

FEBRUARY 28, 2013

St. Jacobs - Elmira Wastewater Treatment Master Plan

- FINAL REPORT -



Prepared for:

Region of Waterloo
150 Frederick Street, 7th Floor
Kitchener, Ontario N2G 4J3
Attention: Pam Law, P.Eng.

Prepared by:

XCG
Environmental Engineers & Scientists

In Conjunction with:

Hatch Mott MacDonald

D.C. DAMMAN and ASSOCIATES

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February 28, 2013

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ST. JACOBS - ELMIRA WASTEWATER TREATMENT MASTER PLAN

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Prepared by:

XCG CONSULTANTS LTD.
Suite 300, 2620 Bristol Circle
Oakville, ON, L6H 6Z7

In Conjunction with:
HATCH MOTT MACDONALD
D.C. DAMMAN & ASSOCIATES

ES 1. EXECUTIVE SUMMARY

ES 1.1 Introduction and Background

The purpose of the St. Jacobs – Elmira Wastewater Treatment Master Plan (WWTMP) is to develop a wastewater treatment strategy for the communities of Elmira, St. Jacobs, and Heidelberg to 2041 to ensure that there is sufficient wastewater treatment capacity available to service the existing population and new growth that is planned within the communities. The project was undertaken as a Master Plan under the Municipal Class Environmental Assessment (EA) (Municipal Engineers' Association, June 2000, as amended in 2007 and 2011). Master Plans allow for the long-term planning of a group of related projects. A Master Plan can complete the Phases 1 and 2 requirements of the Municipal Class EA. The Master Plan can also be used to support further work undertaken as part of a Schedule B project. Phases 3 and 4 requirements may need to be completed for any Schedule C project related to the Master Plan.

ES 1.2 Existing Conditions

The communities of St. Jacobs, Elmira and Heidelberg are situated within the Township of Woolwich, part of the Regional Municipality of Waterloo (the Region). The communities of St. Jacobs and Elmira each have their own wastewater collection and treatment systems. A small development in the village of Heidelberg is serviced with a communal wastewater collection and treatment system. The Township of Woolwich is responsible for the operation and maintenance of the sewage collection systems while the Region owns and is responsible for the operation of the wastewater treatment plants (WWTPs).

The Elmira WWTP provides tertiary treatment for wastewater generated in the Town of Elmira and has a Certificate of Approval (CofA) rated average day flow (ADF) capacity of 7,800 m^3/d and a peak flow capacity of 19,500 m^3/d. A preliminary capacity assessment of the Elmira WWTP indicates that the Elmira WWTP ADF capacity is limited by the capacity of the bioreactors due to historically high influent $cBOD_5$ concentrations from industrial sources. The Region is currently addressing this through enforcement of their Sewer Use By-Law. The Elmira WWTP also experiences high wet weather flows due to the impacts of inflow and infiltration (I/I) entering the sewage collection system.

The St. Jacobs WWTP provides tertiary treatment for wastewater generated in the Town of St. Jacobs and has a CofA rated ADF capacity of 1,450 m^3/d. A preliminary capacity assessment of the St. Jacobs WWTP indicates that the ADF capacity of the St. Jacobs WWTP may actually be lower than the CofA rated ADF capacity due to the impacts of very low temperatures (<3°C) in the oxidation ditch on winter nitrification performance. The St. Jacobs WWTP experiences very high levels of I/I for extended periods of time, resulting in sustained high flows to the plant during wet weather periods.

The Heidelberg WWTP provides tertiary treatment for wastewater generated in a development of about 90 homes in the village of Heidelberg. The Heidelberg WWTP has a CofA rated ADF capacity of 130 m^3/d and a peak flow capacity of 276 m^3/d. The Heidelberg WWTP is small and involves a complex Biological Nutrient Removal (BNR) process, resulting in high operational costs.

ES 1.3 Public and Agency Consultation

Members of the public and those on the project mailing list, which included agencies, stakeholders and Aboriginals, were provided with project notifications through direct mail outs at key points in the Master Plan process. These notifications were also published in local newspapers.

A Steering Committee consisting of staff from the Region of Waterloo, Township of Woolwich, City of Waterloo and the Grand River Conservation Authority (GRCA) was established to provide technical input and direction on the project. In addition to the agencies represented on the Steering Committee, other federal, provincial and municipal agencies, as well as utilities and special interest groups, were consulted during the course of the Master Plan process. Additions were made to the project mailing list upon request.

Key project information such as notifications, Public Information Centre (PIC) materials (i.e., display boards, comment sheet, handout) were posted on the Region of Waterloo web site.

The Notice of Commencement for the St. Jacobs – Elmira Wastewater Treatment Plant Master Plan was published in the Waterloo Region Record on Friday, November 19, 2010 and in the Woolwich Observer on Saturday, November 20, 2010.

The Notice of PIC was published in the Elmira Independent on November 22 and 29, 2012 and in the Woolwich Observer on November 17 and December 1, 2012.

A PIC was held from 5:00 pm to 7:00 pm on Tuesday, December 4, 2012 at the St. Jacobs Community Centre to provide an opportunity for members of the public to obtain information on the Master Plan process, the alternative solutions, the evaluation of these alternatives and the recommended preferred alternative. It was also an opportunity for members of the public to obtain responses to questions and provide comment and input to the study. Members of the project team, including Regional staff and consultant representatives, were available to provide and discuss information on the Master Plan, and to receive comments and input.

A total of nine people provided their name and contact information on the Attendance Record for the PIC. No completed Comment Sheets were submitted to the Region. However, the Region received two e-mail responses. No responses were received from First Nations contacted during the Master Plan.

The Notice of Completion was published in the Waterloo Chronicle on Wednesday, March 13, 2013 and Wednesday, March 20, 2013, in the Woolwich Observer on Saturday, March 16, 2013 and Saturday, March 23, 2013, and the Elmira Independent on Thursday, March 14, 2013 and Thursday, March 21, 2013. The Notice of Completion advised members of the public of the opportunity to review and provide

comments on the Master Plan. A period of 30 calendar days from March 12, 2013 to April 11, 2013 was provided for the public review of the Master Plan.

ES 1.4 Population and Flow Projections

Growth and flow projections were developed in consultation with the Township and Region Planning department. Based on the resulting population projections, sewage flow projections were developed for each WWTP being considered in the St. Jacobs – Elmira WWTMP. Flow projections for the WWTPs are presented in Table ES1.

Table ES1 Flow Projections

Year	Projected Flows for St. Jacobs (m^3/d)	Projected Flows for Elmira (m^3/d)	Projected Flows for Heidelberg (m^3/d)
Current	1,050	4,024	51
2011	1,115	4,410	51
2016	1,278	4,991	51
2021	1,441	5,668	51
2026	1,604	6,345	51
2029	1,702	6,751	51
2031	1,767	7,022	51
2041	2,093	8,376	51
CofA Rated ADF Capacity	**1,450**	**7,800**	**130**

Based on the Table ES1, the St. Jacobs WWTP is projected to exceed its CofA ADF rated capacity in about 2021. The Elmira WWTP is projected to exceed its WWTP CofA ADF rated capacity in about 2037. As there is no population growth expected in the serviced area of Heidelberg, the projected flows for the Heidelberg WWTP are expected to remain at approximately 51 m^3/d.

ES 1.5 Review of I/I Reduction Programs

The St. Jacobs and Elmira wastewater collection systems both experience significant I/I, which takes up valuable capacity within the conveyance systems and wastewater treatment plants. The 1997 Elmira and St. Jacobs Wastewater Treatment Class EA set peak flow I/I reduction targets for the Elmira and St. Jacobs wastewater collections systems. These targets, which were to be achieved by 2008, were a 205 L/s or 39 percent reduction for Elmira and a 39 L/s or 62 percent reduction for St. Jacobs.

The Township has undertaken a systematic review aimed at identifying and quantifying I/I from drainage areas in St. Jacobs and Elmira and has undertaken comprehensive inspection and assessment activities in order to identify sources.

With the public side rehabilitation work completed in St. Jacobs, the program has not reduced I/I to the extent expected. While flow data show a generally downward trend in sanitary sewer flows, the benefit of the Township's I/I reduction efforts to date are difficult to quantify. To meet targets, the Township has recognized that I/I remedial works are required on private infrastructure and have identified foundation drain connection and deficient laterals as potential sources of I/I. The Township is currently proceeding to investigate and evaluate options for addressing these deficiencies.

With ongoing I/I reduction initiatives, the community of St. Jacobs must reduce the overall per capita ADF to 539 L/cap·d to defer expansion requirements for the St. Jacobs WWTP until 2024 (to coincide with the completion of the Waterloo WWTP expansion). Based on the projected per capita ADF of 572 L/cap·d, this is equivalent to a required reduction of 33 L/cap·d or about 6 percent.

The Township has completed extensive work in Elmira to address I/I including five subcatchments which were found to contribute a significant component of the I/I being experienced in the collection system. I/I studies suggest that the primary source of I/I in the Elmira sanitary sewer system is private side direct connections to the sanitary system, exacerbated by the high groundwater in the area. The Township initiated a pilot project involving private side source controls to evaluate the different methods of achieving target I/I reductions.

Current I/I reduction programs in Elmira have shown an I/I reduction of 25 L/cap·d. Based on 2041 population of 21,359 in Elmira, this is equivalent to a reduction of approximately 534 m^3/d. Therefore, continuation of the I/I reduction program combined with continued implementation of water efficiency programs would likely reduce the 2041 projected flows to within the CofA rated ADF capacity of the existing Elmira WWTP.

ES 1.6 Review of Alternative Solutions

A number of planning alternatives to address the wastewater servicing needs for Elmira, St. Jacobs and Heidelberg were developed.

Preliminary evaluation of the on-going I/I reduction initiatives and the impacts on the projected flows for Elmira suggests that the 2041 projected flows for Elmira can be met at the existing CofA rated design capacity when combined with continued I/I reduction and continued implementation of water efficiency programs. Provided that the Elmira WWTP does not receive wastewater from other communities (i.e. Heidelberg or St. Jacobs), an expansion of the Elmira WWTP will not be needed within the planning period of this Master Plan. However, the Elmira WWTP will need to be optimized or upgraded to address known performance or capacity limitations or possible more stringent future regulatory requirements.

A long list of alternatives for the servicing of St. Jacobs and Heidelberg was developed and alternatives were eliminated based on the ability of each alternative to meet project objectives. Based on this evaluation, a short-list of alternatives for servicing St. Jacobs and Heidelberg was developed for more detailed evaluation. The detailed evaluation was conducted on feasible combinations of the short-listed

alternatives for the communities of St. Jacobs and Heidelberg. The feasible combinations of short listed alternatives (referred to as options) for servicing St. Jacobs and Heidelberg are presented in Table ES2.

Table ES2 Feasible Combination of Alternative Solutions

Option	Short Listed Alternatives	
	St. Jacobs Servicing Component	**Heidelberg Servicing Component**
1	Upgrade and expand the St. Jacobs WWTP	Maintain existing Heidelberg WWTP
2		Decommission the Heidelberg WWTP and transfer flows to the St. Jacobs WWTP
3		Decommission the Heidelberg WWTP and transfer flows to the Waterloo WWTP
4	Decommission the St. Jacobs WWTP and transfer flows to the Waterloo WWTP	Maintain existing Heidelberg WWTP
5		Decommission the Heidelberg WWTP and transfer flows to the Waterloo WWTP
6	Upgrade the existing plant and transfer flows beyond the existing capacity of the St Jacobs WWTP to the Waterloo WWTP	Maintain existing Heidelberg WWTP
7		Decommission the Heidelberg WWTP and transfer flows to the St. Jacobs WWTP
8		Decommission the Heidelberg WWTP and transfer flows to the Waterloo WWTP

ES 1.7 Review of Alternative Solutions

The options identified in Table ES2 were evaluated against a set of criteria established in conjunction with the Steering Committee. The criteria were categorized as technical, environmental, social and economical. Each category was considered to have equal weight. The options were evaluated based on a weighted application of the evaluation criteria and ranked from most preferred to least preferred.

The result of the evaluation is presented in Table ES3. Based on the detailed evaluation, the preferred option for servicing the communities of St. Jacobs and Heidelberg involves decommissioning the St. Jacobs WWTP and transferring flows to the Waterloo WWTP, while maintaining the existing Heidelberg WWTP until it reaches the end of its life expectancy and significant upgrades are required.

Continued implementation of I/I reduction and water efficiency programs in St. Jacobs and Elmira is an essential part of the preferred alternative.

Table ES3 Results of Evaluation

Ranking	Option
1	Option 4 - Decommission the St. Jacobs WWTP and transfer flows to the Waterloo WWTP. Maintain existing Heidelberg WWTP
2	Option 1 - Upgrade and expand the St. Jacobs WWTP. Maintain existing Heidelberg WWTP
3	Option 5 - Decommission the St. Jacobs WWTP and transfer flows to the Waterloo WWTP. Decommission the Heidelberg WWTP and transfer flows to the Waterloo WWTP
4	Option 6 - Upgrade the existing plant and transfer flows beyond the existing capacity of the St Jacobs WWTP to the Waterloo WWTP. Maintain existing Heidelberg WWTP
5	Option 8 - Upgrade the existing plant and transfer flows beyond the existing capacity of the St Jacobs WWTP to the Waterloo WWTP. Decommission the Heidelberg WWTP and transfer flows to the Waterloo WWTP
6	Option 2 - Upgrade and expand the St. Jacobs WWTP. Decommission the Heidelberg WWTP and transfer flows to the St. Jacobs WWTP
7	Option 3 - Upgrade and expand the St. Jacobs WWTP. Decommission the Heidelberg WWTP and transfer flows to the Waterloo WWTP
8	Option 7 - Upgrade the existing plant and transfer flows beyond the existing capacity of the St Jacobs WWTP to the Waterloo WWTP. Decommission the Heidelberg WWTP and transfer flows to the St. Jacobs WWTP

The capital cost of implementing the required works associated with decommissioning the St. Jacobs WWTP and transferring flows to the City of Waterloo is estimated at $7.2 M. This option represents the lowest thirty-year life cycle cost of the options considered.

ES 1.8 Implementation Plan

Implementation of the preferred alternative involves continued implementation of I/I reduction programs and water efficiency programs in St. Jacobs and Elmira.

Optimizing and upgrading the existing Elmira WWTP is ongoing and is classified as a "Schedule A" activity under the Municipal Class EA; therefore, these upgrades can proceed immediately without further requirements under the Municipal Class EA. Initial steps should focus on the reduction of industrial loadings, characterization of the resulting wastewater influent and development of a calibrated process model that can be used to optimize the bioreactor capacity.

A "Schedule B" Class EA will be required to determine the most appropriate forcemain route for conveying flows from the existing St. Jacobs WWTP site to the City of Waterloo wastewater collection system.

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Appendix F Capacity and Needs Assessment
Appendix G Alternative Solutions
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Appendix I Public, Agency, Stakeholder and Aboriginal Consultation

1. INTRODUCTION AND PURPOSE

The Regional Municipality of Waterloo (Region) has completed a Wastewater Treatment Master Plan for the communities of St. Jacobs and Elmira in the Township of Woolwich (Township). The wastewater systems in both communities are operated as a 2-tier system with the Township responsible for wastewater collection and the Region responsible for wastewater treatment and biosolids management. The Region owns the two wastewater treatment plants located in St. Jacobs and Elmira.

In 1997, a Class Environmental Assessment (EA) study examined alternatives to provide adequate wastewater treatment capacity to St. Jacobs and Elmira to the year 2021. In addition, a Region-wide Wastewater Treatment Master Plan (WWTMP) was completed in 2007, and identified the need to develop separately a Master Plan for St. Jacobs and Elmira that would specifically examine the treatment requirements for these two communities.

The purpose of this Master Plan was to review wastewater treatment and servicing for the two communities of St. Jacobs and Elmira since the implementation of the recommendations of the 1997 Class EA study, as well as the completion of the 2007 Region-wide WWTMP. The Master Plan reviews wastewater treatment requirements and recommends a preferred alternative to meet growth in the communities to 2041.

This study also provided an opportunity to consider wastewater treatment requirements for the community of Heidelberg as part of an overall solution.

1.1 Background

The Towns of St. Jacobs and Elmira are located in the Township of Woolwich (Township). The Elmira Wastewater Treatment Plant (WWTP) provides tertiary treatment for wastewater generated in the Town of Elmira and has a Certificate of Approval (CofA) rated average day flow (ADF) capacity of 7,800 m^3/d and a peak flow capacity of 19,500 m^3/d.

The St. Jacobs WWTP provides tertiary treatment for wastewater generated in the Town of St. Jacobs and has a CofA rated ADF capacity of 1,450 m^3/d.

The Heidelberg WWTP provides tertiary treatment for wastewater generated in a development of about 90 homes in the village of Heidelberg. The Heidelberg WWTP has a CofA rated ADF capacity of 130 m^3/d and a peak flow capacity of 276 m^3/d.

1.2 Study Objectives

The objectives of the Master Plan study were to:

- Review wastewater treatment requirements in the communities of St. Jacobs and Elmira and recommend a wastewater treatment strategy to meet growth in the communities for the next 30 years;
- Consider the feasibility of incorporating flows from the Heidelberg WWTP into an overall solution;

- Allow for public, agency, stakeholder and Aboriginal consultation to satisfy the Municipal Class EA process; and
- Complete Phases 1 and 2 of the Municipal Class EA (Municipal Engineers Association, October 2000 as amended in 2007 and 2011).

1.3 Class Environmental Assessment and Master Planning Process

The Municipal Class EA (Municipal Engineers Association, 2000, as amended in 2007 and 2011) outlines an approved planning process for municipal infrastructure projects, including wastewater projects. Municipal proponents can use the Class EA process to meet the requirements of the Ontario Environmental Assessment Act (EAA). Individual projects subject to the Municipal Class EA process are categorized as Schedule A, A^+, B or C, depending on the type of project and its potential environmental effects. The Municipal Class EA planning and design process is illustrated in Figure 1.1.

The Master Plan provisions of the Municipal Class EA allow municipalities to develop long range plans for integrated infrastructure requirements. The St. Jacobs - Elmira Wastewater Treatment study was completed as a Master Plan, fulfilling the requirements of Phases 1 and 2 of the Municipal Class EA.

Projects that result from the Master Planning process will be subject to the requirements of the Municipal Class EA process which may include further assessment for Schedule B activities. In addition, Phase 3 and Phase 4 requirements may need to be carried out for any Schedule C activities identified in the Master Plan.

Further details on the Master Plan process are provided in Section A.2.7 of the Municipal Class EA.

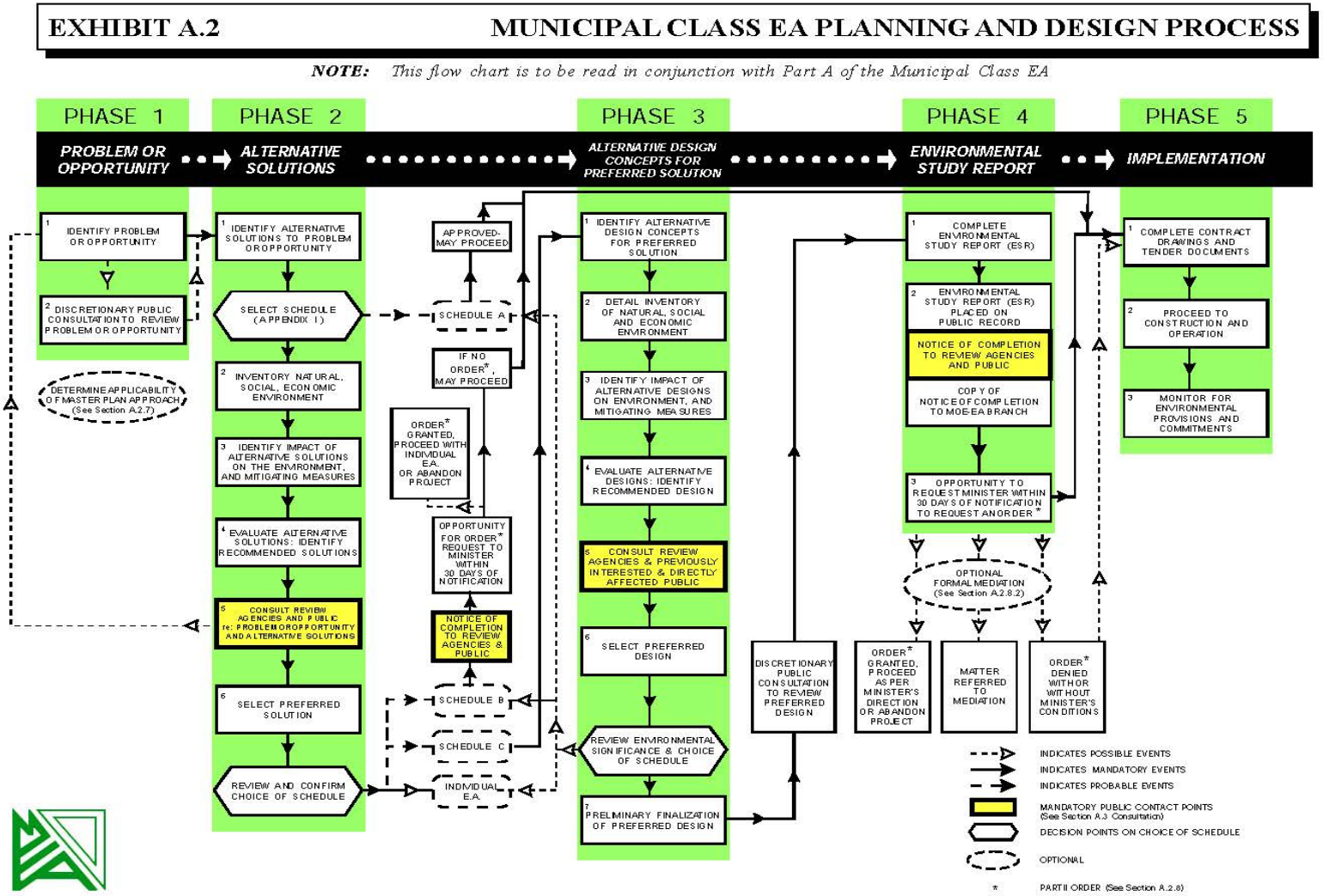


Figure 1.1 Municipal Class EA Process

1.4 Project Organization

Figure 1.2 illustrates the Project Organization.

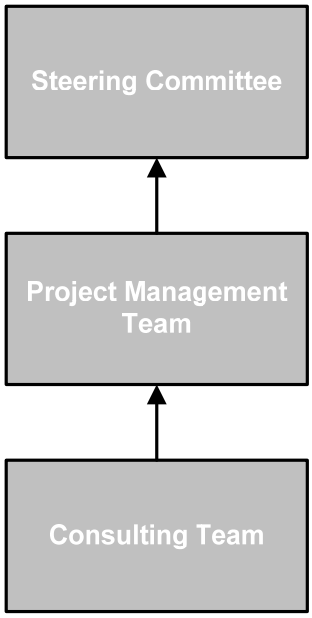


Figure 1.2 Project Organization

A Steering Committee was established to provide advice to the Project Management Team during the course of the study. The Steering Committee was comprised of Regional staff as well as staff from the Township of Woolwich, the City of Waterloo and the Grand River Conservation Authority (GRCA), as listed in Table 1.1.

Table 1.1 Members of the Steering Committee

Steering Committee Member	Organization or Affiliation
Pam Law	Region of Waterloo
Nancy Kodousek	Region of Waterloo
Jorge Calvacante	Region of Waterloo
Kaoru Yajima	Region of Waterloo
Todd Cowan	Township of Woolwich
Dan Kennaley	Township of Woolwich
Mark Bauman	Township of Woolwich
Allan Poffenroth	Township of Woolwich
Denise McGoldrick	City of Waterloo
Mark Anderson	Grand River Conservation Authority

Three meetings were held with the Steering Committee. Table 1.2 summarizes the items discussed at each of the Steering Committee meetings. Detailed information on the three Steering Committee meetings, including agendas, presentation materials and meeting notes, is included in Appendix I.

Table 1.2 Members of the Steering Committee

Steering Committee Meeting	Agenda Items

Meeting # 1 – June 3, 2011	• Welcome and Introductions
	• Role of the Steering Committee
	• Purpose and Background to the Study
	• Overview of Project Work Plan and Proposed Schedule
	• Consultation Strategy
	• Overview of Work Completed to Date
	  o Existing Conditions
	  o Future Populations and Future Flows
	  o Review of Extraneous Flow Reduction Programs
	  o Assimilative Capacity Review
	• Next Steps and Timing

Meeting # 2 – April 18, 2012	• Welcome and Introductions • Project Objectives • Future Growth and Flow Projections • Long List of Alternatives for Servicing Elmira, St. Jacobs and Heidelberg • Short-Listed Alternatives • Evaluation Criteria and Methodology • Evaluation of Short-Listed Alternatives • Preferred Alternative for Servicing Elmira, St. Jacobs and Heidelberg • Next Steps

Meeting # 3 – November 1, 2012	• Introductions
	• Project and Meeting Objectives
	• Outcome of Preliminary Evaluation of Alternatives
	  o Alternatives Evaluated
	  o Evaluation Methodology
	  o Preliminary Preferred Alternative
	• Updated City of Waterloo Growth and Flow Projections
	• Impact on Preliminary Evaluation of Alternatives
	  o Cost Implications
	  o Revised Evaluation Matrix
	  o Preferred Alternative
	• Next Steps

1.5 Report Format

The Master Plan report consists of the following sections:

- Section 1.0 - Introduction and Purpose
- Section 2.0 - Existing Conditions
- Section 3.0 - Population and Flow Projections
- Section 4.0 - Problem Statement
- Section 5.0 - Status of Extraneous Flow Reduction Programs
- Section 6.0 - Review of Assimilative Capacity
- Section 7.0 - Alternative Solutions
- Section 8.0 - Evaluation Process
- Section 9.0 - Evaluation of Alternative Solutions
- Section 10.0 - Public, Agency, Stakeholder and Aboriginal Consultation
- Section 11.0 - Implementation
- Section 12.0 - References.

A series of technical memorandums (TM) were prepared and are included as appendices. The appendices to this Master Plan are:

- Appendix A - Technical Memorandum No. 1A - Background Information
- Appendix B - Technical Memorandum No. 1B - Existing Conditions
- Appendix C - Technical Memorandum No. 2 - Future Flow Projections
- Appendix D – Technical Memorandum No. 3 - Assimilative Capacity Study
- Appendix E - Technical Memorandum No. 4/5 - Review of I/I Reduction Programs
- Appendix F - Technical Memorandum No. 6 - Capacity and Needs Assessment
- Appendix G - Technical Memorandum No. 7 - Alternative Solutions
- Appendix H - Technical Memorandum No. 8 - Evaluation Process
- Appendix I - Public, Agency, Stakeholder and Aboriginal Consultation.

2. EXISTING CONDITIONS

The communities of St. Jacobs, Elmira, and Heidelberg are situated within the Township of Woolwich, one of four townships that, together with the cities of Waterloo, Kitchener and Cambridge, make up the Regional Municipality of Waterloo. The wastewater systems in these three communities are operated as a 2-tier system, with the Township responsible for wastewater collection and pumping, and the Region responsible for wastewater treatment, discharge and biosolids management.

The communities of St. Jacobs, Elmira and Heidelberg have their own separate wastewater collection and treatment facilities. The Region owns the St. Jacobs, Elmira and Heidelberg WWTPs, and the facilities are operated by the Ontario Clean Water Agency (OCWA) under contract to the Region.

A detailed review of the historic operating conditions at the St. Jacobs, Elmira and Heidelberg WWTPs is provided in TM No. 1B "Existing Conditions", which is provided in Appendix B. A detailed review of the current capacity of the St. Jacobs and Elmira WWTP is provided in TM No. 6 "Capacity and Needs Assessment", which is provided in Appendix F.

2.1 Town of St. Jacobs

2.1.1 Treatment Objectives and Compliance Requirements

The CofA effluent requirements for the St. Jacobs WWTP are summarized in Table 2.1.

Table 2.1 CofA Objectives and Non-compliance Limits (CofA No 3-0690-99-006)

Parameter	Effluent Objectives		Non-Compliance Limits	
	Concentration (1)	Total Loading	Concentration	Total Loading
$cBOD_5$	5.0 mg/L	7.3 kg/d (2)	10.0 mg/L	14.5 kg/d (2)
TSS	5.0 mg/L	7.3 kg/d (2)	10.0 mg/L	14.5 kg/d (2)
TP	0.2 mg/L	0.3 kg/d (2)	0.3 mg/L	0.44 kg/d (2)
TAN (May-Oct)	0.7 mg/L	1.0 kg/d (3)	1.0 mg/L	1.5 kg/d (3)
TAN (Nov-Apr)	1.0 mg/L	1.5 kg/d (3)	2.0 mg/L	2.9 kg/d (3)
E .coli (4)	100 counts/100mL	-	200 counts/100 mL	-

Notes:
1. Based on monthly average concentration values.
2. Based on the annual average loading during any calendar year.
3. Based on the monthly concentration of the parameter multiplied by the average daily flow over the corresponding monthly period the sample was taken, exceeds its corresponding loading.
4. Based on monthly geometric mean.

2.1.2 St. Jacobs Wastewater Collection System

The St. Jacobs wastewater collection system was originally constructed in 1971. The St. Jacobs wastewater collection system consists of approximately 10 km of sanitary sewers ranging in size from 200 mm to 450 mm in diameter, with the majority of pipes being 200 mm and 300 mm in diameter. The sewer system includes approximately 122 manholes.

Figure 2.1 presents the layout and extent of the St. Jacobs wastewater collection system including the location of the St. Jacobs WWTP.

2.1.3 St. Jacobs Wastewater Treatment Plant

The St. Jacobs WWTP is located on Princess Street East, in the Town of St. Jacobs. The WWTP has a serviced population of approximately 1,836 people.

The St. Jacobs WWTP is a Class III facility consisting of an extended aeration process (oxidation ditch) with tertiary filtration. The St. Jacobs WWTP was originally constructed in 1971 and was expanded in 2000. The St. Jacobs WWTP is operated under Ministry of the Environment (MOE) CofA No. 3-0690-99-006 issued on October 21, 1999. The St. Jacobs WWTP has an average day CofA rated capacity of 1,450 m^3/d.

Figure 2.2 presents an aerial view of the WWTP and Figure 2.3 presents a process flow diagram (PFD) of the WWTP.

Raw wastewater enters the WWTP from an on-site sewage pumping station (SPS). Raw wastewater passes through the grinder/auger screen and vortex grit removal tank. Screened and degritted wastewater is combined with return activated sludge (RAS) and flows to an oxidation ditch. The oxidation ditch is aerated by two rotors.

The mixed liquor from the oxidation ditch is distributed to two secondary clarifiers. The secondary effluent flows to three continuous backwash sand filters and is disinfected by UV radiation prior to discharge to Conestogo River. The UV system consists of one bank of UV lamps installed in one channel. Provisions exist for chlorination in the event of plant by-pass.

Waste Activated Sludge (WAS) is stored in an aerated holding tank prior to being hauled by truck for stabilization at another Regional WWTP and land application.

The St. Jacobs WWTP is currently operating at about 70 percent of the CofA rated ADF capacity. Detailed information on the historic operation of the St. Jacobs WWTP is provided in TM No. 1B “Existing Conditions”, which is provided in Appendix B.

Based on the preliminary capacity assessment provided in Appendix E, the ADF capacity of the St. Jacobs WWTP may actually be lower than the CofA rated ADF capacity due to the impacts of very low temperatures (<3°C) in the oxidation ditch on winter nitrification performance and capacity.

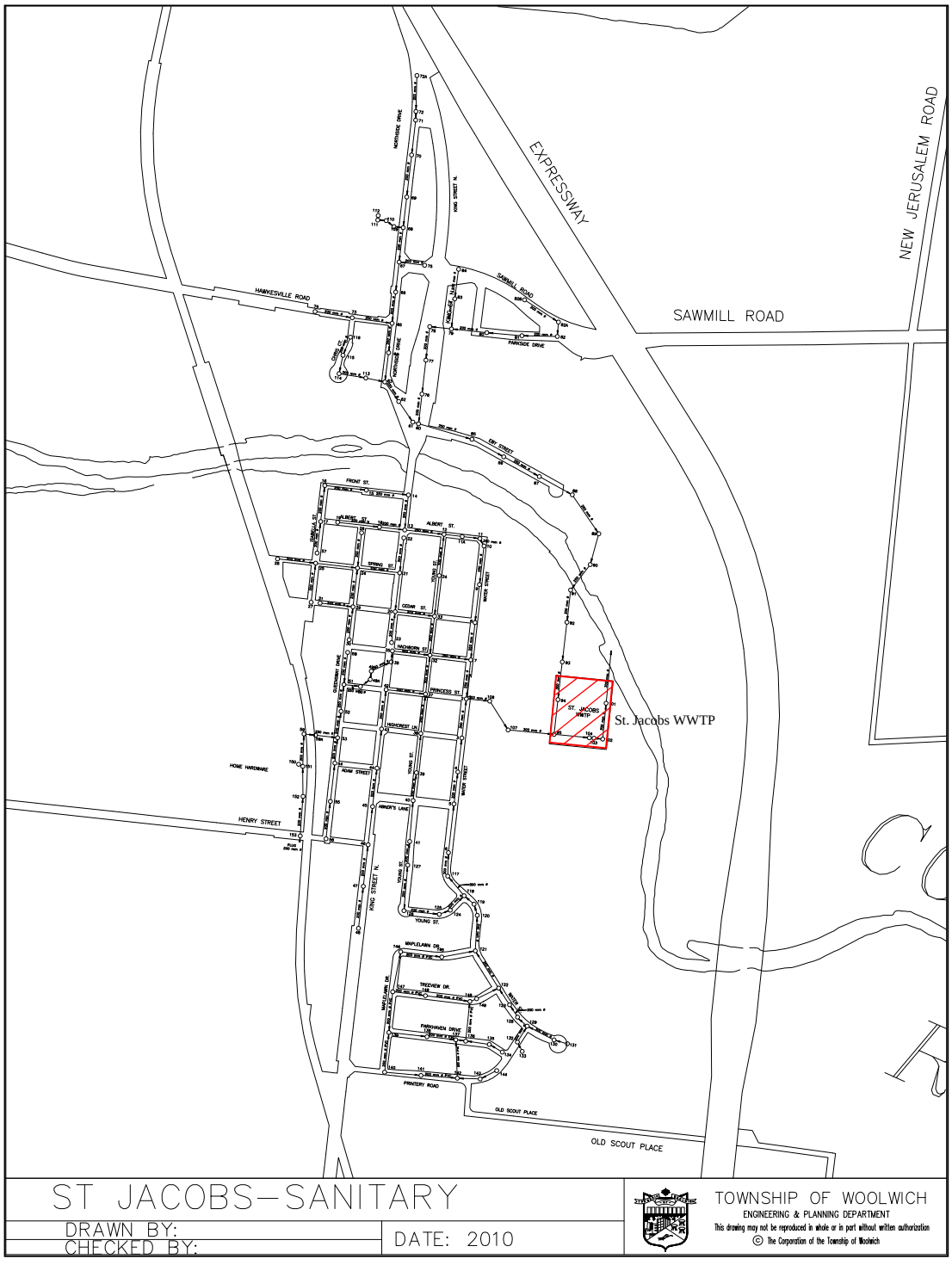


Figure 2.1 St. Jacobs Wastewater Collection System

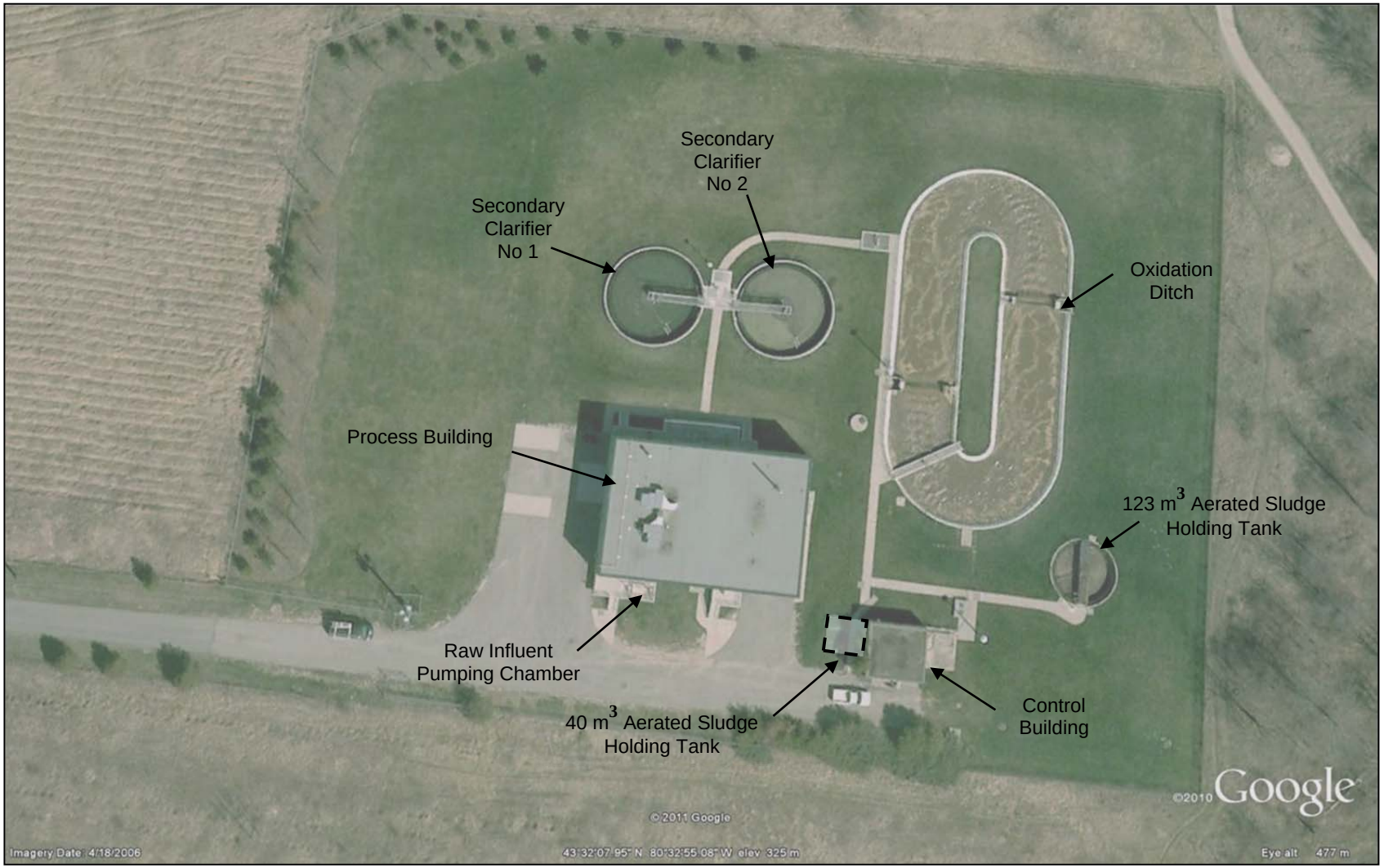


Figure 2.2 St. Jacobs WWTP - Overhead View

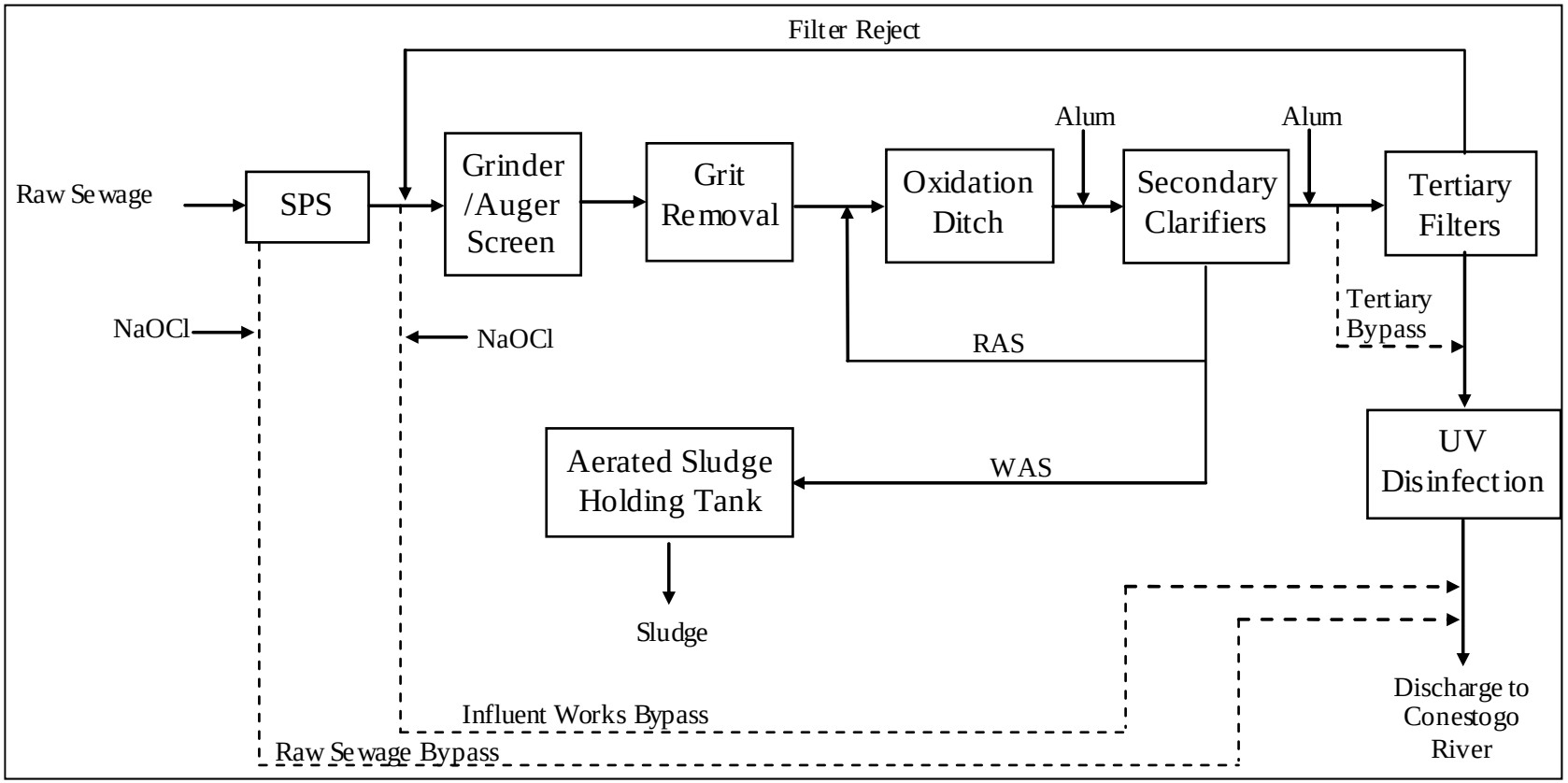


Figure 2.3 St. Jacobs WWTP Flow Schematic

2.2 Town of Elmira

2.2.1 Treatment Objectives and Compliance Requirements

The CofA effluent requirements for the Elmira WWTP are summarized in Table 2.2.

Table 2.2 CofA Objectives and Non-compliance Limits (CofA No 2530-84BL9Q)

Parameter	Effluent Objectives	Non-Compliance Limits	
	Concentration (1)	Concentration (1)	Total Loading (2)
$cBOD_5$	5.0 mg/L	10.0 mg/L	78.0 kg/d
TSS	5.0 mg/L	10.0 mg/L	78.0 kg/d
TP	0.2 mg/L	0.5 mg/L	3.9 kg/d
TAN (May-Oct)	0.4 mg/L	0.7 mg/L	5.5 kg/d
TAN (Nov-Apr)	1.0 mg/L	2.0 mg/L	15.6 kg/d
pH	Between 6.5 to 9.0 inclusive	Between 6.0 to 9.5 inclusive	-
E .coli (3)	-	200 counts/100 mL	-

Notes:
5. Based on monthly average concentration values.
6. Based on the annual average loading.
7. Based on monthly geometric mean density.

2.2.2 Elmira Collection System

The Elmira wastewater collection system consists of approximately 33 km of sanitary sewers ranging in size from 100 mm to 525 mm diameter, with the majority of pipes being 250 mm and smaller. The sewer system includes approximately 530 manholes.

The older North Elmira sewer system (now 75+ years old) is also serviced by a cellar drain system, including common manholes in which the sanitary and cellar drain sewers are separated by a bulkhead. Water from weeping tiles and downspouts have their own collection system (cellar drain system), independent of the sanitary sewers. Water from these systems does not flow to the WWTP under dry weather conditions; however, the common manholes between the cellar drain and sanitary sewer systems provide an opportunity for cellar drain flows to enter the sanitary sewer system as inflow if the manholes surcharge for any reason (e.g. during wet weather).

Many of the homes in the South Elmira sewer system, which were built prior to 1980, had foundation drains connected to the sanitary sewer. The area also has storm sewers which are too shallow to allow foundation drain connections.

Figure 2.4 shows the layout and extent of the Elmira wastewater collection system including the location of the Elmira WWTP.



Figure 2.4 Elmira Wastewater Collection System

2.2.3 Elmira Wastewater Treatment Plant

The Elmira WWTP is located at 80 First Street East, in the Town of Elmira. The WWTP has a serviced population of approximately 10,011 people.

The Elmira WWTP is a Class III facility with a Biological Nutrient Removal (BNR) process and tertiary filtration. The Elmira WWTP, originally constructed in 1967, was expanded in 1983 and again in 2000. The Elmira WWTP is operated under MOE Amended CofA No. 2530-84BL9Q issued on June 8th, 2010. The Elmira WWTP has an average day CofA rated capacity of 7,800 m^3/d.

Figure 2.5 presents an aerial view of the WWTP and Figure 2.6 presents a PFD of the WWTP.

Raw wastewater enters the WWTP from an off-site SPS. The WWTP is serviced by six equalization tanks, four located off-site adjacent to the SPS and two located on-site at the WWTP. It should be noted that two of the off-site equalization tanks were recently constructed as part of the current upgrade project; therefore, these tanks are shown schematically in aerial view of the WWTP.

Raw wastewater at the WWTP passes through two mechanically cleaned bar screens and two vortex grit removal tanks. Screened and degritted wastewater flows to two circular primary clarifiers. Primary effluent is combined with the RAS stream and flows to two bioreactors. Each bioreactor is baffled into five separate cells arranged as follows: anoxic, anaerobic, swing zone (anoxic/aerboic), aerobic, and aerobic. Recycle pumps within the bioreactors allow for internal mixed liquor recycling from the final aerobic zone to the swing zone.

The combined mixed liquor from the bioreactors is distributed to three secondary clarifiers. The secondary effluent flows to two automatic backwash sand filters and is disinfected by UV radiation prior to discharge to Canagagigue Creek. The UV system consists of two banks of UV lamps installed in two parallel channels. Provisions exist for chlorination in the event of plant by-pass. Effluent is discharged by gravity to Canagagigue Creek under normal conditions, but an effluent pumping station is provided for periods of high receiving stream water levels.

Primary sludge is fermented in a fermenter tank. The supernatant from the fermenter tank is returned to the anaerobic zone of the bioreactors to facilitate biological phosphorus removal. The fermenter sludge is dewatered in a centrifuge. WAS and scum are combined and dewatered in the centrifuge. Sludge cake is landfilled for final disposal.

The Elmira WWTP is currently operating at about 54 percent of the CofA rated ADF capacity. Detailed information on the historic operation of the Elmira WWTP is provided in TM No. 1B “Existing Conditions”, which is provided in Appendix B.

Based on the preliminary capacity assessment, details of which are included in Appendix F, the Elmira WWTP ADF capacity has been limited by the bioreactors due to historically high influent $cBOD_5$ concentrations. The plant CofA ADF capacity may be met by reducing influent $cBOD_5$ concentrations and/or optimizing and upgrading the individual unit process capacities. The Region is currently addressing this through enforcement of their Sewer Use By-Law and optimization and upgrades at the WWTP.

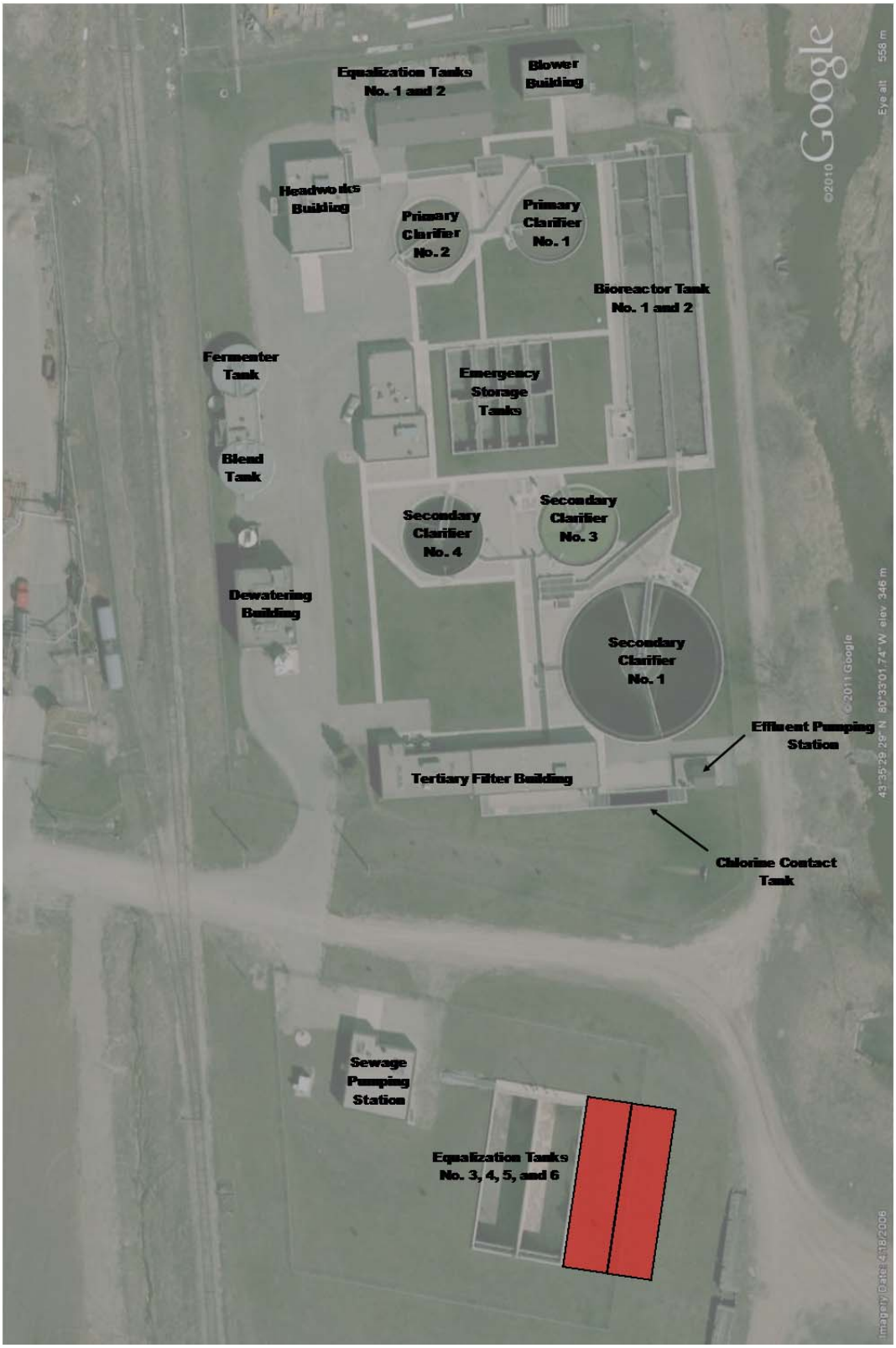


Figure 2.5 Elmira WWTP - Aerial View

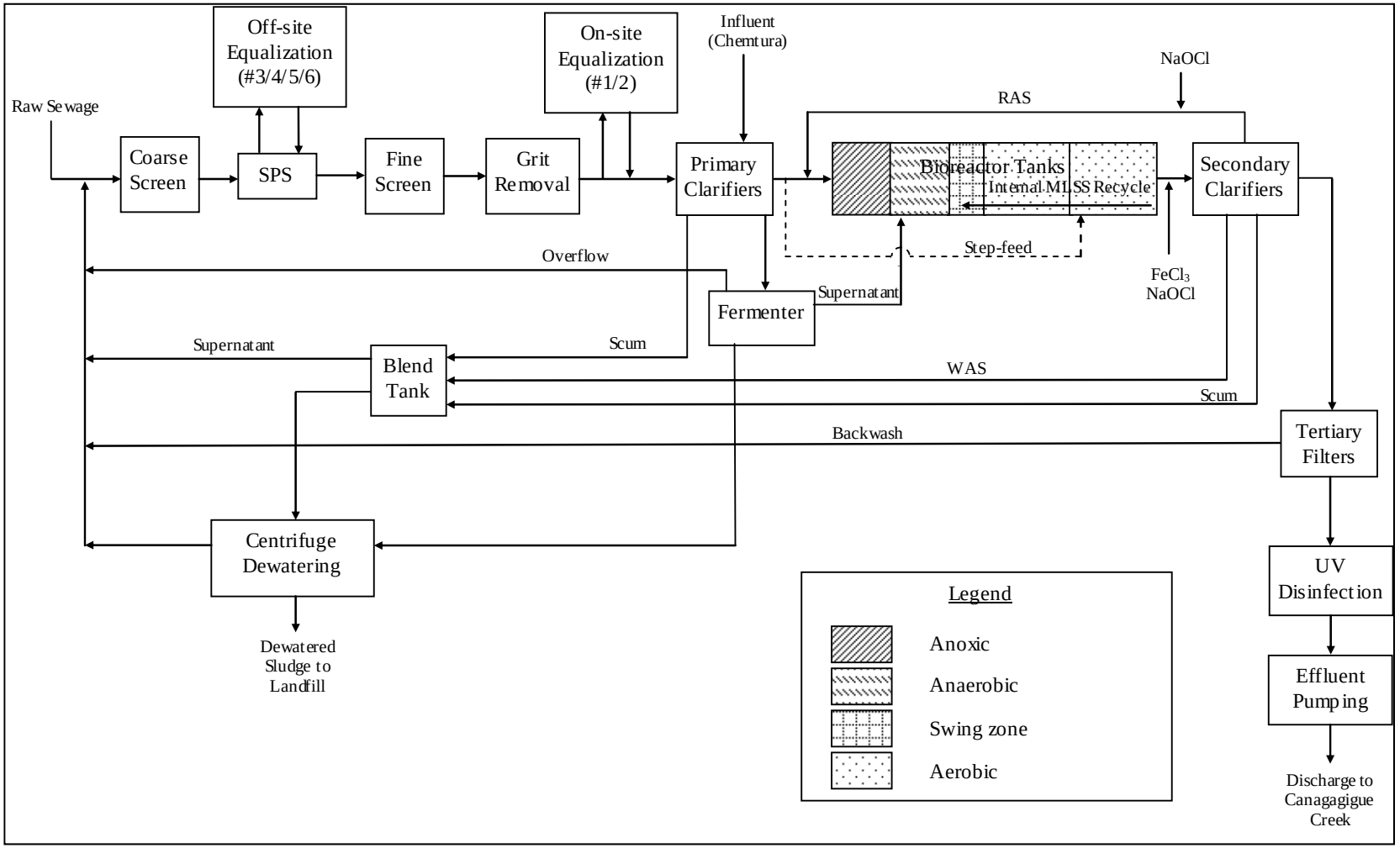


Figure 2.6 Elmira WWTP Flow Schematic

2.3 Town of Heidelberg

2.3.1 Treatment Objectives and Compliance Requirements

The CofA effluent requirements for the Heidelberg WWTP are summarized in Table 2.3.

Table 2.3 CofA Objectives and Non-compliance Limits (CofA No 7707-5NSKGL)

Parameter	Effluent Objectives		Non-Compliance Limits	
	Average Concentration (1)	Daily Concentration	Concentration	Total Loading (2)
$cBOD_5$	5.0 mg/L	20 mg/L	7.5 mg/L	0.58 kg/d
TSS	5.0 mg/L	20 mg/L	10.0 mg/L	0.78 kg/d
TP	0.3 mg/L	1.2 mg/L	0.4 mg/L	0.03 kg/d
TAN (May-Oct)	1.5 mg/L	6.0 mg/L	2.0 mg/L	0.16 kg/d
TAN (Nov-Apr)	3.0 mg/L	12.0 mg/L	4.0 mg/L	0.31 kg/d
Nitrate - N	7.5 mg/L	30.0 mg/L	10.0 mg/L	0.78 kg/d
pH	Between 6.5 to 9.0 inclusive	-	Between 6.0 to 9.5 inclusive	
E .coli (3)	150 counts/100mL		200 counts/100 mL	

Notes:
1. Based on monthly average concentration values.
2. Based on the monthly average loading values.
3. Based on monthly geometric mean.

2.3.2 Heidelberg Wastewater Treatment Plant

The Heidelberg WWTP is located at Lot 14 in the Village of Heidelberg. The WWTP services the Alt Heidelberg Estates consisting of 90 residential lots.

The Heidelberg WWTP is a Class II facility with a Biological Nutrient Removal (BNR) process and tertiary filtration. The Heidelberg WWTP is operated under MOE Amended CofA No. 7707-5NSKGL issued on August 6th, 2003. The Heidelberg WWTP has an average day CofA rated capacity of 130 m^3/d.

Figure 2.7 presents an aerial view of the WWTP and Figure 2.8 presents a PFD of the WWTP.

Raw sewage enters the Heidelberg WWTP through an on-site lift station, consisting of two submersible sewage pumps with a firm pumping capacity of 540 m^3/d. No additional septage or other flows are sent to the Heidelberg WWTP. From the lift station, the raw sewage enters into one of the two equalization tanks and is pumped through the pump chamber to a splitter box for distribution into the aeration tanks.

Wastewater is treated in two bioreactors with a total volume of about 108 m^3. The bioreactors each consists of one anaerobic tank, one anoxic tank and one aerobic tank to allow for biological nutrient removal. Aeration and mixing are provided by coarse bubble diffusers and a submersible mixer. The chemical addition of acetic

acid is used as a source for volatile fatty acids (VFAs) for the biological phosphorus removal process. Aluminum sulphate is also provided for further phosphorus removal purposes.

Following biological treatment, the mixed liquor enters one secondary clarifier with a volume of 60.8 m^3. The secondary clarifier is equipped with a settled sludge pump chamber with two submersible pumps for returning activated sludge to either the anaerobic or anoxic tanks or WAS to the aerated holding tank. Each of the submersible pumps has a rated capacity of 3.2 L/s, which is equivalent to the peak flow capacity to the Heidelberg WWTP.

Following secondary treatment, the wastewater is conveyed to two multimedia effluent filters. A 6.9 m^3 clear well is equipped with two filter backwash water pumps, each having a rated capacity of 11.1 L/s. The filtered effluent flows to an effluent channel equipped with a UV disinfection system comprising of three banks of two lamps each. Following UV disinfection, the treated wastewater is discharged through an outfall pipe with headwall and grating to Heidelberg Creek.

Biosolids pumped from the secondary clarifier are treated in a 4.5 m x 1.8 m aerated holding tank equipped with seven coarse bubble diffusers. Supernatant is returned to the equalization tank pump chamber and solids are hauled to the Waterloo WWTP for further conditioning.



Figure 2.7 Heidelberg WWTP - Overhead View

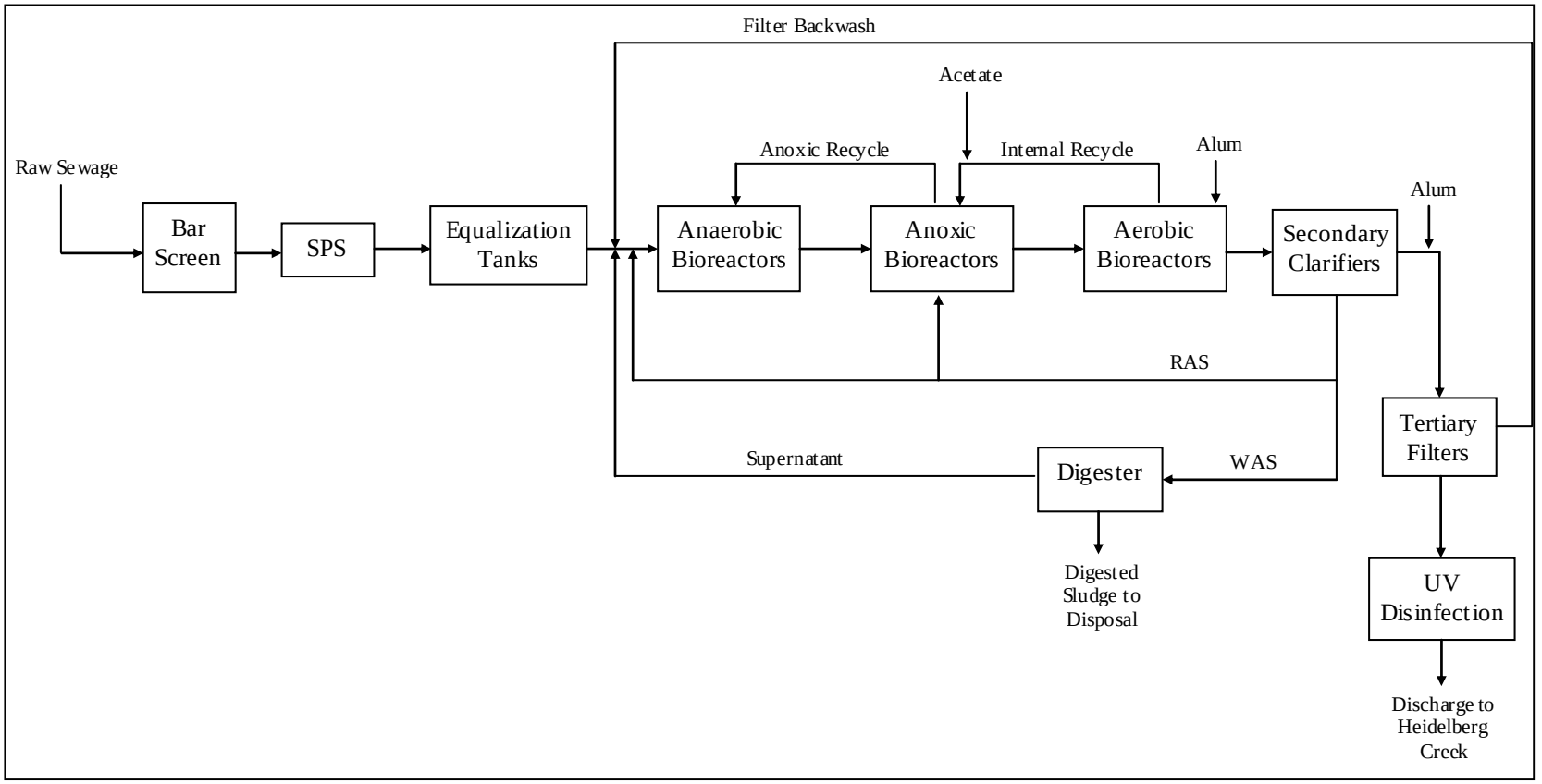


Figure 2.8 Heidelberg WWTP Flow Schematic

3. POPULATION AND FLOW PROJECTIONS

The approach used to project wastewater flows at the St. Jacobs, Elmira and Heidelberg WWTPs to the year 2041 is documented in TM No. 2 - "Future Flow Projections", which is provided in Appendix C.

Population projections for the communities of St. Jacobs, Elmira and Heidelberg are presented in Table 3.1.

Table 3.1 Population Projections

Year	Projected Population for St. Jacobs	Projected Population for Elmira	Projected Population for Heidelberg
2009	1,836	10,011	277
2011	1,950	10,639	277
2016	2,235	12,209	277
2021	2,520	14,039	277
2026	2,805	15,869	277
2029	2,976	16,967	277
2031	3,090	17,699	277
2041	3,660	21,359	277

It should be noted that the 2041 population projections for the communities of St Jacobs and Elmira, while used for the purposes of this Master Plan are adopted by the Region for this purpose only, and will not necessarily be used in population forecasting for the Region of Waterloo Regional Official Plan or its related Population and Employment Implementation Guideline, nor related policy development.

Flow projections for the communities of St. Jacobs, Elmira and Heidelberg are presented in Table 3.2.

Table 3.2 Flow Projections

Year	Projected Flows for St. Jacobs (m^3/d)	Projected Flows for Elmira (m^3/d)	Projected Flows for Heidelberg (m^3/d)
2009	1,050	4,024	51
2011	1,115	4,410	51
2016	1,278	4,991	51
2021	1,441	5,668	51
2026	1,604	6,345	51
2029	1,702	6,751	51
2031	1,767	7,022	51
2041	2,093	8,376	51
CofA Rated ADF Capacity	**1,450**	**7,800**	**130**

Figure 3.1 illustrates the projected population and ADF for St. Jacobs to 2041.

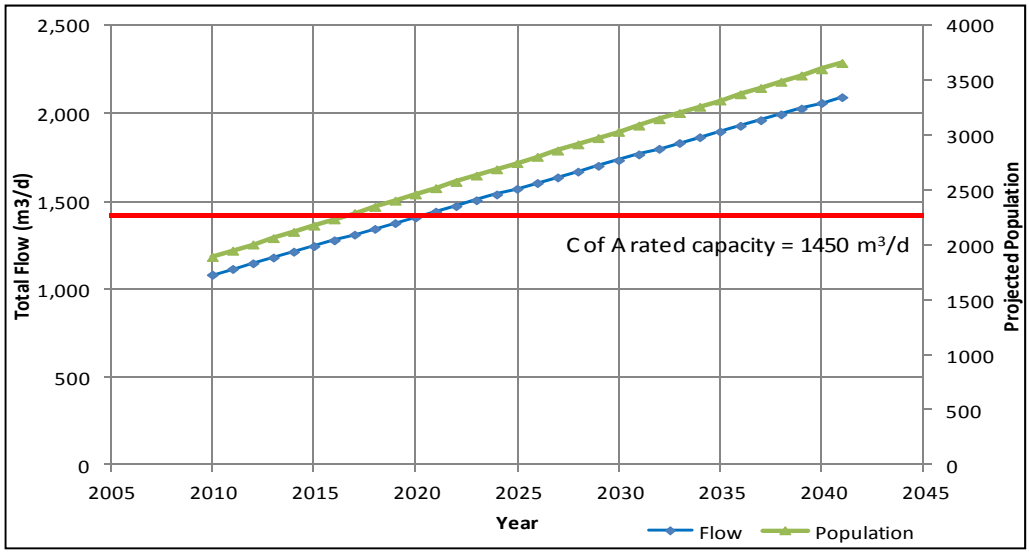


Figure 3.1 St. Jacobs Projected Population and ADF

Figure 3.2 illustrates the projected population and ADF for Elmira to 2041.

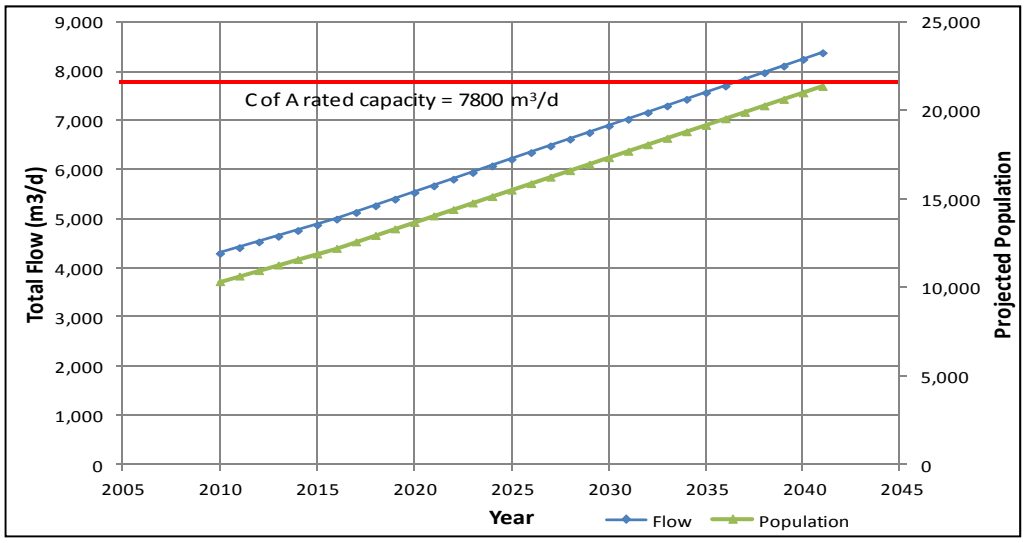


Figure 3.2 Elmira Projected Population and ADF

Based on the historic per capita flow of 572 L/cap·d for St. Jacobs and population growth projections, the Town of St. Jacobs is projected to exceed its WWTP CofA ADF rated capacity in about 2021.

Based on the historic per capita flow of 370 L/cap·d for Elmira domestic contribution, population projections provided by the Region and Township, and a projected industrial flow contribution of 472 m^3/d, the Town of Elmira is projected to exceed its WWTP CofA ADF rated capacity in about 2037. As no growth is expected for the community of Heidelberg, the projected flows are expected to remain at about 51 m^3/d.

4. PROBLEM STATEMENT

Phase 1 of the Municipal Class EA planning process involves the identification and description of the problem or opportunity statement.

To guide the St. Jacobs – Elmira Master Plan, the following problem statement was developed:

The projected 2041 average wastewater flows for the communities of Elmira and St. Jacobs are expected to exceed the existing CofA ADF capacities of the individual WWTPs. As a result, additional wastewater servicing capacity must be provided to accommodate planned growth in these communities. Although average wastewater flows for Heidelberg are within the Heidelberg WWTP CofA capacity, it was identified that the Heidelberg WWTP is a complex WWTP that is expensive to operate due to the small size of the facility, and requires a considerable amount of operator attention. Therefore, the feasibility of incorporating the flows from Heidelberg WWTP into the overall solution is evaluated as part of this Master Plan.

5. STATUS OF EXTRANEOUS FLOW REDUCTION PROGRAMS

The St. Jacobs and Elmira wastewater collection systems both experience significant I/I, which takes up valuable capacity within the conveyance systems and wastewater treatment plants. The 1997 Elmira and St. Jacobs Wastewater Treatment Class EA set peak flow I/I reduction targets for the Elmira and St. Jacobs wastewater collections systems. These targets, which were to be achieved by 2008, were a 205 L/s or 39 percent reduction for Elmira and a 39 L/s or 62 percent reduction for St. Jacobs.

Over the past 10 years, the Township of Woolwich has undertaken a number of I/I reconstruction and rehabilitation projects to achieve these targets, and has collected a significant amount of sewer flow data to assess the success of their efforts. A detailed review of the I/I reduction measures in St. Jacobs and Elmira is provided in TM No. 4/5 "Review of I/I Reduction Programs", which is provided in Appendix E.

5.1 St. Jacobs I/I Reduction Programs

The Township has had an active program of I/I investigation and repair since 1989, and has indicated that the most cost effective repairs have already been completed. Despite this, groundwater infiltration continues to be an issue in St. Jacobs, with no significant specific sources identified to date.

Rainfall and sewer flow monitoring and field investigations (including CCTV sewer inspections, manhole inspections, cistern inspections, smoke testing, assessment of sewer laterals, and exterior lot inspection) conducted over a period of many years indicate that I/I is endemic throughout the collection system, and no single major source of I/I has been found that if addressed would significantly reduce the overall volume of I/I entering the sewer system. The Township recently identified and removed excessive flow from a manhole coming from a new subdivision development. The Township has implemented policies and procedures to ensure that newly constructed infrastructure does not contribute to I/I. The Township now requires that all I/I deficiencies be repaired prior to the Township assuming the new sewer infrastructure.

Remaining sources of I/I in St. Jacobs include known gravity connections of foundation drains to sanitary sewers and known sewer lateral deficiencies identified by recent CCTV inspections of laterals on Water Street, with potentially more to be found by proposed CCTV inspection of laterals on Young Street. The plan is to address these with a sewer lateral relining program.

The current public side I/I rehabilitation program has not reduced I/I to the extent the Township had hoped. Private sewer lateral rehabilitation and/or foundation drain disconnection appears to be the only viable solution to reduce I/I in St. Jacobs.

With ongoing I/I reduction initiatives, the community of St. Jacobs must reduce the overall per capita ADF to 539 L/cap·d to defer expansion of the St. Jacobs WWTP until 2024 (to coincide with the completion of the Waterloo WWTP expansion). Based on the projected per capita ADF of 572 L/cap·d, this is equivalent to an overall reduction of 33 L/cap·d. Alternately, per capital flows for new growth must be reduced to about 468 L/cap·d to defer the St. Jacobs WWTP expansion until 2024.

5.2 Elmira I/I Reduction Programs

Historically, excessive I/I in Elmira have resulted in basement flooding and bypassing of untreated sewage to the receiving stream. The Township has been investigating and correcting sources of I/I in Elmira since 1994.

Recent and ongoing I/I reduction and collection system improvement projects in Elmira have included the following:

- I/I separation projects from 1998 to 2007;
- Ongoing I/I investigations and minor fixes;
- South Trunk Sewer construction, including decommissioning of South Elmira wastewater pumping station;
- Replacement of the Chemtura Trunk Sewer (suspected to be a source of I/I) with new Elmira North Trunk Sewer in 2007;
- Riverside Drive reconstruction in 2007, including replacement of sewers in older area of town with new infrastructure;
- CCTV inspection of sanitary sewer laterals in Birdland and North Elmira;
- Sanitary sewer lateral re-lining program;
- Flow monitoring in new subdivision developments; and
- Spot repairs in sewers.

Rainfall and sewer flow monitoring and field investigations (including CCTV sewer inspections, manhole inspections, dye testing, groundwater monitoring, household private side system surveys and special I/I pilot projects) were conducted over a period of years to identify and quantify potential sources of I/I.

Household surveys of the sewer systems in both north and south Elmira were completed to identify the nature and extent of any improper connections. The household surveys characterized improper connections as those with sumps discharging to the internal plumbing or where there were connections from an unknown location (from which a direct connection to the sanitary system was inferred).

Groundwater monitoring included a review of background geotechnical reports, as well as in-field monitoring. In-field monitoring confirmed that high groundwater conditions exist throughout the year and average groundwater levels are above the obvert of the sanitary sewer system.

Conclusions of the I/I studies suggest that the primary source of I/I in the Elmira sanitary sewer system was private side direct connections to the sanitary system, exacerbated by the high groundwater in the area. It was determined that a private side solution was required in order to significantly reduce I/I. The Township initiated a pilot project involving private side source controls to evaluate different methods of achieving target I/I reductions.

Following the pilot project, the Township, in cooperation with the Region of Waterloo, commenced a phased installation of new sanitary sewers, in the areas identified as having the worst I/I problems. With 17 percent of the program completed, the results have shown an average day I/I reduction of 25 L/cap·d. Based on 2041 population of 21,359 in Elmira, this is equivalent to a reduction of approximately 534 m^3/d. Therefore, continuation of the I/I reduction program, combined with public side I/I rehabilitation program and water efficiency programs, would likely provide adequate reduction of the 2041 projected flows to within the CofA rated ADF capacity of the existing Elmira WWTP.

6. REVIEW OF ASSIMILATIVE CAPACITY

An assimilative capacity study (ACS) of the receiving waters of both the St. Jacobs and Elmira WWTPs was undertaken to determine the effluent limits that would apply to these WWTPs in the future should either or both of the facilities be expanded. Details of the assimilative capacity study are documented in TM No. 3 - "Determination of Effluent Requirements for the Elmira and St. Jacobs Wastewater Treatment Plants", which is provided in Appendix D. Additional details on the water quality monitoring program and relevant correspondence with the MOE is included in Appendix D.

6.1 Water Quality Monitoring Program

A water quality monitoring program was developed and executed as part of the Master Plan. Information collected under the program was to be used to develop a database for future use by the Region. Biweekly water quality data both upstream and downstream of the St. Jacobs WWTP outfall in the Conestogo River and upstream and downstream of the Elmira WWTP outfall in Canagagigue Creek were collected from December 2010 until November 2011.

This data collection program was conducted concurrent with the assimilative capacity study so the data were not available for the ACS analysis. However at the conclusion of the data collection program, the Conestogo River data were compared to the historic data to ensure the collected data did not impact the recommended effluent limits.

Upon completion of this sampling program, sampling at these locations for these two plants were added to the comprehensive sampling program the Region has for the Grand, Nith and Speed Rivers. This program includes multi-day sampling during each of the four seasons, upstream and downstream of the Region's WWTPs.

6.1.1 Sampling Locations

On November 8, 2010, field reconnaissance was conducted in the vicinity of the St. Jacobs and Elmira WWTPs. Based on this field work, locations that would provide representative water quality data for future assimilative capacity analysis were selected. The sample locations are identified in Table 6.1.

Table 6.1 Approximate Co-ordinates of Proposed Sampling Stations

STATION ID	Zone	Easting	Northing
ST JACOBS US	17 T	536091	4821015
ST JACOBS DS NEAR	17 T	536578	4820497
ELMIRA US	17 T	536360	4826615
ELMIRA DS NEAR	17 T	536368	4826564
Notes: Detailed description of STATION ID provided below			

The Elmira Downstream (DS) Near Station is located directly upstream of the Chemtura Outfall.

The sampling locations for the St. Jacobs WWTP are presented in Figure 6.1.

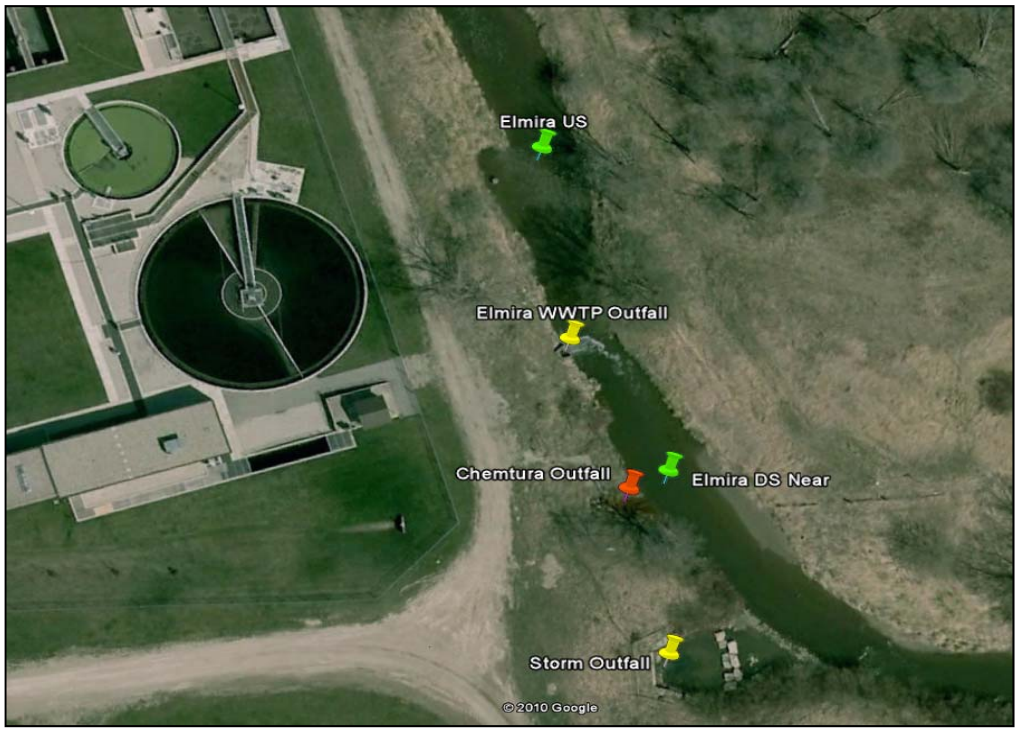


Figure 6.1 Sampling Locations for Elmira WWTP

The sampling locations for the Elmira WWTP are shown in Figure 6.2.

6.2 Assimilative Capacity

To formulate reasonable recommendations for effluent limits for future flows at expanded Elmira and St. Jacobs WWTPs, the following four steps were taken:

1. *Define background water quality;*
2. *Define low flow conditions in the receiving streams;*
3. *Determine* receiver water quality impacts for each water quality parameter based on the effluent limits in compliance with MOE Guideline F-5, in-stream provincial water quality objectives (MOE, 1994a), Canadian Environmental Protection Act (CEPA) requirements and the Municipal Wastewater Effluent (MWWE) regulations under the Fisheries Act; and
4. *Formulate the recommended effluent limits b*ased on the work completed in steps one through three.

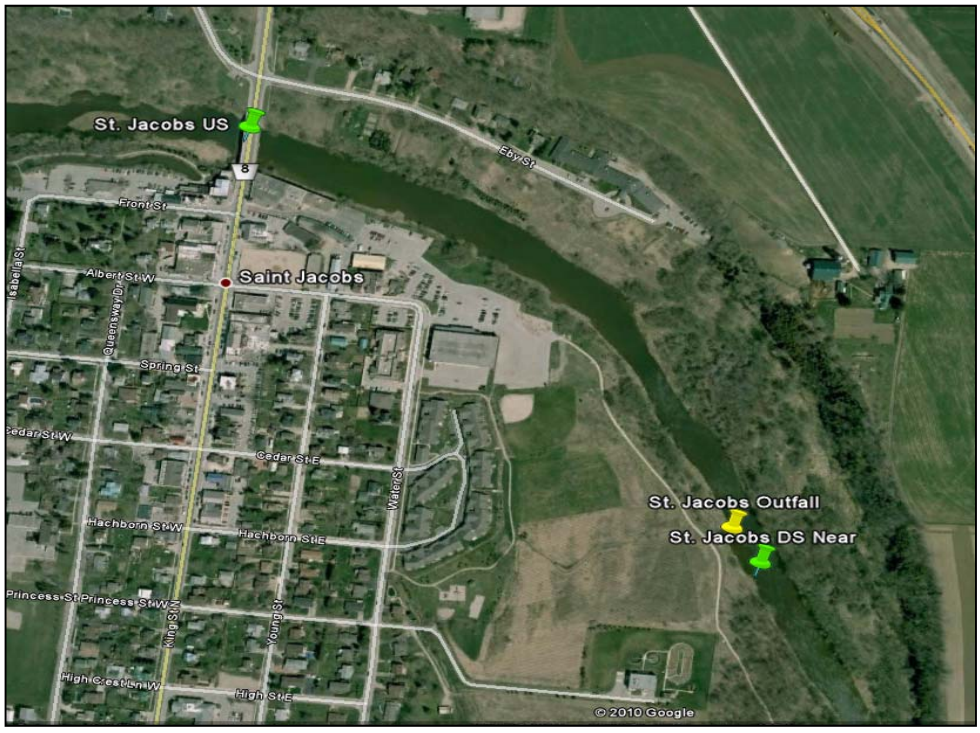


Figure 6.2 Sampling Locations for St. Jacobs WWTP

6.2.1 Water Quality Analysis

Historical water quality data from multiple sources were combined to develop the ambient water quality data set used for this analysis. The data sources used for development of the ambient water quality data is presented in Table 6.2.

Table 6.2 Data Sources for Ambient Water Quality

Receiver	Source	Location relative to outfall	Period of record	Parameters of interest
Canagagigue Creek	Chemtura data collection location SS+855	5 - 10 m upstream of outfall	1995 - 2007	Temperature, pH, ammonia, nitrate and total phosphorus
	Chemtura data collection location SS+770	90 - 100 m upstream of outfall	1997 - 2010 (1)	Temperature, pH, ammonia, nitrate and total phosphorus
	Provincial Water Quality Monitoring Station 16018405102	4,000 - 4,500 m upstream of outfall	1973 - 2010	BOD_5, dissolved oxygen, fecal coliforms, *E.coli* and total suspended solids.
Conestogo River	Provincial Water Quality Monitoring Station 16018407702	28 km upstream of outfall	1975 - 2010	Temperature, pH, ammonia, nitrate, BOD_5, total phosphorus, dissolved oxygen, fecal coliforms, E.coli and total suspended solids

Notes:
1. Only the years 2008 - 2010 were used to supplement the data collected at SS+855 for the parameters listed.

Available water quality data are provided in Table 6.3 and 6.4 for the Canagagigue Creek (Elmira WWTP) and Conestogo River (St. Jacobs WWTP), respectively.

Table 6.3 Canagagigue Creek Water Quality Summary

Parameter 75th Percentile	Winter (Jan-Mar)	Spring (Apr-Jun)	Summer (Jul-Sep)	Fall (Oct-Dec)
Total Phosphorus (mg/L)	0.103	0.060	0.126	0.155
Unionized Ammonia (mg/L)	0.009	0.009	0.012	0.016
DO (mg/L)	12.3	10.0	7.6	10.6
BOD_5 (mg/L)	3.3	3.0	5.1	3.6
Fecal Coliforms/*E. coli* (cfu/100ml)	411	735	3080	1093
Total Suspended Solids (mg/L)	43	28	73	39
Nitrates (mg/L)	11.0	7.85	1.95	6.10

Table 6.4 Conestogo River Water Quality Summary

Parameter 75th Percentile	Winter (Jan-Mar)	Spring (Apr-Jun)	Summer (Jul-Sep)	Fall (Oct-Dec)
Total Phosphorus (mg/L)	0.149	0.076	0.078	0.086
Unionized Ammonia (mg/L)	0.003	0.013	0.015	0.008
DO (mg/L)	12.8	12.0	9.0	11.6
BOD_5 (mg/L) (annual)	21.0			
Fecal Coliforms/*E. coli* (cfu/100ml)	210	38	797	293
Total Suspended Solids (mg/L)	25	16	14	16
Nitrates (mg/L)	5.35	4.63	3.12	3.91

The MOE Policy status and exceedance of federal guidelines for both receiving streams were defined for several parameters of interest, as follows:

- Canagagigue Creek and the Conestogo River were both MOE Policy 2 for TP and *E.coli;*
- Canagagigue Creek and the Conestogo River were both MOE Policy 1 for un-ionized ammonia and dissolved oxygen; and
- The CWQG (2.93 mg/L-N) for nitrate was exceeded for most seasons for both receivers.

6.2.2 Low Flow Analysis

The calculated low flows applicable for the Elmira WWTP receiving stream are provided in Table 6.5.

Table 6.5 7Q20 Estimates for Canagagigue Creek at Elmira Outfall

Season	7Q20 (m^3/s)	Estimated 7Q20 upstream of Elmira WWTP (m^3/s)
Winter (Jan - Mar)	0.194	0.148
Spring (Apr - Jun)	0.357	0.311
Summer (Jul- Sep)	0.293	0.247
Fall (Oct - Dec)	0.266	0.220

Notes:
7Q20 statistics based on the dataset from 1984 – 2006.
7Q20 upstream of Elmira WWTP = 7Q20 - Elmira WWTP ADF.

The calculated low flows applicable for the St. Jacobs WWTP receiving stream are provided in Table 6.6.

Table 6.6 7Q20 Estimates for Conestogo River at St. Jacobs Outfall

Season	7Q20 Conestogo River at Glen Allan (m^3/s)	7Q20 Conestogo River at Glen Allan pro-rated to St. Jacobs (1) (m^3/s)	7Q20 Conestogo River at St. Jacobs (m^3/s)
Winter (Jan - Mar)	0.706	*0.965* (2)	1.80
Spring (Apr - Jun)	1.54	2.10	*1.96* (2)
Summer (Jul- Sep)	2.02	2.76	*2.96* (2)
Fall (Oct - Dec)	0.881	1.20	*1.37* (2)

Notes:
1. Pro-rate factor determined as (drainage area to St. Jacobs) / (drainage area to Glen Allan) = 790/578
2. Italicized values used for analysis

6.2.3 Receiver Quality Impacts

As noted in Section 5.0, expansion of the Elmira WWTP is not required to address the wastewater servicing needs for the Town of Elmira; the preferred alternative is to continue to reduce I/I and implement water efficiency strategies for Elmira. Therefore, effluent limits for an expanded Elmira WWTP were not developed.

For an expanded St. Jacobs WWTP, it was determined that the receiving stream is MOE Policy 2 for total phosphorus; therefore it was recommended the existing compliance loading limit of 0.44 kg/d be maintained. The receiving stream was MOE Policy 1 with respect to dissolved oxygen (DO); therefore, it was recommended to maintain the existing $cBOD_5$ limit of 10 mg/L. Similarly, for total suspended solids (TSS), it was recommended to maintain the existing limit of 10 mg/L.

For total ammonia, an analysis of end of pipe toxicity and downstream complete mixing was undertaken to identify the limiting condition. As illustrated in Table 6.7, end of pipe toxicity is the limiting condition for un-ionized ammonia and, using the

results of the mass balance assessment, preliminary total ammonia compliance limits were suggested (Table 6.8).

Table 6.7 Ammonia Effluent Limit Determination - St. Jacobs

Season	75th Percentile of River Percent Un-ionized Ammonia (%)	Maximum Allowable Ammonia Concentration (mg/L-N)	End of Pipe Un-ionized Ammonia Concentration ($mg/L\text{-}NH_3$)	Mixed Stream Un-ionized Ammonia Concentration ($mg/L\text{-}NH_3$)
Winter (Jan - Mar)	1.4	5.9	0.1	0.006
Spring (Apr - Jun)	10	0.81	0.1	0.014
Summer (Jul- Sep)	11	0.75	0.1	0.016
Fall (Oct - Dec)	4.0	2	0.1	0.010

Note:
These values are applicable to both the St. Jacobs and the St. Jacobs + Heidelberg flows.

Table 6.8 Proposed Ammonia Compliance Limits

Discharge Period	St. Jacobs Ammonia Limit (mg/L)
November 1 - April 30	2.0
May 1 - October 31	0.75

Note:
Discharge concentrations were modified from the original seasons to account for the varying ambient water temperatures. Cooler water temperatures are often observed in November, December and April which results in a smaller dissociation ratio and therefore higher limits are appropriate.

These total ammonia nitrogen (TAN) limits are at or near the Limit of Technology (LOT).

6.2.4 Mixing Zone Analysis

To ensure that the proposed effluent compliance limits resulted in an acceptable sized mixing zone, a mixing zone analysis was completed on the Conestogo River for total ammonia impacts from the St. Jacobs WWTP. The mixing zone analysis was completed using CORMIX 6.0 and cross sectional stream data from GRCA's HEC-RAS modelling. The discharge depth/average depth reflects calculated 7Q20 flows and stream dimensions.

The mixing zone was defined for total ammonia based on achieving PWQO for un-ionized ammonia in stream. The resulting mixing zone dimensions indicated that the mixing zone is expected to be less than 25 percent of the channel for all seasons.

The CORMIX outputs are presented in Table 6.9.

Table 6.9 CORMIX Outputs - St. Jacobs

Scenario	Mixing Zone Length (m)	Mixing Zone Width (m)	Percent Zone of Passage
Winter	1.17	1.02	97
Spring	1.26	2.48	92
Summer	0.9	2.76	91
Fall	2.68	3.38	89

6.2.5 Recommended Effluent Limits

The proposed effluent compliance limits and objectives for an expanded St. Jacobs WWTP are presented in Tables 6.10 and 6.11, respectively.

Table 6.10 Proposed Effluent Compliance Limits - St. Jacobs WWTP

Effluent Parameter	Average Concentration (mg/L)	Average Waste Loading (kg/d)
$CBOD_5$	10.0	21.4
Total Suspended Solids	10.0	21.4
Total Phosphorus	0.2	0.43
Total Ammonia Nitrogen	0.75 (May to Oct) 2.0 (Nov to Apr)	1.6 (May to Oct) 4.3 (Nov to Apr)
E. coli less than 200 organisms per 100 mL		
Note*:* The determined effluent limits assume that the 2041 flows presented will be used for the design; other options of pumping all or some of St. Jacobs flows to other locations has not been evaluated.		

Table 6.11 Proposed Effluent Objectives - St. Jacobs WWTP

Effluent Parameter	Average Concentration (mg/L)	Average Waste Loading (kg/d)
$CBOD_5$	5.0	10.7
Total Suspended Solids	5.0	10.7
Total Phosphorus	0.15	0.32
Total Ammonia Nitrogen	0.5 (May to Oct) 1.0 (Nov to Apr)	1.1 (May to Oct) 2.2 (Nov to Apr)
E. coli less than 100 organisms / 100 mL (monthly geometric mean density)		
pH of the effluent between 6.5 - 9.0, inclusive		

6.2.6 MOE Comments

Technical Memorandum (TM No. 3) – Determination of Effluent Requirements for the Elmira and St. Jacobs Wastewater Treatment Plants (dated September 12, 2011) was submitted to the MOE – West Central Region for comment.

MOE comments resulting from the review and XCG responses are provided in Appendix D. It was agreed that further receiving stream evaluation would be required to firmly establish effluent limits for an expanded St. Jacobs WWTP as part of a Schedule C Class EA, if expansion of the St. Jacobs WWTP was selected as the preferred alternative in the Master Plan.

6.3 Water Quality Data Comparison

After the sampling program was complete, the data from the Conestogo River upsteam of the St. Jacobs WWTP were compared to the Conestogo River at Glen Allen. The results of the comparison are summarized below.

- There is no statistical difference between the TP concentration means at the two monitoring locations. The receiver is Policy 2 with respect to TP.
- There is no statistical difference between the unionized ammonia concentration means at the two monitoring locations. The receiver is Policy 1 with respect to unionized ammonia.
- Nearly all of the BOD_5 values measured at St. Jacobs were below the detection limit (2 mg/L); a conservative value of 2.0 mg/L was used as the 75th percentile concentration. This is very similar to that observed at Glen Allan.
- Dissolved oxygen concentrations at Glen Allan and St. Jacobs were in the same range. Both stations support that the receiver is Policy 1 with respect to dissolved oxygen.
- TSS concentrations were similar at both Glen Allan and St. Jacobs. Approximately half of the TSS observations at St. Jacobs were less than the detection limit of 10 mg/L. Due to the large number of non-detects, a statistical comparison was not completed.
- There was significant difference in nitrate concentrations between the Glen Allan and St. Jacobs nitrate concentrations. Concentrations at both locations exceed the Canadian Water Quality Guideline (CWQG).

7. ALTERNATIVE SOLUTIONS

A number of planning alternatives to address the wastewater servicing needs for Elmira, St. Jacobs, and Heidelberg were developed. Each alternative was evaluated based on the ability of the alternative to meet the project objectives. Based on the results of the preliminary evaluation, a short-list of alternatives was developed. Detailed description on each alternative is provided in Appendix G.

7.1 Long List of Alternatives

7.1.1 Servicing for the Community of Elmira

There are a number of alternatives for the servicing of Elmira that involve expansion of the existing facility or construction of a new facility to provide for servicing for expected growth. However, the preliminary evaluation of the on-going I/I reduction initiatives and the impacts on the projected flows for Elmira suggested that the 2041 projected flows for Elmira can be met at the existing CofA rated design capacity when combined with continued I/I reduction and continued implementation of water efficiency programs.

Although the Elmira WWTP does not need to be expanded hydraulically, there may be a need to upgrade/optimize the plant to address known performance or capacity limitations, as described in Appendix F. Provided that other flows are not diverted to the Elmira WWTP as part of the preferred alternative, an expansion of the Elmira WWTP will not be needed within the planning period of this Master Plan. Therefore, the alternatives that involve expansion of the existing facility or construction of a new facility were not considered further.

Two possible alternatives for the servicing of Elmira are:

- Alternative 1A - "Do nothing"; and
- Alternative 1B - Continue to reduce I/I and to implement water efficiency programs.

7.1.2 Servicing for the Community of St. Jacobs

The possible alternatives for servicing St. Jacobs include:

- Alternative 2A - "Do nothing";
- Alternative 2B - Continue to reduce I/I and to implement water efficiency programs;
- Alternative 2C - Upgrade and expand the St. Jacobs WWTP;
- Alternative 2D - Decommission the St. Jacobs WWTP and construct a new WWTP;
- Alternative 2E - Upgrade the existing plant and construct a new plant for flows beyond the existing capacity of the St Jacobs WWTP;
- Alternative 2F - Decommission the St. Jacobs WWTP and transfer flows to the Elmira WWTP;

- Alternative 2G - Upgrade the existing plant and transfer flows beyond the existing capacity of the St Jacobs WWTP to the Elmira WWTP;
- Alternative 2H - Decommission the St. Jacobs WWTP and transfer flows to the Waterloo WWTP; and
- Alternative 2I - Upgrade the existing plant and transfer flows beyond the existing capacity of the St Jacobs WWTP to the Waterloo WWTP.

7.1.3 Servicing for the Community of Heidelberg

The possible alternatives for servicing Heidelberg include:

- Alternative 3A - Maintain existing Heidelberg WWTP;
- Alternative 3B - Decommission the Heidelberg WWTP and transfer flows to the St. Jacobs WWTP; and
- Alternative 3C - Decommission the Heidelberg WWTP and transfer flows to the Waterloo WWTP.

7.2 Selection of Short Listed Alternatives

A preliminary evaluation of the long list of alternative solutions was completed.

A summary of the preliminary evaluation of alternative solutions for Elmira is presented in Table 7.1.

Table 7.1 Preliminary Evaluation of Alternative Solutions for Elmira

Alternative	Will Alternative Satisfy All Project Objectives?	
	Yes	No
Alternative 1A - "Do nothing"		X
Alternative 1B - Continue to reduce I/I and to implement water efficiency programs	X	

As the "Do nothing" alternative would not provide servicing for planned future development in Elmira, it would not satisfy the project objectives and was not considered further.

The "Continue to reduce I/I and to implement water efficiency programs" alternative would involve continued implementation of programs to reduce wastewater flows through water efficiency programs and I/I reduction. Based on TM No. 5 - Review of Infiltration and Inflow Reduction Programs (included in Appendix D) current I/I reduction programs in Elmira have shown an I/I reduction of 25 L/cap·d. Based on a 2041 population of 21,359 in Elmira, this is equivalent to a reduction of approximately 534 m^3/d. Therefore, continuation of the I/I reduction program combined with continued implementation of water efficiency programs would likely provide adequate reduction of the 2041 projected flows to within the CofA rated ADF capacity of the existing Elmira WWTP.

A summary of the preliminary evaluation of alternative solutions for St. Jacobs is presented in Table 7.2.

Table 7.2 Preliminary Evaluation of Alternative Solutions for St. Jacobs

Alternative	Will Alternative Satisfy All Project Objectives?		Could Alternative be Part of Solution?
	Yes	No	
Alternative 2A - "Do nothing"		X	
Alternative 2B - Continue to reduce I/I and to implement water efficiency programs		X	X
Alternative 2C - Upgrade and expand the St. Jacobs WWTP	X		
Alternative 2D - Decommission the St. Jacobs WWTP and construct a new WWTP		X	
Alternative 2E - Upgrade the existing plant and construct a new plant for flows beyond the existing capacity of the St Jacobs WWTP		X	
Alternative 2F - Decommission the St. Jacobs WWTP and transfer flows to the Elmira WWTP		X	
Alternative 2G – Upgrade the existing plant and transfer flows beyond the existing capacity of the St Jacobs WWTP to the Elmira WWTP		X	
Alternative 2H - Decommission the St. Jacobs WWTP and transfer flows to the Waterloo WWTP	X		
Alternative 2I – Upgrade the existing plant and transfer flows beyond the existing capacity of the St Jacobs WWTP to the Waterloo WWTP	X		

As the "Do nothing" alternative would not provide servicing for planned future development in St. Jacobs, it would not satisfy the project objectives and was not considered further.

Although flow reductions resulting from water efficiency and I/I reduction programs alone are unlikely to be sufficient to offset the flow increase due to increased growth, this alternative can be combined with other alternatives to address the future wastewater servicing needs for St. Jacobs. Continued I/I reduction and water efficiency programs will form a part of the overall preferred solution for addressing the future wastewater needs for St. Jacobs.

Alternatives that involve decommissioning the existing St Jacobs WWTP and constructing a new WWTP, or constructing a new WWTP to serve new growth in St. Jacobs, are not considered to be economically viable; therefore, these alternatives were not considered further.

Any alternatives involving transferring flows to the Elmira WWTP were not considered further as the assimilative capacity of Canagagigue Creek is limited and the MOE is unlikely to grant large flow increases to this receiver.

All servicing alternatives for Heidelberg satisfy the project objectives and were carried forward for further evaluation.

The short-listed alternatives are presented in Table 7.3.

Table 7.3 Short-Listed Alternatives

Community	Alternative
Elmira Wastewater Servicing	Alternative 1B - Continue to reduce I/I and to implement water efficiency programs
St. Jacobs Wastewater Servicing	Alternative 2C - Upgrade and expand the St. Jacobs WWTP
	Alternative 2H - Decommission the St. Jacobs WWTP and transfer flows to the Waterloo WWTP
	Alternative 2I – Upgrade the existing plant and transfer flows beyond the existing capacity of the St Jacobs WWTP to the Waterloo WWTP
Heidelberg Wastewater Servicing	Alternative 3A - Maintain existing Heidelberg WWTP
	Alternative 3B - Decommission the Heidelberg WWTP and transfer flows to the St. Jacobs WWTP
	Alternative 3C - Decommission the Heidelberg WWTP and transfer flows to the Waterloo WWTP

7.3 Short-List of Alternative Solutions

The preferred alternative for servicing Elmira was identified as the continuation of I/I reduction and water efficiency programs - no further evaluation was required.

Each of the short-listed alternatives for servicing St. Jacobs was evaluated in combination with alternatives for servicing Heidelberg. The feasible alternative solutions are presented in Table 7.4.

Table 7.4 Feasible Alternative Solutions

Option	Short Listed Alternatives	
	St. Jacobs Servicing Component	Heidelberg Servicing Component
1	Upgrade and expand the St. Jacobs WWTP	Maintain existing Heidelberg WWTP
2		Decommission the Heidelberg WWTP and transfer flows to the St. Jacobs WWTP
3		Decommission the Heidelberg WWTP and transfer flows to the Waterloo WWTP
4	Decommission the St. Jacobs WWTP and transfer flows to the Waterloo WWTP	Maintain existing Heidelberg WWTP
5		Decommission the Heidelberg WWTP and transfer flows to the Waterloo WWTP
6	Upgrade the existing plant and transfer flows beyond the existing capacity of the St Jacobs WWTP to the Waterloo WWTP	Maintain existing Heidelberg WWTP
7		Decommission the Heidelberg WWTP and transfer flows to the St. Jacobs WWTP
8		Decommission the Heidelberg WWTP and transfer flows to the Waterloo WWTP

Options that involve the upgrade and expansion of the St. Jacobs WWTP (Option 1, 2 and 3) would involve new raw sewage pumps, a new screen, a new vortex grit removal unit, three new bioreactors with fine bubble diffusers, blowers, an additional

secondary clarifier, five new continuous backwash sand filters and two new UV disinfection systems. A conceptual level layout of the expanded St. Jacobs WWTP is presented in Figure 7.1.

Options that involve only the upgrade of the St Jacobs WWTP to the current capacity and transferring flows beyond to the Waterloo WWTP (Option 6, 7 and 8) would involve the decommissioning of the existing oxidation ditch and construction of two new bioreactors with fine bubble diffusers, and blowers. A conceptual level layout of the upgraded St. Jacobs WWTP is presented in Figure 7.2.

Options that involve decommissioning of the St. Jacobs WWTP (Options 4 and 5) could include the conversion of the existing secondary clarifiers or other tankage into equalization basins to reduce peak flows and to minimize the size of the pumping station and forcemain.

Options that involve transferring flows (Options 2, 3, 4, 5, 6, 7 and 8) would involve construction of a sewage pumping station, forcemains and odour control. Possible forcemain routes for options that involve transferring flows from the Heidelberg WWTP to St. Jacobs or Waterloo WWTP or from the St. Jacobs WWTP to Waterloo WWTP are shown schematically in Figure 7.3. These routes are presented for the purposes of the evaluation of alternatives for this Master Plan. A more detailed assessment of the forcemain routing will be undertaken as part of subsequent Class EA.

Options that involve transferring flows from St. Jacobs to the Waterloo WWTP (Options 4, 5, 6, 7 and 8) will require a detailed capacity analysis of the various trunk sewer sections in the City of Waterloo collection system and possible upgrades to ensure that sufficient capacity is available.

The City of Waterloo will initiate in 2013 a Sanitary Master Plan. Should the transferring of flows from Heidelberg WWTP and/or St. Jacobs WWTP be the preferred alternative, the Region will provide future contributions from the St. Jacobs WWTP to the City so that these flows can be included in the Master Plan calculations.

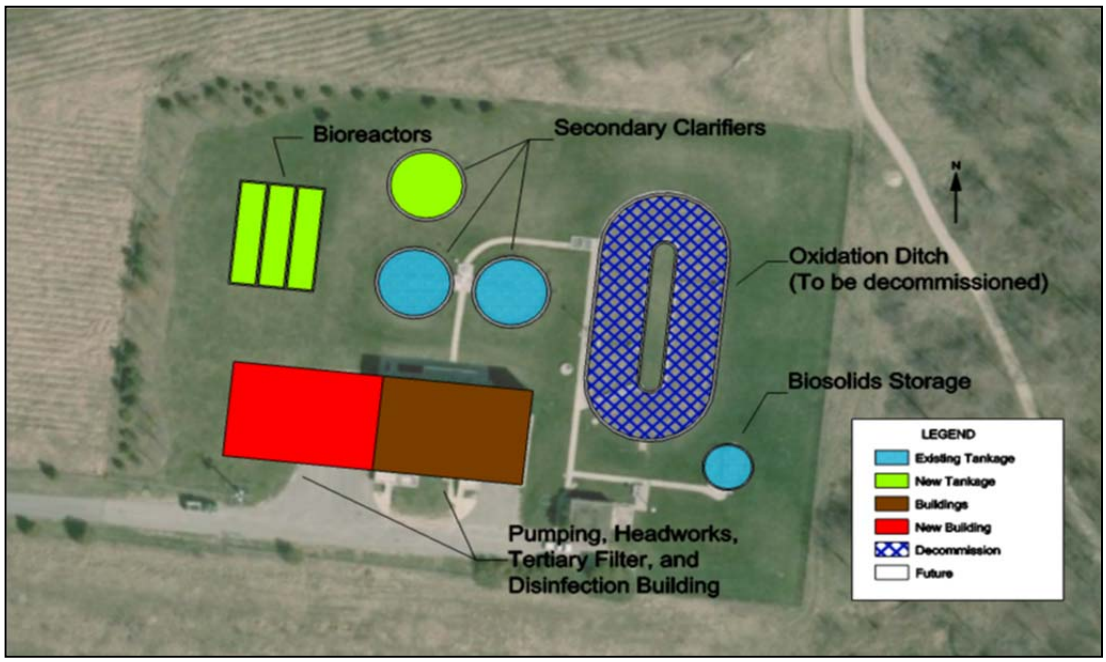


Figure 7.1 St. Jacobs WWTP - Conceptual Level Expansion Requirements

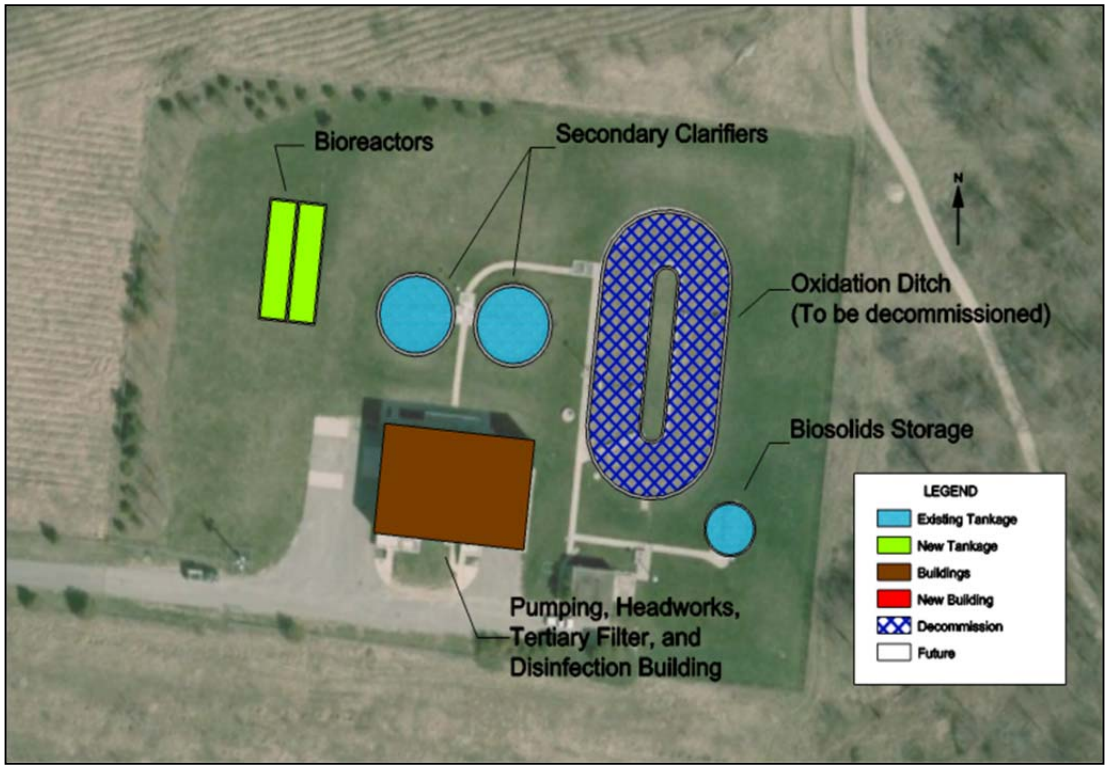


Figure 7.2 St. Jacobs WWTP - Conceptual Level Upgrade Requirements

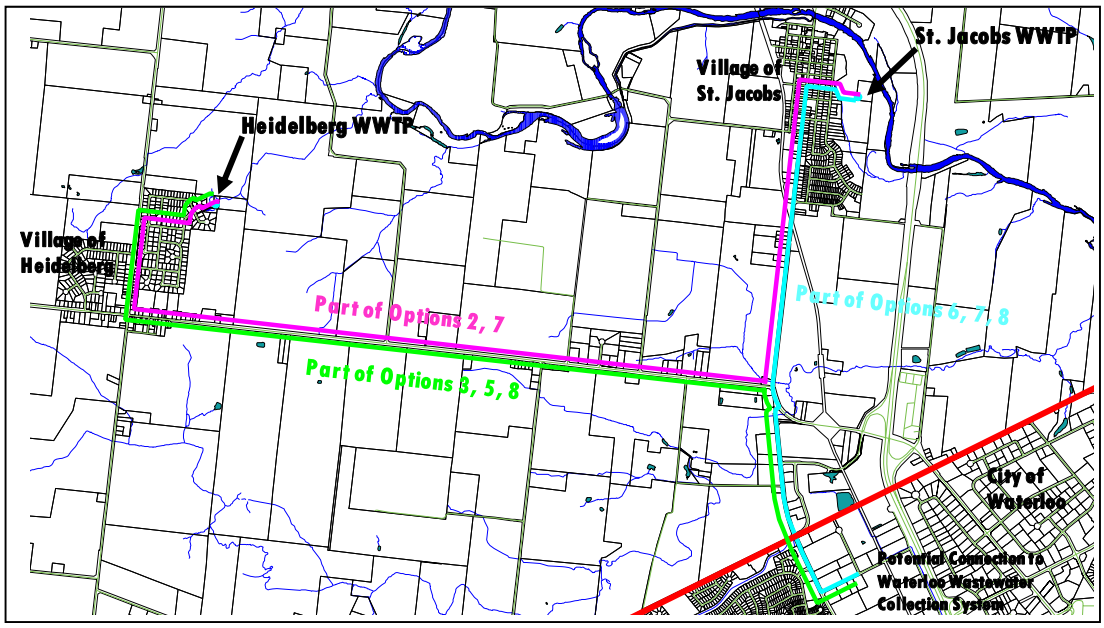


Figure 7.3 Conceptual Forcemain Routes

8. EVALUATION PROCESS

Details on the evaluation criteria and methodology are provided in TM No. 8 "Evaluation Process", which is provided in Appendix H.

Each short-listed alternative for the servicing of St. Jacobs was evaluated in combination with alternatives for the servicing of Heidelberg. The evaluation was conducted to determine the preferred combination of alternatives (i.e., option) for servicing St. Jacobs and Heidelberg.

8.1 Evaluation Criteria

The evaluation of each option for servicing St. Jacobs and Heidelberg was based on the evaluation criteria presented in Table 8.1.

Table 8.1 Evaluation Criteria

EA Category	Criteria	Description
Technical	Satisfaction of objectives	• Degree to which option addresses wastewater servicing needs for the Communities of Elmira, St. Jacobs, and Heidelberg to 2041 and does not restrict planned growth.
	Consistent with regulatory requirements, policies, guidelines and standards	• Degree to which the option complies with Federal, and Provincial regulatory requirements, and Regional policies, guidelines and standards for planning and construction, including sustainability policy.
	Technical feasibility	• Ease of implementation. • Constructability. • Operational capability. • Potential for phased construction. • Ability to meet projected future effluent limits.
	System complexity	• Number of facilities to be managed. • Operational requirements for facilities.
Environmental	Surface water impacts	• Potential impacts on surface water resources.
	Groundwater impacts	• Potential impacts on groundwater quality and quantity.
	Land requirement	• Land requirement for construction. • Land recovered due to decommissioning.
	Impacts on Natural Environment During Construction	• Impact of construction on core environmental features.
Social	Socio-economic impacts	• Potential noise, dust, odour, traffic, etc. impacts on adjacent land owners during construction. • Potential noise, dust, odour, traffic, etc. impacts on adjacent land owners during operation.
	Impacts on Archaeological and Heritage Resources	• Impacts on archaeological and heritage resources, including First Nations impacts.
Economical	Capital, operating and maintenance, and life cycle costs	• Capital costs. • Land acquisition costs. • Operating and maintenance costs. • Net present value life cycle costs. • Impact on investments in upgrades already made.

8.2 Evaluation Methodology

The options were evaluated against each criterion using the following general methodology:

1. For each criterion, options were evaluated as:

   ○ No impact
   ◔ Negligible impact
   ◑ Minor impact
   ◕ Moderate impact
   ● High impact

2. Each EA Category (Technical, Environmental, Social and Economical) was considered to have equal weight.
3. Based on the results of the evaluation, options were ranked from most preferred to least preferred.

9. EVALUATION OF ALTERNATIVE SOLUTIONS

The consulting team conducted a preliminary evaluation of the short-listed options based on the criterion presented in Table 8.1 and scoring method presented in Section 8.2. At an Alternatives Comparison Workshop, the preliminary scoring of the short-listed options was presented to the Project Management Team and discussed. The scoring of each option was further refined based on input from the Project Management Team.

Basis for assigning the ratings to each option for each criteria is summarized below.

9.1 Satisfaction of Objectives

- All options meet criteria.

9.2 Consistent with Regulatory Requirements, Policies, Guidelines and Standards

- All options are consistent with Region's policies, guidelines, and standards, including the sustainability policy.
- Options that involve pumping of St Jacobs flows through a forcemain to Waterloo have higher energy consumption and hence higher greenhouse gas (GHG) emissions.
- Options that involve pumping of Heidelberg flows through a forcemain do not significantly increase energy use or GHG emissions due to the very low flows involved.

9.3 Technical Feasibility

- Pumping stations are easier to operate than WWTPs.
- If St Jacobs is upgraded or expanded, this will involve the largest amount of construction.
- All options are expected to meet projected effluent limits.
- Conversion of WWTPs to pumping stations will result in less impact on operations during construction than expansion or upgrading of the WWTP.
- None of the options provide for significant phasing opportunities.
- Additional studies may be required to assess the twinning of the trunk sewers in the City of Waterloo and to select the route.
- No capacity at Waterloo until it is expanded (2024), all capacity before that time has been allocated for the City of Waterloo.

9.4 System Complexity

- The decommissioning of both St. Jacobs and Heidelberg WWTPs, and transferring all flows to the Waterloo WWTP, results in the lowest system complexity as only one WWTP will need to be operated.
- Maintaining one of the two plants introduces an increased degree of complexity to the system.
- Maintaining both St. Jacobs and Heidelberg WWTPs results in the highest degree of complexity.

9.5 Surface Water Impacts

- Removal of effluent discharge from the St. Jacobs WWTP to the Conestogo River by diverting flow to the Waterloo WWTP and discharging to the Grand River results in a lower impact due to the higher assimilative capacity of the Grand River.
- Since St Jacobs WWTP is located within the regulated area of the floodplain, upgrades or expansions to the plant will require building in the floodplain.
- The decommissioning of the Heidelberg WWTP will have no impact on surface water resources.

9.6 Groundwater Impacts

- Pumping flows from Heidelberg will require the construction of a forcemain in a Wellhead Protection Area (WPSA-4 & WPSA-5) and in a Regional Recharge Area, as designated in the Region's Official Plan. However, negligible impacts are expected during construction. Appropriate mitigation measures will be implemented during the construction of the forcemain to minimize impacts.[1]
- A forcemain from St. Jacobs to Waterloo will not pass through any Wellhead Protection Areas or Regional Recharge Areas. Therefore, no impact on groundwater is expected.
- The Heidelberg WWTP is located approximately 450 metres from the existing municipal well.

9.7 Land Requirement

- Land recovered from decommissioning St. Jacobs WWTP has negligible benefit because it is located in the flood plain and would have very limited development potential for other uses.
- All forcemains will be constructed within existing road allowances; therefore no land acquisition is expected.

9.8 Impacts on Natural Environment during Construction

- The St. Jacobs WWTP is located within a Significant Valley Feature, as designated in the Region's Official Plan. Therefore, any option that requires construction at the St. Jacobs WWTP or a forcemain to or from St. Jacobs will have an impact on this designated feature.
- The construction of a forcemain from Heidelberg to Waterloo will not impact any Core Environmental Features, as designated in the Region's Official Plan.
- Forcemain routes from St. Jacobs to Waterloo will involve 3 stream crossings.
- Forcemain routes from Heidelberg to St. Jacobs will involve 3 stream crossings.
- Forcemain routes from Heidelberg to Waterloo will involve 2 stream crossings.

[1] Regional policy requires that a study be completed for development applications within a Source Water Protection Area to demonstrate that the proposed use will not negatively impact the quantity and/or quality of drinking water resources.

9.9 Socio-economic Impacts

- Those options that involve construction of forcemains within existing road allowances will cause short term disruption of traffic and property access.
- The expansion of the St. Jacobs WWTP has the lowest impact during construction; impact is primarily associated with truck traffic in and out of the plant during construction on the existing site.
- During the operations phase, long forcemains have the potential for odour problems at the forcemain discharge point; however, appropriate measures can be implemented to mitigate these potential impacts at the receiving WWTP or pumping station.
- Odours are not expected to be a problem during operation of the WWTPs since appropriate design and mitigation measures will be implemented.
- The duration of construction of the forcemains and upgrade or expansion of the St. Jacobs WWTP is approximately the same.

9.10 Impacts on Archaeological and Heritage Resources

- It is not expected that WWTP upgrades and expansion, and the construction of forcemains will impact archaeological resources or heritage sites.
- Upgrades to the St. Jacobs WWTP will be on an existing disturbed site, therefore, it is not expected that there will be an impact. In the event that archaeological resources are uncovered during construction, appropriate measures would be undertaken, in accordance with the Ontario Heritage Act.

9.11 Life Cycle Cost Comparison

Conceptual level capital costs, operating and maintenance costs, and life cycle costs were developed for each of the options. These costs are based on a conceptual level of design and are considered accurate to a range of -50% to +50%. These costs are intended to allow a comparison between the options and should be refined for the selected option during preliminary design.

The conceptual level capital costs estimates include upgrade and/or expansion of the existing St. Jacobs WWTP, construction of pumping stations and forcemains to transfer flows, and possible upgrades to the City of Waterloo collection system to accommodate the additional flows. Details on the infrastructure requirements of each option are discussed in Section 7.3.

The conceptual level net present value (NPV) operations and maintenance (O&M) cost estimates were based on O&M costs per unit of flow treated plus the additional energy costs and maintenance costs to maintain an additional pump station, if applicable.

Actual costs will depend on site specific conditions, design details and the construction environment at the time of implementation. A summary of the calculated capital, NPV O&M and life cycle costs for each option are presented in Table 9.1.

Table 9.1 Life Cycle Cost Comparison

Option	Capital Cost	30-Year NPV Operating and Maintenance Cost	Life Cycle Cost (1)
Option 1 - Upgrade and expand the St. Jacobs WWTP. Maintain existing Heidelberg WWTP	$9,500,000	$7,800,000	$17,300,000
Option 2 - Upgrade and expand the St. Jacobs WWTP. Decommission the Heidelberg WWTP and transfer flows to the St. Jacobs WWTP	$15,000,000	$5,300,000	$20,300,000
Option 3 - Upgrade and expand the St. Jacobs WWTP. Decommission the Heidelberg WWTP and transfer flows to the Waterloo WWTP	$14,100,000	$5,300,000	$19,400,000
Option 4 - Decommission the St. Jacobs WWTP and transfer flows to the Waterloo WWTP. Maintain existing Heidelberg WWTP	$7,200,000	$7,400,000	$14,600,000
Option 5 - Decommission the St. Jacobs WWTP and transfer flows to the Waterloo WWTP. Decommission the Heidelberg WWTP and transfer flows to the Waterloo WWTP	$11,800,000	$4,900,000	$16,700,000
Option 6 - Upgrade the existing plant and transfer flows beyond the existing capacity of the St Jacobs WWTP to the Waterloo WWTP. Maintain existing Heidelberg WWTP	$8,400,000	$8,000,000	$16,400,000
Option 7 - Upgrade the existing plant and transfer flows beyond the existing capacity of the St Jacobs WWTP to the Waterloo WWTP. Decommission the Heidelberg WWTP and transfer flows to the St. Jacobs WWTP	$13,900,000	$5,500,000	$19,400,000
Option 8 - Upgrade the existing plant and transfer flows beyond the existing capacity of the St Jacobs WWTP to the Waterloo WWTP. Decommission the Heidelberg WWTP and transfer flows to the Waterloo WWTP	$13,000,000	$5,400,000	$18,400,000

Notes:

1. Life cycle costs based on capital costs and the thirty-year net present value of the operating and maintenance costs assuming inflation rate of 3%, interest rate of 3%, and hydro cost of 10 cents/ kWh.

Based on Table 9.1, options were ranked relative to other options based on life cycle costs. Option 4 - Decommission the St. Jacobs WWTP and transfer flows to the Waterloo WWTP and maintain existing Heidelberg WWTP has the lowest thirty-year life cycle cost.

9.12 Results of Alternative Evaluation

Based on the evaluation described in Sections 9.1 to 9.11, an evaluation matrix was completed. The completed evaluation matrix is presented in Table 9.2.

Option 4 - Decommission the St. Jacobs WWTP and transfer flows to the Waterloo WWTP and maintain existing Heidelberg WWTP had the lowest overall score, resulting in the highest rank (i.e., lowest impacts and costs, and most preferred). Therefore, this option was selected as the preferred option for providing servicing for the communities of St. Jacobs and Heidelberg.

Table 9.2 Evaluation Matrix

Options	Technical					Environmental					Social			Economical		Score	Overall Ranking
	Satisfaction of objectives	Consistent with regulatory requirements, policies, guidelines and standards	Technical feasibility	System complexity	Average Score	Surface water impacts	Ground-water impacts	Land require-ment	Impacts on Natural Environment During Construction	Average Score	Socio-economic impacts	Impacts on Archae-logical and Heritage Resources	Average Score	Capital, operating and maintenance, and life cycle costs	Average Score		
Option 1 - Upgrade and expand the St. Jacobs WWTP. Maintain existing Heidelberg WWTP	○	○	◔	◑	◔	◑	○	○	◔	◔	◔	○	◔	◑	◑	16/16	2
Option 2 - Upgrade and expand the St. Jacobs WWTP. Decommission the Heidelberg WWTP and transfer flows to the St. Jacobs WWTP	○	○	◔	◔	◔	◑	◔	○	◑	◔	◑	○	◔	●	●	27/16	6
Option 3 - Upgrade and expand the St. Jacobs WWTP. Decommission the Heidelberg WWTP and transfer flows to the Waterloo WWTP	○	○	◑	◔	◔	◑	◔	○	◑	◔	◑	○	◔	●	●	28/16	7
Option 4 - Decommission the St. Jacobs WWTP and transfer flows to the Waterloo WWTP. Maintain existing Heidelberg WWTP	○	◔	◔	◔	◔	◔	○	○	◑	◔	◑	○	◔	◑	◔	14/16	1
Option 5 - Decommission the St. Jacobs WWTP and transfer flows to the Waterloo WWTP. Decommission the Heidelberg WWTP and transfer flows to the Waterloo WWTP	○	◔	◔	○	◔	◔	◔	○	◑	◔	◑	○	◔	◑	◑	18/16	3
Option 6 - Upgrade the existing plant and transfer flows beyond the existing capacity of the St Jacobs WWTP to the Waterloo WWTP. Maintain existing Heidelberg WWTP	○	◔	◑	◑	◔	◑	○	○	◑	◔	◑	○	◔	◑	◑	21/16	4
Option 7 - Upgrade the existing plant and transfer flows beyond the existing capacity of the St Jacobs WWTP to the Waterloo WWTP. Decommission the Heidelberg WWTP and transfer flows to the St. Jacobs WWTP	○	◔	◑	◔	◔	◑	◔	○	◑	◔	◑	○	◔	●	●	29/16	8
Option 8 - Upgrade the existing plant and transfer flows beyond the existing capacity of the St Jacobs WWTP to the Waterloo WWTP. Decommission the Heidelberg WWTP and transfer flows to the Waterloo WWTP	○	◔	◑	◔	◔	◑	◔	○	◑	◔	◑	○	◔	◕	◕	25/16	5

Notes:

○ ◔ ◔ ◔ ◔ ◔ ◔ ◔ ◑ ◑ ◑ ◑ ◕ ◕ ◕ ◕ ◕ ● (No Impact → High Impact)

10. PUBLIC, AGENCY, STAKEHOLDER, AND ABORIGINAL CONSULTATION

Public and agency consultation is an important component of the Class EA process. A vital component of the Master Plan process involved consultation with interested stakeholders, including regulatory and review agencies, the public and Aboriginals. The following outlines the public, agency, stakeholder and Aboriginal consultation that was undertaken during the Master Plan process.

10.1 Notifications

Members of the public and those on the project mailing list (see Section 10.4), which included agencies, stakeholders and Aboriginals, were provided with project notifications through direct mail outs at key points in the Master Plan process. These notifications were also published in local newspapers.

The following provides details on: the Notice of Commencement; the Notice of Public Information Centre (PIC); and the Notice of Completion.

10.1.1 Notice of Commencement

The Notice of Commencement for the St. Jacobs – Elmira Wastewater Treatment Plant Master Plan was published in the Waterloo Region Record on Friday, November 19, 2010 and in the Woolwich Observer on Saturday, November 20, 2010. Background information on the wastewater systems in St. Jacobs and Elmira was provided, along with information on the purpose of the Master Plan, the Master Plan process and opportunities for public input. Questions or comments on the study were invited and contact information for the Region of Waterloo and the consulting team project managers was noted. The Notice of Commencement newspaper advertisement is provided in Appendix I.

In addition, a letter and attached Notice of Commencement were mailed to those on the project mailing list on November 17, 2010 (At the advice of GRCA, the City of Brantford was sent a Notice of Commencement on June 7, 2011. The City of Brantford was also added to the project contract list.). This mailing included letters to federal, provincial and municipal agencies, utilities, Aboriginals, special interest groups and stakeholders. Examples of these letters are provided in Appendix I.

The Notice of Commencement was also posted on the Region's web site.

10.1.2 Notice of Public Information Centre

A PIC was held to provide an opportunity for members of the public to obtain information on the Master Plan process, the alternative solutions, the evaluation of these alternatives and the recommended preferred alternative. It was also an opportunity for members of the public to obtain responses to questions and provide comment and input to the study.

The PIC was held on Tuesday, December 4, 2012. Information on the PIC was published in the Waterloo Region Record on November 16 and 23, 2012. The date, time and location for the PIC were noted under the heading "We Want to Hear From You on These Upcoming Events Happening in Your Area". A reference regarding where to obtain additional information was also provided. A copy of this notification is included in Appendix I.

The Notice of PIC was also published in the Elmira Independent on November 22 and 29, 2012 and in the Woolwich Observer on November 17 and December 1, 2012. The newspaper notice for these publications is included in Appendix I.

The Notice of Public Information Centre was also posted on the Region of Waterloo's web site.

In addition, a letter of notification of the PIC was mailed to those on the project mailing list on Tuesday, November 6, 2012. Examples of these letters are provided in Appendix I.

10.1.3 Notice of Completion

The Notice of Completion was published in the Waterloo Chronicle on Wednesday, March 13, 2013 and Wednesday, March 20, 2013, in the Woolwich Observer on Saturday, March 16, 2013 and Saturday, March 23, 2013, and the Elmira Independent on Thursday, March 14, 2013 and Thursday, March 21, 2013.

The Notice of Completion advised members of the public of the opportunity to review and provide comments on the Master Plan. A period of 30 calendar days from March 12, 2013 to April 11, 2013 was provided for the public review of the Master Plan. Contact information for the Waterloo Region and consulting team project managers was noted. Copies of the Master Plan were available for review and comment at the following locations: Region of Waterloo Clerk's Office; Township of Woolwich Clerk's Office; and on the Region's web site. The Notice of Completion newspaper advertisement is provided in Appendix I. This notice was also posted on the Region of Waterloo web site.

In addition, a letter and attached Notice of Completion were mailed to those on the project contact list on Tuesday, March 12, 2013. Examples of these letters are provided in Appendix I.

10.2 Public Information Centre

As noted in Section 10.1.2, a PIC was held to provide an opportunity for members of the public to obtain information on the Master Plan process, the alternative solutions, the evaluation of these alternatives and the recommended preferred alternative. It was an opportunity for members of the public to obtain responses to questions and provide comment and input to the project. The PIC was held from 5:00 pm to 7:00 pm on Tuesday, December 4, 2012 at the St. Jacobs Community Centre in St. Jacobs, Ontario.

The PIC was a drop-in format with display boards available for viewing and an opportunity for one-on-one discussions with project team members. Members of the project team, including Waterloo Region and consultant representatives, were available to provide and discuss information on the Master Plan, and to receive comments and input.

A Comment Sheet and Handout were available for attendees. The display boards provided information on:

- Study Objectives;
- Projected Population and Flows;
- Evaluation Process;
- Wastewater Treatment Alternatives;
- Wastewater Servicing for Elmira;
- Wastewater Servicing Options for St. Jacobs and Heidelberg;
- St. Jacobs WWTP Expansion – Conceptual Layout;
- St. Jacobs WWTP Upgrades – Conceptual Layout;
- Forcemain Routes;
- Evaluation Criteria and Key Considerations;
- Life Cycle Cost Summary;
- Evaluation Matrix;
- Preferred Alternative for Servicing St. Jacobs, Elmira and Heidelberg;
- What Happens Next; and
- Invitation to Submit Comments and Contact Information (Waterloo Region and Consulting Team Project Managers).

The PIC materials were also posted on the Waterloo Region web site.

A total of nine people provided their name and contact information on the Attendance Record for the PIC. No completed Comment Sheets were submitted to the Region. However, the Region received two e-mail responses which are provided in Appendix I, along with the responses to these e-mails.

The following questions/comments were received from a representative of property owners for three properties located in the northern quadrant of St. Jacobs:

- Did the Master Plan take into account future growth to the Countryside Line?;
- Were population estimates, land use densities and timing of development provided by the Township?;
- Were the data provided in line with the developer's plans?; and
- How would these lands be serviced?.

The representative also expressed an interest in meeting with the Township and/or Region to discuss servicing of these lands.

In consultation with the Township, the Region responded by indicating that for new residential development, the Township assumes a land density of 45 ppl per hectare on developable lands (Greenfield lands, not including any Provincially Constrained). Questions/comments regarding servicing were directed to the Township as they are responsible for wastewater servicing and collection.

Comments were also received from a representative of the developer of Jacob's Trail Phase 2, off Printery Road and Water Street in St. Jacobs. The comments provided to the Region noted that that all the submitted Draft Plan Supporting Documents are available on the Township of Woolwich web site. The Region responded by indicating that Regional staff had reviewed the application that was referenced and provided comment to the Township. The Region further noted that information on the draft plan of subdivision was accounted for in the population projections used for the study and should be reflected in the Region's Water and Wastewater Monitoring Report next year.

Copies of the Comment Sheet, Attendance Sheet, display boards and Handout are provided in Appendix I.

10.3 Project Contact List and Web-site Postings

A project contact list was maintained throughout the Master Plan process. The contact list was developed at the Notice of Commencement stage and contacts were added to the contact list in response to requests from stakeholders and members of the public. A copy of the project contact list is provided in Appendix I. This list was used for the mailing of all study notifications.

In addition, key project information such as notifications, PIC materials (i.e., display boards, comment sheet, handout) were posted on the Region of Waterloo web site.

10.4 Agency and Stakeholder Consultation

In addition to the agencies represented on the Steering Committee, other federal, provincial and municipal agencies, as well as utilities and special interest groups, were consulted during the course of the Master Plan process. The following are agencies, utilities and special interest groups that were included on the project contact list, provided with project notifications and asked to provide concerns or comments regarding the study:

Federal

- Aboriginal Affairs and Northern Development Canada (AANDC) (formerly Indian and Northern Affairs Canada (INAC));

Provincial

- Ministry of Aboriginal Affairs (MAA);
- Ministry of the Environment, West Central Region;
- Ministry of the Environment, Guelph District Office;
- Ministry of Agriculture, Food and Rural Affairs;

- Ministry of Tourism and Culture;
- Ministry of Municipal Affairs and Housing;
- Ministry of Natural Resources, Guelph District Office;
- Ministry of Transportation;
- Ontario Realty Corporation;
- Grand River Conservation Authority;

Municipal

- Township of Woolwich;
- City of Waterloo;
- City of Brantford;

Utilities

- Hydro One Networks;
- Waterloo North Hydro;
- Rogers Cable;
- Bell Canada;
- Canadian Pacific Railways;
- CN Great Lakes;
- Union Gas;
- Enbridge Gas Distribution Inc.;
- Ontario Power Generation;

Special Interest Groups

- Region of Waterloo Ecological and Environmental Advisory Committee;
- City of Waterloo Environmental Advisory Committee;
- Waterloo Federation of Agriculture; and
- The Waterloo Stewardship Network.

Additions were made to the mailing list upon request.

The project contact list contains complete information on agencies, utilities and stakeholders contacted during the Master Plan process and is provided in Appendix I. Table 10.1 provides a summary of comments received from agencies and stakeholders, along with the response to these comments. Appendix I contains copies of replies received from agencies and stakeholders, as well as the Region's responses to these.

10.5 Aboriginal Consultation

10.5.1 Agency Contacts

The information for the agencies contacted regarding Aboriginal consultation is provided on the project mailing list included in Appendix I. In addition, all correspondence from these agencies is summarized in Table 10.1 and included in Appendix I.

Indian and Northern Affairs Canada (INAC) (Specific Claims Branch, Comprehensive Claims Branch, Lands and Trusts Services, Litigation Management and Resolution Branch, and Financial Issues and Cost Sharing) and the Ontario Ministry of Aboriginal Affairs (MAA) were contacted and included on the project mailing list. These agencies were contacted to determine whether there were any land claims that have been submitted to the Government of Canada or the Government of Ontario that may be affected by projects resulting from the Master Plan process.

Notice of Commencement

Notice of Commencement letters were sent to the following contacts on November 17, 2010:

- Mr. Don Boswell, Senior Claims Analyst, Specific Claims Branch, INAC;
- Ms. Louise Trépanier, Director, Claims East of Manitoba, Comprehensive Claims Branch, INAC;
- Ms. Josée Beauregard, Litigation Team Leader, Eastern Litigation Directorate, INAC;
- Mr. Jean-François Tardif, Director, Financial Issues and Cost Sharing, INAC;
- Mr. Martin Rukavina, Senior Policy Advisor, Aboriginal and Ministry Relationships Branch, MAA; and
- Ms. Pam Wheaton, Director, Aboriginal and Ministry Relationships Branch, MAA.

The Notice of Commencement newspaper advertisement was also attached to these letters.

In response to a suggestion made in a November 30, 2010 e-mail from Mr. Don Boswell, the following additional INAC departmental letters were sent by the Region on December 6, 2010:

- Mr. Sean Darcy, Manager, Assessment and Historical Research Directorate; and
- Mr. Dale Pegg, Senior Policy Advisor, Consultation and Accommodation Unit.

These additional INAC contacts received the same Notice of Commencement letter as that sent to those in the original November 17, 2010 mailing to INAC.

During the Master Plan process, INAC was renamed to Aboriginal Affairs and Northern Development Canada (AANDC). All references from this point forward are to AANDC even though the original documentation may have been from INAC.

Notice of Public Information Centre and Notice of Completion

The Notice of PIC and the Notice of Completion were also sent to AANDC and the Ontario Ministry of Aboriginal Affairs on November 7, 2012 and March 12, 2013, respectively. These notices were sent to the Regional Subject Expert for Ontario in the Consultation and Accommodation Unit of AANDC, in accordance with current protocols for contacts with AANDC. This Unit was established to assist in the coordination of departmental responses to consultation-related queries within AANDC.

Table 10.1 Summary of Agency and Stakeholder Comments

Date	Contact	Comment	Response to Comment
Federal			
November 30, 2010	Don Boswell Senior Claims Analyst Ontario Research Team Specific Claims Branch Indian and Northern Affairs Canada (now Aboriginal Affairs and Northern Development Canada)	• suggested contacting the First Nations in the vicinity of your area of interest to advise them of your intentions • suggested consulting the Reporting Centre on Specific Claims • can only speak directly to claims filed under the Specific Claims Policy in the Province of Ontario; suggested contacting the Assessment and Historical Research Directorate, the Consultation and Accommodation Unit and the Litigation Management and Resolution Branch	• First Nations in vicinity of area of interest have received the Notice of Commencement • in reference to the Litigation Management and Resolution Branch, Ms. Josée Beauregard, Litigation Team Leader, Eastern Litigation Directorate has been sent the Notice of Commencement • Region undertook additional Notice of Commencement contacts with the Assessment and Historical Research Directorate and the Consultation and Accommodation Unit, INAC – December 6, 2010; these contacts were also added to the project mailing list
December 22, 2010	Josée Beauregard Litigation Team Leader Eastern Litigation Directorate Litigation Management and Resolution Branch Indian and Northern Affairs Canada (now Aboriginal Affairs and Northern Development Canada)	• our inventory includes active litigation in the vicinity of this property – Six Nations of the Grand River Band of Indians v. Attorney General for Canada and Her Majesty the Queen in the Right of Ontario, Ontario Superior Court of Justice, filed in Brantford, court reference number 406/95 • also Chippewas of Kettle and Stoney Point v. Her Majesty the Queen in the Right of Canada as represented by the Attorney General of Canada and Minister for Department of Indian Affairs and Northern Development, Corporation of Township of Bosonquet Court file reference #C22725 • unable to comment with respect to the possible effects of these claims as the cases have not yet been adjudicated and any statement regarding the outcome of the litigation would be speculative at this point • it is recommended that you consult legal counsel as to the effect these actions could have on the lands you are concerned with • should also contact Don Boswell of Specific Claims Branch and Nicole Cheechoo for information on Comprehensive Claims	• Specific Claims Branch has been contacted – response from Don Boswell received on November 30, 2010 • Ms. Louise Trépanier, Director Claims East of Manitoba, Comprehensive Claims Branch was sent Notice of Commencement • no response required

Table 10.1 Summary of Agency and Stakeholder Comments

Date	Contact	Comment	Response to Comment
April 5, 2011	Corey Dekker Consultation and Accommodation Unit Indian and Northern Affairs Canada (now Aboriginal Affairs and Northern Development Canada)	• provided information on communities which fall within 100 km of the project location • Six Nations of the Grand River – have many specific claims filed with Canada, not all of which are currently active; in general, the Six Nations' claims deal with past grievances that relate to lands known as the Haldimand Tract; negotiations are ongoing • Mississaugas of the New Credit – Brant Tract Purchase claim settled on October 29, 2010 • Caldwell First Nation – no active relevant claims according to ATRIS • Oneida of the Thames – no active relevant claims according to ATRIS • Métis – provided contact information for Métis Nation of Ontario Head Office	• comments noted • no response required
Provincial			
November 24, 2010	Barbara Slattery EA/Planning Coordinator Ministry of the Environment West Central Region	• offered to assist by participating on a Technical Steering Committee; would like to participate at the point when specific projects have been identified to ensure agreement as to their schedule and subsequent EA requirements • keep in mind the range of other approvals and/or permits that may be required in order to implement the specific projects that are identified through the master planning process • it is MOE's expectation that the master planning exercise will: • address the key principles of successful EA; • address at least the first two phases of the Municipal Class EA; • allow for an integrated process with other planning initiatives; • provide a strategic level assessment of various options to better address overall system needs and potential impacts and mitigation	• Region provided response on January 17, 2011 • response noted that Region will fulfil expectations outlined re. master planning exercise • noted that a Steering Committee will be formed • Region appreciates MOE offer for assistance and will be extending an invitation for representation from EA planning as well as Technical Services Branch to sit on the Steering Committee • Region anticipates that assimilative capacity will be one of the major challenges associated with the Master plan which may necessitate additional meetings with the Ministry to discuss

Table 10.1 Summary of Agency and Stakeholder Comments

Date	Contact	Comment	Response to Comment
		• take a system-wide approach to planning which relates infrastructure either geographically or by a particular function • recommend an infrastructure master plan which can be implemented through the implementation of separate projects • include a description of the specific projects including any approvals that will be required • proponent is encouraged to visit the Ministry's web site for the most up-to-date Aboriginal contacts	
November 29, 2010	Melissa Larion, BES, MA Resource Planner Grand River Conservation Authority	• any future development within the regulated areas requires the prior issuance of a permit pursuant to Ontario Regulation 150/06 from the GRCA • forward any study information as it becomes available • would like to be involved in the development of the Master Plan through review and/or committee involvement	• offer to participate on committee noted • contact added to project mailing list • GRCA to be invited to participate on Steering Committee
December 23, 2010	Dwayne Evans Planner Municipal Services Office – Western Ministry of Municipal Affairs and Housing	• notes that the Provincial Policy Statement, 2005 (PPS) and the Growth Plan for the Greater Golden Horseshoe both apply to the Township of Woolwich and the Region of Waterloo • this project may have implications with respect to matters covered by the PPS and Growth Plan and we recommend that you consider these policies in the development of this Master Plan • a Master Plan for wastewater supply servicing should consider the following: • appropriate size and type of system(s) to accommodate present and future requirements • the services that can be sustained by the water resources upon which they rely • the system(s) are located and designed in accordance with provincial standards • the services are financially viable and comply with all other regulatory requirements	• January 14, 2011 response provided by Pam Law, Region of Waterloo • response noted information provided by MMAH • response indicated that the Region will continue to provide relevant project information and notifications as the Master Plan process progresses • added name to project mailing list, in addition to Mr. Matthew Ferguson • {Subsequent January 17, 2011 e-mail to Pam Law suggested that Mr. Ferguson be removed from mailing list since Mr. Evans has assumed his position]

Table 10.1 Summary of Agency and Stakeholder Comments

Date	Contact	Comment	Response to Comment
		• water conservation and water use efficiency is promoted • human health and the natural environment are protected • you should ensure that the local Official Plan policies regarding municipal wastewater services and management are integrated into the development of this Master Plan	
January 11, 2011	Lisa Myslicki Environmental Coordinator Ontario Realty Corporation (ORC) – Professional Services (ORC merged with Infrastructure Ontario on June 27, 2011))	• note that lands managed by Hydro One, on behalf of ORC are in the study area; map showing location of ORC property provided • should the proposed activities impact cultural heritage features, on ORC managed lands, a request to examine cultural heritage issues which can include the cultural landscape, archaeology and places of sacred and secular value could be required • the purchase of MEI owned / ORC managed lands or disposal of rights and responsibilities (e.g., easement) for ORC managed lands triggers the application of the MEI Class EA • if the MEI Class EA is triggered, and deferral to another ministry's or agency's Class EA or individual EA is requested, the alternative EA will be subject to a critical review prior to approval for any signoff of a deferral by the proponent	• January 14, 2011 response provided by Pam Law, Region of Waterloo • response noted information provided by ORC • response indicated that the Region will continue to provide relevant project information and notifications as the Master Plan process progresses • added name to mailing list, in addition to Mr. Anton Pojasok
January 24, 2011	Heather Levecque Manager, Consultation Unit Aboriginal Relations and Ministry Partnerships Division Ministry of Aboriginal Affairs	• if any archaeological resources could be impacted by your project, you should contact your regulating or approving Ministry to inquire about whether any additional Aboriginal communities should be contacted • with respect to your project, and based on the brief materials you have provided, we can advise that the project appears to be located in an area where Six Nations may have existing or asserted rights or claims in MAA's land claims process or litigation, that could be impacted by your project • suggested that the Region contact the Six Nations of the Grand River Territory and the Haudenosaunee Confederacy Chiefs Council	• no further action required • all suggested First Nation and agency contacts have been made • Heather Levecque added to project mailing list

Table 10.1 Summary of Agency and Stakeholder Comments

Date	Contact	Comment	Response to Comment
		• also suggested contacting the INAC Special Claims Branch, Assessment and Historical Research and Litigation Management and Resolution Branch	
December 3, 2012	Beth Brown Supervisor of Resource Planning Grand River Conservation Authority	• our interest relates to assimilative capacity as well as our regulatory role • we wish to note that the study area contains numerous natural hazard and natural heritage features including Canagagigue Creek, the Conestogo River and their tributaries, floodplain, erosion hazards, wetlands, and the allowances adjacent to these features • these features and their allowances are regulated under Ontario Regulation 150/06 – Development, Interference with Wetlands and Alterations to Shorelines and Watercourse Regulation • any future development within the regulated areas will require the prior issuance of permit from the GRCA • please provide any information presented at the PIC as well as the draft report to the attention of Mark Anderson and Andrew Herreman	• no response required • Region provided PIC materials on December 5, 2012
December 25, 2012	Lisa Myslicki Environmental Advisor, Environmental Management Infrastructure Ontario	• IO requires that the proponent of the project conduct a title search by reviewing parcel register(s) for adjoining lands, to determine the extent of ownership by MOI or its predecessors ownership • please contact IO if any ownership of provincial government lands are known to occur within your study area and are proposed to be impacted • please remove IO from your circulation list, with respect to this project, if there are no IO managed lands in the study area • in addition, in the future, please send only electronic copies of notices for any projects impacting IO managed lands to: Keith.Noronha@infrastructureontario.ca	• Region of Waterloo provided response on January 3, 3013 (see Appendix I) • response outlined recommended preferred alternative and noted that no provincial lands are required for the WWTP infrastructure • at this time, it is expected that the forcemain route to transfer flows from the St. Jacobs WWTP to the Waterloo WWTP will be within existing road allowances • however, a separate Class EA will be undertaken subsequent to this study to identify the detailed forcemain route • the Region will include IO on the mailing list to receive future notifications as part of this separate Class EA process

Table 10.1 Summary of Agency and Stakeholder Comments

Date	Contact	Comment	Response to Comment
Utilities			
November 21, 2012	Craig Fisher Specialist, Wastewater Program Safety, Environment and Regulatory Canadian Pacific	• in receipt of various notices for the project • apparently, Mr. Rick Corbin, formerly of CP, is on a list that is produced for these notices • since his retirement, the notices are forwarded to me; however, I have no need for them • please remove him from project mailing list	• removed from project mailing list for Notice of Completion
Public and Stakeholders			
October 13, 2010	Ian S. Robertson, P.Eng. Director of Engineering Meritech Engineering (representative of Valley View Heights (St. Jacobs) Ltd.)	• notes that the Region of Waterloo's Wastewater Treatment Master Plan states that "consideration could be given to pumping wastewater to the Waterloo WWTP via the City of Waterloo collection system" • his client has undertaken to investigate the viability and cost of redirecting flows from a portion of the Village to a new pumping station on their lands at the south end of St. Jacobs, and pumped to Waterloo • as part of the study options for the Wastewater Master Plan, we respectfully request that the Region of Waterloo examine the feasibility of diverting some or all of the sanitary flows from the St. Jacobs Wastewater Treatment Plant to the City of Waterloo	• Region of Waterloo forwarded response to Mr. Robertson on November 1, 2010 • response thanked Mr. Robertson for his specific concerns relating to wastewater treatment capacity within St. Jacobs • the Region noted that as part of the Class EA process, all feasible options for wastewater treatment for St. Jacobs and Elmira will be examined, including the diversion of some or all of the sanitary flows from these communities to an alternate treatment location • name has been added to project mailing list to receive project notifications
November 28, 2012	Hugh Handy Associate GSP Group Inc.	• requested population and development information based on calculations for growth	• Region of Waterloo provided response on November 29, 201 – response included in Appendix I

10.5.2 Responses to Agency Contacts

The responses received to contacts with AANDC and MAA are summarized in Table 10.1.

Notice of Commencement

Three responses to the Notice of Commencement mailing were received from AANDC. Copies of these responses are included in Appendix I. A response was also received from the Ministry of Aboriginal Affairs.

Notice of Public Information Centre

No responses were received to the Notice of Public Information Centre.

10.5.3 Aboriginal Contacts

Notice of Commencement

Notice of Commencement letters (see Appendix I) were sent to the following Aboriginal contacts on November 17, 2010:

- Mississaugas of the New Credit First Nation;
- Six Nations of the Grand River;
- Six Nations of the Grand River Eco-Centre; and
- Six Nations Haudenosaunee Confederacy Council.

The Notice of Commencement newspaper advertisement was also attached to these letters. These letters provided background information on the wastewater systems in St. Jacobs and Elmira, along with information on the purpose of the Master Plan, the Master Plan process and opportunities for input. Questions or comments on the study were invited and contact information for the Region of Waterloo and the consulting team project managers was noted.

A response to these letters was requested by December 15, 2010.

Notice of Public Information Centre

Notice of Public Information Centre letters (see Appendix I) were sent to the above noted Aboriginal contacts on November 7, 2012.

Notice of Completion

Notice of Completion letters (see Appendix I) were sent to the above noted Aboriginal contacts on March 12, 2013. The Notice of Commencement newspaper advertisement was also attached to these letters.

10.5.4 Responses to Aboriginal Contacts

No responses were received from these Aboriginal groups during the Master Plan process.

11. IMPLEMENTATION

11.1 Elmira

Based on population and flow projections, wastewater flows from the community of Elmira are not expected to exceed the CofA rated capacity of the WWTP until the year 2037. Therefore, reduction of wastewater flows through I/I programs and water efficiency programs will avoid the need for a plant expansion beyond the planning horizon of 2041.

To achieve the levels of flow reductions required, the community of Elmira must continue efforts to reduce I/I. In the short term, ongoing efforts to reduce I/I in Elmira include the following:

- CCTV inspection of sanitary sewer laterals in Birdland and North Elmira;
- Sanitary sewer lateral re-lining program;
- Flow monitoring in new subdivision developments; and
- Spot repairs in sewers.

In the long term, the Township should continue to: investigate alternative I/I reduction approaches to determine which of them offer the greatest cost-benefit; work with the Region regarding WWTP capacity; monitor sewer flows to quantify and identify sources of I/I; and correct I/I problems as they are found.

Based on a preliminary capacity assessment, the Elmira WWTP ADF capacity may be limited by the bioreactors due to historically high influent $cBOD_5$ concentrations. The plant CofA ADF capacity may be met by further reducing influent $cBOD_5$ concentrations and/or optimizing and upgrading the Elmira WWTP to address capacity limitations. The Region is working on reducing influent loading, including the relocation of a large industrial contributor and enforcement of the Sewer Use By-Law. The Region has also recently undertaken upgrades to the WWTP to improve internal recycle streams and optimize some processes.

In conjunction with on-going I/I reduction programs, initial steps for WWTP optimization should focus on: continued reduction of industrial flows; the characterization of the resulting wastewater influent; and the development of a calibrated process model that can be used to optimize the bioreactor capacity. Conversion of the bioreactor anoxic zones and anaerobic zones to aerobic zones may be required to provide additional bioreactor capacity; this may also require upgrades to the aeration diffusers and blower capacity.

Optimizing and upgrading the existing Elmira WWTP is ongoing and is classified as a "Schedule A" activity under the Municipal Class EA process; therefore, these upgrades have proceeded without further requirements under the Municipal Class EA.

11.2 St. Jacobs

The preferred servicing alternative for addressing the wastewater servicing needs for the community of St. Jacobs is to decommission the existing St. Jacobs WWTP and transfer flows to the City of Waterloo. Continued I/I reduction and water efficiency

programs will also form a part of the preferred solution for addressing the future wastewater needs for St. Jacobs.

Based on population and flow projections, the St. Jacobs WWTP is expected to exceed the CofA rated capacity by the year 2021; however, these projections assume no reduction in I/I for the existing community and new growth. With ongoing I/I reduction initiatives and water efficiency programs, the overall per capita ADF must be reduced to 539 L/cap·d or the per capita flows from new growth in the community must be about 468 L/cap·d to defer the St. Jacobs WWTP expansion until 2024 to coincide with the completion of the proposed Waterloo WWTP expansion.

The implementation of I/I reduction programs should continue. The Township has had an active program of I/I investigation and repair since 1989. Remaining sources of I/I in St. Jacobs include known gravity connections of foundation drains to sanitary sewers and known sewer lateral deficiencies identified by recent CCTV inspections of laterals on Water Street, and potentially more to be found by proposed CCTV inspection of laterals on Young Street. The Township's plan is to address these with a sewer lateral relining program.

The Township identified that their next steps in addressing I/I in St. Jacobs include the successful completion of the ongoing manhole rehabilitation program (61 manholes) and consideration of private side I/I sources. The Township is currently evaluating private side repair programs but has issues associated with liability. The Township plans to proceed with a new Sewer Lateral Rehabilitation/Relining Program, along with ongoing I/I correction in St. Jacobs.

In the interim, the St. Jacobs WWTP will continue to operate until the year 2024 to coincide with the completion of the Waterloo WWTP expansion. At that time, the St. Jacobs WWTP will be decommissioned and flows from the community of St. Jacobs will be transferred to the City of Waterloo. This will require the construction of a new sewage pumping station and forcemain to convey flows to the City of Waterloo.

A "Schedule B" Class EA will be undertaken to determine the most appropriate forcemain route for conveying flows from the existing St. Jacobs WWTP site to the City of Waterloo wastewater collection system. Odour control will be required on the discharge end of the forcemain. It is recommended that the existing tankage at the St. Jacobs WWTP be converted into equalization basins to minimize pumping station and forcemain requirements and the impacts of peak flows on the Waterloo WWTP and sewage collection system. Odour control for these tanks may also be required. These issues will be addressed in the Class EA to be undertaken prior to the implementation of this project.

11.3 Heidelberg

The preferred servicing alternative for the community of Heidelberg is to maintain the existing Heidelberg WWTP until it reaches the end of its life expectancy and significant upgrades are required. Alternatives for the servicing of the community of Heidelberg will be reviewed when the existing Heidelberg WWTP needs to be replaced or is in need of major upgrades.

11.4 I/I Reduction Programs

A key element of the St. Jacobs – Elmira Wastewater Treatment Master Plan is the continuation of efforts in both communities to reduce extraneous flow entering the collection system as I/I under wet weather conditions. The Township and the Region should jointly develop an I/I reduction program for these communities with realistic I/I reduction targets and timelimes in order to ensure that adequate wastewater collection and treatment capacity will be available to service planned growth.

12. REFERENCES

Earthtech (2007), Region of Waterloo - Wastewater Treatment Master Plan.

Metcalf and Eddy (1991), Wastewater Engineering, Treatment Disposal Reuse, Third Edition, McGraw-Hill, Inc. Toronto.

Ministry of the Environment (2008), Design Guidelines for Sewage Works.

Municipal Engineers Association (2000), Municipal Class Environmental Assessment, October 2000, as amended in 2007 & 2011.

APPENDIX A
BACKGROUND INFORMATION

XCG CONSULTANTS LTD.
T 905 829 8880 F 905 829 8890 | toronto@xcg.com
2620 Bristol Circle, Suite 300, Oakville, Ontario, Canada L6H 6Z7

XCG File No.: 3-035-51-01
March 10, 2011

TECHNICAL MEMORANDUM NO. 1A
ST. JACOBS - ELMIRA WASTEWATER TREATMENT MASTER PLAN
BACKGROUND INFORMATION

Prepared for:

REGION OF WATERLOO
150 Frederick Street, 7th Floor
Kitchener, Ontario
N2G 4J3

Attention: Pam Law, P.Eng.

Prepared by:

XCG CONSULTANTS LTD.
Suite 300, 2620 Bristol Circle
Oakville, Ontario
L6H 6Z7

1. OBJECTIVES

The Region of Waterloo (Region) is undertaking a Wastewater Treatment Master Plan (WWTMP) for both the Elmira and St. Jacobs communities concurrently, ensuring that Phases 1 and 2 of the Municipal Class Environmental Assessment (MCEA) are satisfied. This Master Plan will review wastewater treatment conditions in these communities since the completion of the 1997 Class Environmental Assessment (EA) study and the 2007 Region-wide Wastewater Treatment Master Plan (WWTMP), and recommend a wastewater treatment strategy to meet growth in the communities for the next 30 years.

The 2007 Region-wide WWTMP recommended the completion of a separate master plan for Elmira WWTP and St. Jacobs WWTP where options for servicing of both communities would be considered together. This study will provide an opportunity to consider wastewater treatment requirements for Elmira and St. Jacobs together and will also provide an opportunity to consider the feasibility of incorporating flows from the Heidelberg WWTP into an overall solution.

The specific objectives of this Technical Memorandum are as follows:

- Provide a list information to be used in this Master Plan and update the status of information retrieval;
- Identify the planned use of the information retrieved and the location where it will be presented; and
- Summarize the key findings of the 1997 Elmira and St. Jacobs Environmental Study Report (ESR) and the 2007 Region-wide Wastewater Treatment Master Plan (WWTMP) as they relate to the Elmira and St. Jacobs WWTPs.

2. INFORMATION STATUS

Table 2.1 below summarizes the information currently available and information outstanding for WWTMP.

Table 2.1 St. Jacobs - Elmira WWTMP Information Needs

Item	Status	Date Received
1. 2007 Wastewater Treatment Master Plan	provided electronically	22/10/10
2. Water Quality in the Grand River: A Summary of Current Conditions (2004 -2006)	Report for 2000-2004 available on line from www.grandriver.ca. Request made for 2004-2006 report	
3. Elmira St. Jacobs WWTP 1997 ESR	Hardcopy	22/10/10
4. Elmira WWTP Design and Operating Information a. Preliminary Design Report, Stantec 1998 b. Stantec TMs 1 to 3 (2008 -2009) c. Review of Elmira WWTP Design and Operation, CH2M Hill 2008 d. Elmira WWTP Storage Expansion – Preliminary Assessment, Stantec 2009 e. Design Brief, Cole Engineering 2010 f. Annual Reports, 2007 - 2009 g. Certificates of Approval	a. provided hardcopy b. 1&3 electronically, 2 hardcopies c. electronically d. hardcopy e. draft-hardcopy f. electronically (2009 not provided still in draft) g. electronically	a. 22/10/10 b. 22/10/10 c. 22/10/10 d. 22/10/10 e. 22/10/10 f. 22/10/10 g. 22/10/10
5. St. Jacobs WWTP Design and Operating Information a. Preliminary Design Report, Stanley 1998 b. Annual Reports, 2007 – 2009 c. Certificates of Approval	a. hardcopy b. electronically (2009 not provided still in draft) c. electronically	a. 22/10/10 b. 22/10/10 c. 22/10/10
6. Heidelberg WWTP Design and Operating Information a. Design Brief b. Annual Reports, 2007 – 2009 c. Certificate of Approval	a. hardcopy b. electronically (2009 not provided still in draft) c. electronically	a. 22/10/10 b. 22/10/10 c. 22/10/10
7. Infiltration/Inflow Reports a. Dillon, May 1997 b. Paragon Pilot Project Report, March 1997 c. Flow Monitoring – Flow Meter Location Maps, Stantec 1996 to Present d. Sewage Collection System Mapping – Elmira, St. Jacobs and Heidelberg e. Inflow and Infiltration Program Evaluation, May 2010 f. Other Flow Monitoring Data	a. hardcopy b. hardcopy c. electronically d. electronically e. hardcopy	a. 22/10/10 b. 22/10/10 c. 07/01/11 d. 07/01/11 e. 19/11/10

Table 2.1 St. Jacobs - Elmira WWTMP Information Needs

Item	Status	Date Received
8. Assimilative Capacity and Water Quality a. Background data for ASC in 2007 WWTP MP b. GRCA Routine Sampling Locations c. Drawings of WWTP Outfalls d. River Cross-sections	a. Looking to see if available b. Available through GRIN website. c. electronically in drawing sets d. Available through Gus Rungis (GRCA). Request made, GRCA to provide.	a. Not available b. 01/11/10 c. 22/10/10
9. Sewage Collection System Mapping a. Elmira b. St. Jacobs c. Heidelberg	Hardcopy received.	26/10/10
10. Current and Projected Populations a. Elmira b. St. Jacobs c. Heidelberg (Serviced Population)	Provided via email	21/10/10
11. Class EA Documentation a. Example Notice of Commencement b. EA Contact List	Provided via email	21/10/10
12. GIS Layers a. Sanitary sewers (Township) b. Sanitary sewer manholes (Township) c. Major and minor roads (Region) d. Watercourses, rivers and streams (Region) e. ESAs, ANSIs (Region) f. Storm sewer locations (Township) g. WWTP locations (Region) h. Pumping station locations (Township) i. Sanitary forcemains (Township) j. Parcel fabric (Region) k. Existing urban boundary (Region) l. Any planned expansion of the urban boundary (Region)	Township mapping provided in hardcopy Region provided electronically in GIS format	26/10/10 26/10/10
13. Other Information a. PWQMN sampling data b. Sampling data from industries with Sewer Surcharge Agreements c. Sampling upstream of Elmira WWTP - 2 sampling periods in 2008, shows raw wastewater characteristics without internal recycle streams d. Crompton influent sampling (Crompton flows enter at the aeration basins) e. Plant drawings (Provided all that were available in files) f. Biowin model (Elmira only)	a. Obtained through MOE – contact Aaron Todd (416)235-6240 b. Region compiling – anticipate to be available by Oct. 29 c. electronically d. electronically e. electronically f. Region to provide	a. 09/11/10 b. 22/10/10 c. 22/10/10 d. 22/10/10 e. 27/10/10

3. BACKGROUND INFORMATION REVIEW

Table 3.1 below summarizes the review status of the background information.

Table 3.1 Background Information Review

Item	Comment
1. 2007 Wastewater Treatment Master Plan	Refer to Section 3.2 of Memo
2. Water Quality in the Grand River: A Summary of Current Conditions (2004 -2006)	Will be reviewed as part of Assimilative Capacity Analysis
3. Elmira St. Jacobs WWTP 1997 ESR	Refer to Section 3.1 of Memo
4. Elmira WWTP Design and Operating Information a. Preliminary Design Report, Stantec 1998 b. Stantec TMs 1 to 3 (2008 -2009) c. Review of Elmira WWTP Design and Operation, CH2M Hill 2008 d. Elmira WWTP Storage Expansion – Preliminary Assessment, Stantec 2009 e. Design Brief, Cole Engineering 2010 f. Annual Reports, 2007 - 2009 g. Certificates of Approval	a. - g. Will be reviewed as part of WWTP Existing Conditions Memo
5. St. Jacobs WWTP Design and Operating Information a. Preliminary Design Report, Stanley 1998 b. Annual Reports, 2007 – 2009 c. Certificates of Approval	a. – c. Will be reviewed as part of WWTP Existing Conditions Memo
6. Heidelberg WWTP Design and Operating Information a. Design Brief b. Annual Reports, 2007 – 2009 c. Certificate of Approval	a. – c. Will be reviewed as part of WWTP Existing Conditions
7. Infiltration/Inflow Reports a. Dillon, May 1997 b. Paragon Pilot Project Report, March 1997 c. Flow Monitoring – Flow Meter Location Maps, Stantec 1996 to Present d. Sewage Collection System Mapping – Elmira, St. Jacobs and Heidelberg e. Other Flow Monitoring Data	a. – e. Will be reviewed as part of I/I Technical Memorandum
8. Assimilative Capacity and Water Quality a. Background data for ASC in 2007 WWTP MP b. GRCA Routine Sampling Locations c. Drawings of WWTP Outfalls d. River Cross-sections	a. - d. Will be reviewed as part of Assimilative Capacity Analysis
9. Current and Projected Populations a. Elmira b. St. Jacobs c. Heidelberg (Serviced Population)	a. - c. Will be summarized in Future Population and Flows TM

Table 3.1 Background Information Review

Item	Comment
10. Other Information a. PWQMN sampling data b. Sampling data from industries with Sewer Surcharge Agreements c. Sampling upstream of Elmira WWTP - 2 sampling periods in 2008, shows raw wastewater characteristics without internal recycle streams d. Crompton influent sampling (Crompton flows enter at the aeration basins)	a. and c. Will be reviewed as part of Assimilative Capacity Analysis b. and d. Flow data will be analysed as part of Future Population and Projected Flow TM

3.1 Elmira and St. Jacobs Environmental Study Report, (Regional Municipality of Waterloo, October 1997)

This project was originally initiated in 1989 but the resulting Environmental Study Report (ESR) was not distributed at that time. Following the subsequent Region-wide Master Plan recommendations, the ESR was re-initiated in 1995. A draft ESR was prepared in 1996 that recommended the upgrade of the Elmira WWTP at the existing site, and construction of a new WWTP near St. Jacobs for servicing the St. Jacobs community and the future population of Elmira. The 1996 draft ESR was not submitted for the 30-day review period in an attempt to incorporate the findings of a parallel study completed by the Township of Woolwich to investigate I/I to the sewer system in Elmira. An Infiltration and Inflow Review Report was prepared in 1997 to examine the potential for I/I reduction in St. Jacobs and Elmira and determine if it will change the outcome of the 1996 draft ESR. The 1997 I/I Review Report found that significant I/I reductions could be achieved in the south area of Elmira. The 1997 I/I Review Report recommended that the 1996 draft ESR be updated to take into account the possible flow reductions from I/I control measures. Subsequently, the 1997 ESR was prepared to reflect the I/I reduction potential.

The 1997 ESR looked at various alternatives for addressing the Elmira and St. Jacobs wastewater treatment needs, which included:

- I/I reduction only;
- Treatment plant expansion only; and
- I/I reduction and treatment plant expansion.

Review of the alternatives found that I/I reduction only would not provide short term growth potential for the community due to the time required to implement this option. The alternative that involves expansion of the treatment plant to meet peak flows without I/I reduction would allow peak flows to pass through the WWTP; however, it may not be able to treat the peak flows effectively to meet CofA effluent criteria. In addition, this option would likely not be supported by the MOEE. Therefore, the third option, I/I reduction and treatment plant expansion was the preferred solution. Although this option was higher cost, it provided a higher level of service and higher effluent quality.

The ESR also looked at the possibility of a Reed Bed System in St. Jacobs; however, it was not recommended due to its inability to consistently produce the effluent quality required, and the considerably higher cost compared to expanding the St. Jacobs WWTP

The 1997 ESR preferred solution included:

- Upgrade and expand the Elmira WWTP at the existing site from 4546 m^3/d to 7800 m^3/d with 4600 m^3 of equalization storage.
- Upgrade and expand the St. Jacobs WWTP at the existing site from 950 m^3/d to 1450 m^3/d with 1450 m^3 of equalization storage.
- Implement I/I reductions in south Elmira and partial repairs and replacement of sanitary sewers in north Elmira.
- Replacing or relining sewer mains in St. Jacobs with replacement of service laterals.
- Continue implementing the water efficiency program.

The upgrade and expansion of both the Elmira WWTP and St. Jacobs would include enhanced precipitation, additional secondary clarification, and tertiary filtration. With the implementation of the I/I programs, the targeted I/I reductions for Elmira and St. Jacobs over a 10 year period were estimated as follows:

- I/I average flow per capita in Elmira would be reduced by 40 percent to 150 L/c/d;
- I/I peak flow in Elmira would be reduced by 39 percent to 205 L/s;
- I/I average flow per capita in St. Jacobs would be reduced by 50 percent to 200 L/c/d; and
- I/I peak flow in St Jacobs. would be reduced by 62% percent 39 L/s.

3.2 Wastewater Treatment Master Plan Update, (EarthTech, August 2007)

The 2007 Region of Waterloo Wastewater Treatment Master Plan (WWTMP) was completed to develop a wastewater treatment strategy to 2041 and to ensure that sufficient capacity in the wastewater systems was available to support existing and new growth in the Region. As a part of the strategy in preparing the 2007 WWTMP, effluent quality and the aggressive growth proposed in the 2005 Places to Grow Act was a key focus.

The overall recommendations of this WWTMP included:

- I/I reduction implemented;
- Continued implementation of the water conservation programs outlined in the Water Supply Master Plan (WSMP) and the Water Efficiency Master Plan (WEMP);

- Pilot project to investigate the potential of grey water reuse in both industrial and municipal areas for cooling water, irrigation, toilet flushing, etc.;
- Continued monitoring and evaluation of the impacts on the Grand River, Speed River, and Nith River; and
- Expand the WWTPs to service future population in the Region of Waterloo.

Recommendations specific to the Elmira and St. Jacobs site in the WWTMP are summarized in the following sections.

3.2.1 Elmira

The 2007 WWTMP identified I/I as being a significant issue in Elmira; however, recent expansion to the existing plant equalization storage and separation of sanitary and stormwater flow was anticipated to significantly reduce I/I flows.

The Elmira WWTP has also experienced high organic loadings, in the range of 50 percent increase in loadings, from an unknown source. This has caused problems in nitrification and denitrification, resulting in the plant being unable to meet its CofA nitrogen limits. Process optimization in the short term was recommended to address this concern. Since the completion of the Master Plan, the Region has identified the sources of the high strength loading and is working with the industries to bring their discharge into compliance with the Region's Sewer Use By-law and associated surcharge agreements.

The WWTMP indicated that Canagagigue Creek had reached its assimilative capacity limit; therefore, the plant cannot be expanded beyond the existing design flows. The projected 2031 average daily flow is 7,400 m^3/day and in 2041 is 9,300 m^3/day. The WWTP currently has a rated average day capacity of 7,800 m^3/day; hence, the plant will have sufficient capacity to 2031, but insufficient for 2041.

To address the projected shortfall in plant capacity in 2041, the completion of the a WWTMP for the Township of Woolwich was recommended, as well as an Assimilative Capacity Study specifically to assess the assimilative capacity of Canagagigue Creek. The primary clarifiers were identified as the unit process that is currently limiting the WWTP capacity. The current primary clarifiers are rated at 6,400 m^3/day; whereas, the aeration tank is capable of treating over 10,000 m^3/day and secondary clarifiers are capable of treating over 9,400 m^3/day.

The overall recommendations for the community of Elmira as outlined in the 2007 WWTMP were as follows.

- A Master Plan Study should be completed in the short term for the Township of Woolwich to evaluate wastewater treatment strategy for future flows in St. Jacobs and Elmira.

- Optimization of the treatment process should be completed in the short term to address the following process issues:
  - Additional equalization storage;
  - Investigate I/I; and
  - Address limitations in primary clarifier capacity.
- The Elmira WWTP should be expanded to 10 MLD in the long term to service the future flow projections, subject to the completion of a Master Plan for the Township of Woolwich and an Assimilative Capacity Study.

3.2.2 St. Jacobs

I/I problems were identified in the 2007 WWTMP as a significant issue in the St. Jacobs community, likely caused by high groundwater levels getting into residential basement tile drains which are connected to the sewage mains.

The WWTMP found that cold weather is an issue in the operation of the St. Jacobs WWTP. Nitrification is not achieved in cold weather conditions due to the low wastewater temperatures in the oxidation ditch, and the secondary clarifiers freeze over during cold weather.

It was found that the current wastewater treatment plant capacity will be insufficient to meet future demands. The forecasted average daily flow for 2031 was 1,900 m^3/day which exceeds the current design capacity of 1,450 m^3/day.

The recommendations for the community of St. Jacobs as outlined in the 2007 WWTMP were as follows.

- A Master Plan Study should be completed in the short term for the Township of Woolwich to evaluate wastewater treatment strategy for future flows in St. Jacobs and Elmira.
- Process issues related to cold temperature conditions should be addressed in the short term. This includes possibly covering the oxidation ditch or construction of an aeration basin with fine pore bubble aeration system which has better control over low temperatures and increased oxygen availability.
- The St. Jacobs WWTP should be expanded to 2.5 MLD in the long term to service the future flow projections, subject to the completion of a Master Plan for the Township of Woolwich.

APPENDIX B
EXISTING CONDITIONS

XCG CONSULTANTS LTD.
T 905 829 8880 F 905 829 8890 | toronto@xcg.com
2620 Bristol Circle, Suite 300, Oakville, Ontario, Canada L6H 6Z7

XCG File No.: 3-035-51-01
August 23, 2011

TECHNICAL MEMORANDUM NO. 1B
ST. JACOBS – ELMIRA WASTEWATER TREATMENT MASTER PLAN
EXISTING CONDITIONS

Prepared for:

REGION OF WATERLOO
150 Frederick Street, 7th Floor
Kitchener, Ontario
N2G 4J3

Attention: Pam Law, P.Eng.

Prepared by:

XCG CONSULTANTS LTD.
Suite 300, 2620 Bristol Circle
Oakville, Ontario
L6H 6Z7

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1. INTRODUCTION

1.1 Background

The Region of Waterloo (Region) is undertaking a wastewater treatment master plan (WWTMP) for both the Elmira and St. Jacobs communities concurrently, ensuring that Phases 1 and 2 of the Municipal Class Environmental Assessment (MCEA) are satisfied. This Master Plan will review wastewater treatment conditions in these communities since the completion of the 1997 Class Environmental Assessment (EA) study and the 2007 Region-wide Wastewater Treatment Master Plan (WWTMP), and recommend a wastewater treatment strategy to meet growth in the communities for the next 30 years.

The 2007 Region-wide WWTMP recommended the completion of a separate master plan for Elmira WWTP and St. Jacobs WWTP where options for servicing of both communities would be considered together. This study will provide an opportunity to consider wastewater treatment requirements for Elmira and St. Jacobs together and will also provide an opportunity to consider the feasibility of incorporating flows from the Heidelberg WWTP into an overall solution.

The St. Jacobs WWTP provides tertiary treatment for wastewater generated in the Town of St. Jacobs. The plant is operated under MOE Amended C of A No. 3-0690-99-006 issued December 1, 1999. The St. Jacobs WWTP has an average day C of A rated capacity of 1,450 m^3/d.

The Elmira Wastewater Treatment Plant (WWTP) provides tertiary treatment for wastewater generated in the Town of Elmira. The plant is operated under Ministry of the Environment (MOE) Amended Certificate of Approval (C of A) No. 2530-84BL9Q issued June 8, 2010. The Elmira WWTP has an average day C of A rated capacity of 7,800 m^3/d and a peak flow capacity of 19,500 m^3/d.

The Heidelberg WWTP provides tertiary treatment for wastewater generated in a small community of about 90 homes in the village of Heidelberg. The plant is operated under MOE Certificate of Approval No. 7707-5NSKGL issued on August 6, 2003. The Heidelberg WWTP has an average day C of A rated capacity of 130 m^3/d and a peak flow capacity of 3.2 L/s.

This Memorandum presents the historical flows and loadings, historical effluent quality as compared to the C of A requirements and limitations for each of the three plants: Elmira WWTP, St. Jacobs WWTP, and Heidelberg WWTP.

1.2 Objectives

The objectives of this technical memorandum are to:

1. Summarize historical flows and loadings for the three WWTPs;
2. Summarize and compare historical effluent quality to C of A requirements for the three WWTPs; and
3. Summarize any known process or hydraulic limitations at the three WWTPs.

1.3 Data Sources

The following data sources were used in the preparation of this report:

- Amended Certificate of Approval No. 2530-84BL9Q issued June 8, 2010 for the Elmira WWTP.
- Amended Certificate of Approval No. 3-0690-99-006 issued December 1, 1999 for the St. Jacobs WWTP.
- Amended Certificate of Approval No. 7707-5NSKGL issued on August 6, 2003 for the Heidelberg WWTP.
- Annual Reports, 2007 and 2008.
- 2009 and 2010 plant performance data from the Region.
- Elmira WWTP Storage Expansion - Preliminary Assessment, Stantec, 2009.
- Design Brief of Elmira WWTP Upgrades, Cole Engineering, 2010.
- Elmira WWTP Design Operations Review, CH2M HILL, 2008.
- Elmira Expansion Plant Drawings, prepared by Acres and Associated, May 1999.
- Elmira Original Plant Drawings, prepared by Walter, Fedy, McCargar, Hachborn Consulting Engineers, June 1971.
- St. Jacobs Upgrade Plant Drawings, prepared by Acres and Associated, May 1999.
- St. Jacobs Original Plant Drawings, prepared by Walter, Fedy, McCargar, Hachborn Consulting Engineers, June 1971.
- Heidelberg Plant Drawings, prepared by Conestoga - Rovers & Associates, May 1997.
- Site visit with the operating staff from the Ontario Clean Water Agency (OCWA), the Region's contracted operating authority, on November 18th, 2010.

2. ST. JACOBS WWTP

The St. Jacobs WWTP is an extended aeration activated sludge WWTP that provides tertiary treatment for wastewater generated in the Town of St. Jacobs. The plant is operated by the Ontario Clean Water Agency (OCWA) on behalf of the Regional Municipality of Waterloo. The plant is operated under Ministry of the Environment (MOE) Amended Certificate of Approval (C of A) No. 3-0690-99-006 issued December 1, 1999. The St. Jacobs WWTP has an average day C of A rated capacity of 1,450 m^3/d.

Raw sewage enters the St. Jacobs WWTP through a lift station, consisting of three submersible lift pumps with a firm pumping capacity of 5,184 m^3/d. No additional septage or other flows are sent to the St. Jacobs WWTP. The sewage is pumped through a grinder/auger influent screening system and to a vortex grit removal system.

Degritted wastewater is conveyed to the 907 m^3 oxidation ditch that provides secondary treatment. The two oxidation ditch rotors provide a total maximum oxidation transfer rate of 1,286.4 kg O_2/day. Mixed liquor from the oxidation ditch enters the clarifier influent distribution chamber and flows to the two circular secondary clarifiers with a diameter of 11.5 m each. The secondary clarifiers both have a scum removal system with a submersible scum pump, as well as a sludge collection/removal mechanism. Phosphorus removal is achieved by a dual point alum injection system, dosing at the clarifiers and the secondary effluent flow prior to the tertiary filters.

There are two submersible pumps in the return activated sludge (RAS) pumping station. Each pump is rated at 41 L/s, and the RAS pumping station has a firm capacity of 2,900 m^3/d, according to the C of A.

Following secondary treatment, the wastewater is gravity fed to three continuous backwash sand filters with a total filter area of 13.9 m^2. Filtered effluent flows through a Parshall flume to measure flow to an open channel gravity flow ultraviolet (UV) disinfection system. Following UV disinfection, the treated wastewater is released into the Conestogo River. There are four sodium hypochlorite metering pumps to provide for any occurrences such as raw sewage bypass, influent works bypass, plant service and emergency effluent discharge disinfection.

The conversion of an old secondary clarifier to an aerated biosolids holding tank provides the St. Jacobs WWTP with the ability to better control their solids wasting rate. According to an OCWA operator, the holding tank allows for about 30 to 40 days worth of sludge storage prior to pumping. The sludge is then hauled to the Waterloo WWTP for further treatment.

2.1.1 Treatment Objectives and Compliance Requirements

The C of A effluent objectives and criteria for the St. Jacobs WWTP are presented in the Amended C of A Number 3-0690-99-006 issued December 1, 1999.

The C of A specifies concentration objectives and non-compliance limits for carbonaceous biochemical oxygen demand ($cBOD_5$), Total Suspended Solids (TSS), Total Phosphorus (TP), Total Ammonia Nitrogen (TAN) and *E. coli* concentrations. The C of A effluent requirements for the St. Jacobs WWTP are summarized in Table 2.1.

Table 2.1 C of A Objectives and Non-compliance Limits (C of A No 3-0690-99-006)

Parameter	Effluent Objectives		Non-Compliance Limits	
	Concentration (1)	Total Loading	Concentration	Total Loading
$cBOD_5$	5.0 mg/L	7.3 kg/d (2)	10.0 mg/L	14.5 kg/d (2)
TSS	5.0 mg/L	7.3 kg/d (2)	10.0 mg/L	14.5 kg/d (2)
TP	0.2 mg/L	0.3 kg/d (2)	0.3 mg/L	0.44 kg/d (2)
TAN (May-Oct)	0.7 mg/L	1.0 kg/d (3)	1.0 mg/L	1.5 kg/d (3)
TAN (Nov-Apr)	1.0 mg/L	1.5 kg/d (3)	2.0 mg/L	2.9 kg/d (3)
E .coli (4)	100 counts/100mL	-	200 counts/100 mL	-

Notes:
1. Based on monthly average concentration values.
2. Based on the annual average loading during any calendar year.
3. Based on the monthly concentration of the parameter multiplied by the average daily flow over the corresponding monthly period the sample was taken, exceeds its corresponding loading.
4. Based on monthly geometric mean.

2.1.2 Raw Wastewater Flows and Characteristics

2.1.2.1 Historical Flow

A summary of the annual effluent wastewater flows for January 2007 to December 2010 is presented in Table 2.2.

Table 2.2 Summary of Historical Plant Flow (2007 – 2009)

Year	Average Day Flow (m^3/d)	Maximum Day Flow	
		(m^3/d)	Factor
2007	882	3,104	3.5
2008	1,253	3,652	2.9
2009	978	3,487	3.6
2010	799	1,873	2.3
Average	978	-	-
C of A Rated Capacity	**1,450**	**-**	**-**

Notes:
Average day flow values based on monthly average flows.

Peak hourly flows are not recorded at the plant. Peak flows through the plant are controlled by the on-site pumping station. The firm capacity of the three submersible raw sewage pumps is 5,184 m^3/d. This peak hourly flow is equivalent to a design peak hour factor of 3.58.

For comparison purposes, the Harmon Peaking factor was estimated to be 3.61 based on the 2009 serviced population of 1,836. This is very similar to the peak factor of 3.58 based on the firm capacity of the raw sewage pumps.

Figure 2.1 presents the flows to the St. Jacobs WWTP for the study period from January 2007 to December 2010.

It can be seen in Figure 2.1 that there are three instances when the monthly average day flow exceeds the current C of A capacity of 1,450 m^3/d (March, April and December 2008).

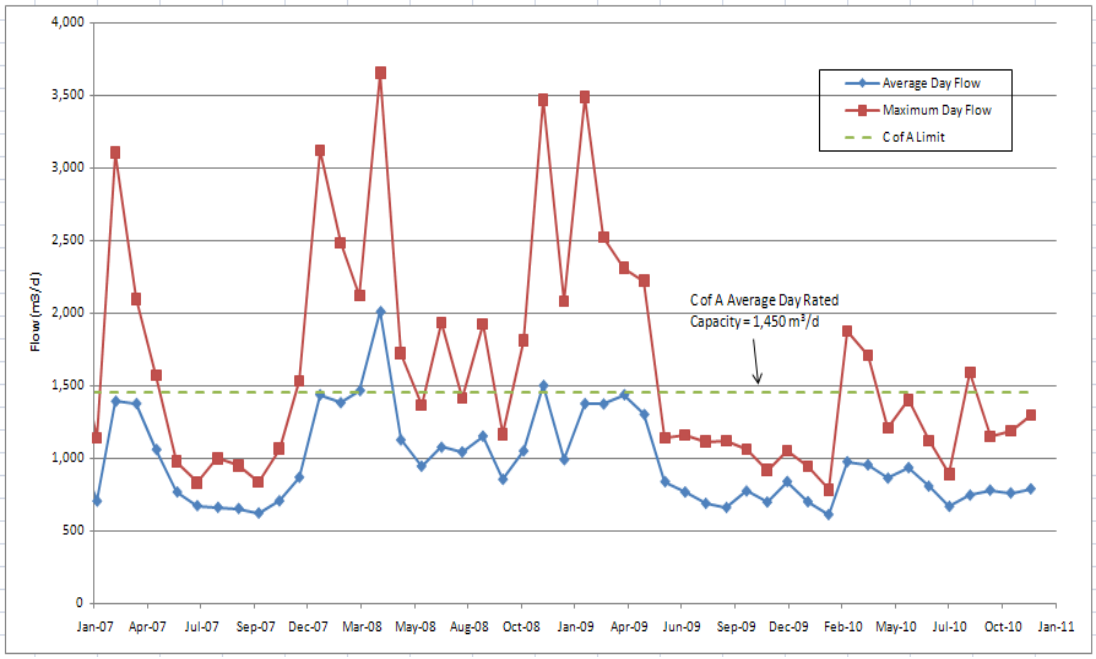


Figure 2.1 St. Jacobs WWTP Flow (2007 - 2009)

No bypass events occurred in 2007; however, three bypass events occurred at the St. Jacobs WWTP in 2008. From January 8 to January 9, approximately 2,500 m^3 of raw bypass was blended with final effluent flows and released. From April 1 to April3, approximately 2,000 m^3 of raw bypass was blended with final effluent flows and released. The last bypass event in 2008 occurred on December 28, with approximately 1,200 m^3 of raw bypass flows blended with final effluent flows before being released. All appropriate authorities were notified and samples were submitted to the lab for each of these events.

2.1.2.2 Raw Wastewater Quality

The raw wastewater entering the St. Jacobs WWTP includes wastewater primarily from domestic and commercial sources. There are no large industrial contributors located in St. Jacobs.

Historical raw wastewater characteristics are shown in Table 2.3.

Table 2.3 Raw Wastewater Characteristics (2007 – 2010)

Year	Average Concentration (mg/L)			
	$cBOD_5$	TSS	TP	TKN
2007	180	205	6.0	39.6
2008	122	185	4.8	35.6
2009	156	204	4.7	33.6
2010	102	126	4.1	29.6
AVERAGE	**140**	**180**	**4.9**	**34.6**
Typical Raw Sewage Concentrations (1)	*110 mg/L (low)* *190 mg/L (med)* *350 mg/L (high)*	*120 mg/L (low)* *210 mg/L (med)* *400 mg/L (high)*	*4 mg/L (low)* *7 mg/L (med)* *12 mg/L (high)*	*20 mg/L (low)* *40 mg/L (med)* *70 mg/L (high)*

Notes:
1. Metcalf & Eddy (2003) for low, medium and high strength sewage.

According to the typical literature values, the wastewater flowing to the St. Jacobs WWTP would be characterized as low to medium strength. The raw wastewater concentrations are representative of a low to medium strength wastewater with respect to $cBOD_5$ and TP, and medium strength with respect to TSS and TKN (Metcalf & Eddy, 2003).

Table 2.4 provides a summary of the historic raw wastewater loadings at the plant.

Table 2.4 Historic Influent Wastewater Loadings

Parameter	2007	2008	2009	2010	Overall Average
$cBOD_5$ (kg/d)	150 (253)	146 (217)	151 (299)	81 (157)	132 (299)
TSS (kg/d)	169 (327)	216 (386)	206 (773)	102 (274)	173 (773)

Notes:
Values in parentheses represent maximum monthly average load values.

2.1.3 Effluent Wastewater Quality

Based on the historical plant effluent, the St. Jacobs WWTP has been able to achieve its effluent compliance limits for the majority of the historic review period. There have been a few occasions when the effluent monthly average exceeds the C of A Non-Compliance limits for $cBOD_5$, TSS, and TP concentration parameters, as can be noticed in Table 2.5. The specific events are listed below.

- The $cBOD_5$ monthly average concentration exceeded the C of A non-compliance limit in February 2007 (see Figure 2.2).
- The TSS monthly average concentration exceeded the C of A non-compliance limit in February and March 2007 and February 2009 (see Figure 2.3).
- The TP monthly average concentration exceeded the C of A non-compliance limit in February and March 2007 and August 2008 (see Figure 2.4).

The historical effluent quality with respect to the key parameters, including $cBOD_5$, TSS, TP, and TAN is summarized in Table 2.5 for the plant effluent.

Table 2.5 Historical Effluent Quality (2007 - 2010)

Year	Average Concentration (mg/L)				
	$cBOD_5$	**TSS**	**TP**	**TAN (May-Oct)**	**TAN (Nov-Apr)**
2007	3.0 (11.5)	7.9 (39.9)	0.29 (1.54)	0.22 (0.64)	0.38 (1.04)
2008	2.0 (2.1)	3.2 (5.3)	0.18 (0.80)	0.30 (0.68)	0.35 (1.25)
2009	2.1 (2.9)	4.4 (10.6)	0.13 (0.24)	0.21 (0.52)	0.32 (0.72)
2010	2.0 (2.3)	3.3 (8.0)	0.13 (0.24)	0.13 (0.26)	0.28 (0.67)
C of A Objective	5	5	0.2	0.7	1.0
C of A Non-Compliance Limit (1)	*10*	*10*	*0.3*	*1.0*	*2.0*

Notes:
Values in parenthesis represent maximum monthly average concentrations.
1. Based on monthly average concentrations.

The historical effluent wastewater loading, with respect to $cBOD_5$, TSS, and TP is summarized in Table 2.6 for the plant effluent. All annual average loadings are within the C of A objectives and non-compliance limits for each of the parameters.

Table 2.6 Historic Effluent Wastewater Loadings

Year	Average Loadings (kg/d)		
	$cBOD_5$	TSS	TP
2007	2.6 (8.1)	7.3 (28.1)	0.25 (1.08)
2008	2.5 (4.0)	4.2 (7.9)	0.22 (0.83)
2009	2.0 (2.9)	5.1 (14.5)	0.13 (0.25)
2010	1.6 (2.0)	2.6 (4.9)	0.11 (0.22)
C of A Objective	7.3	7.3	0.3
C of A Non-Compliance Limit (1)	*14.5*	*14.5*	*0.44*

Notes:
Values in parenthesis represent maximum monthly average load values.
1. Based on annual average loading.

Figure 2.2 to Figure 2.5 present the average final effluent concentrations for $cBOD_5$, TSS, TP, and TAN, respectively. The C of A Effluent Objectives and Non-Compliance Limits are also shown for reference.

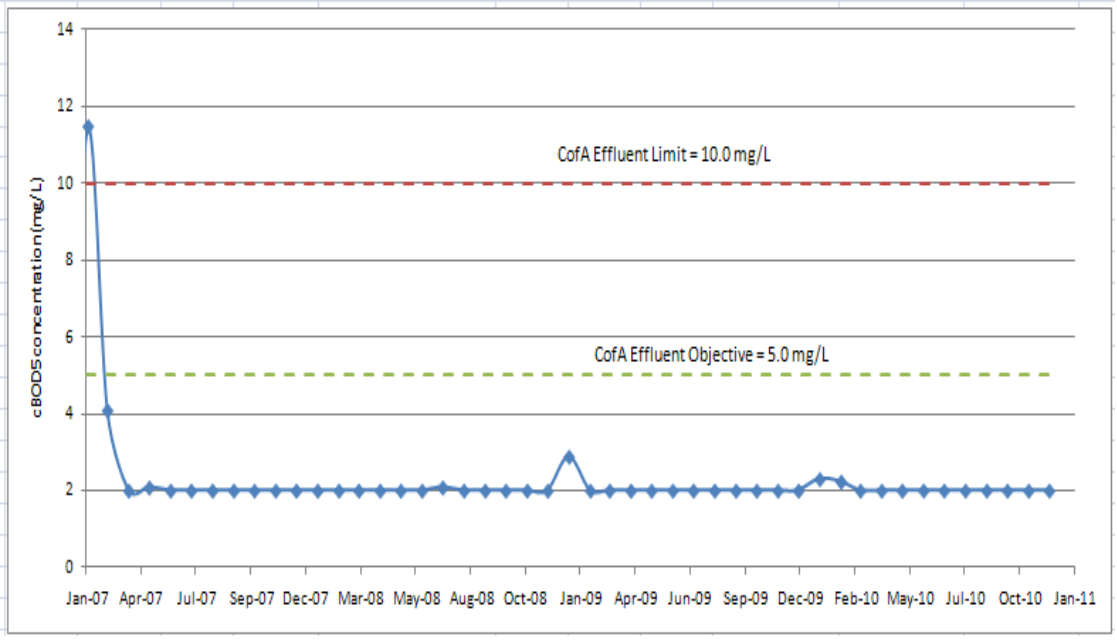


Figure 2.2 Final Effluent Average Monthly $cBOD_5$ Concentration

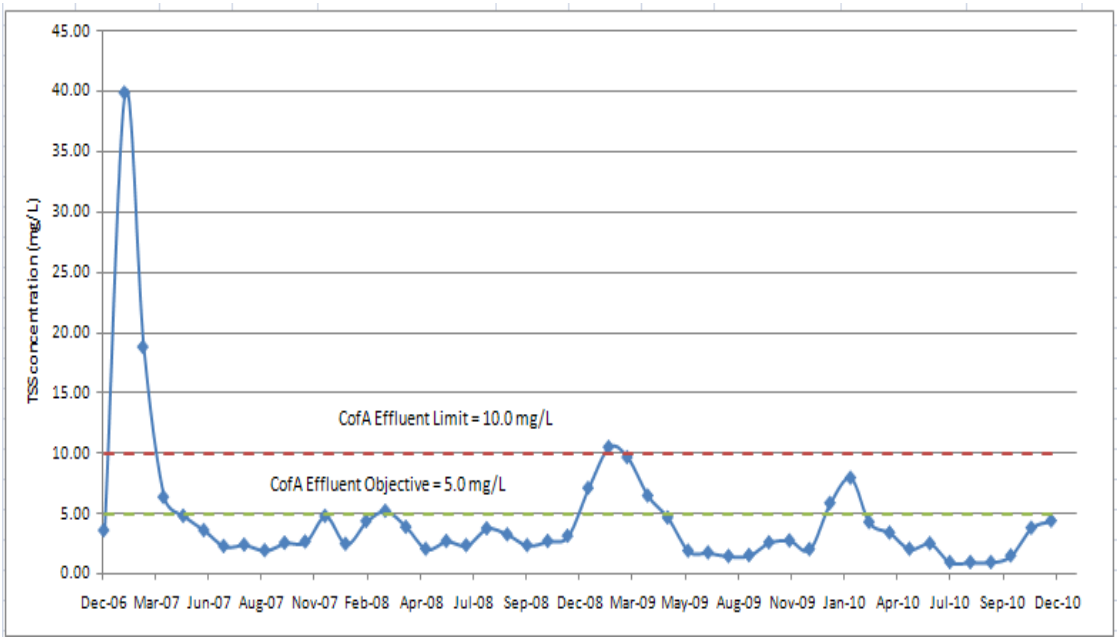


Figure 2.3 Final Effluent Average Monthly TSS Concentration

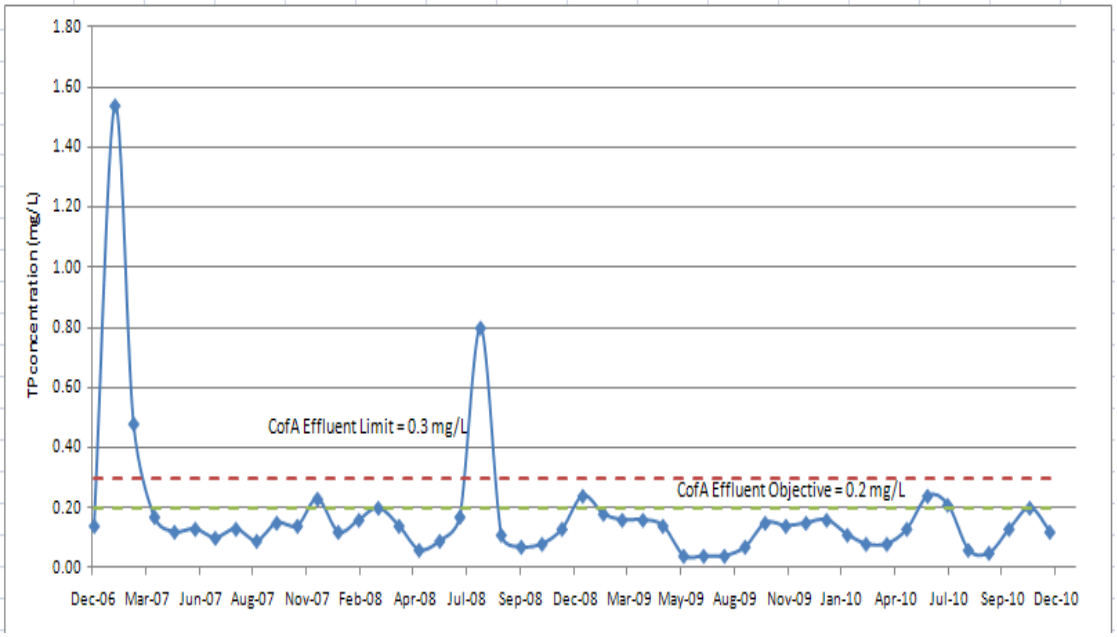


Figure 2.4 Final Effluent Average Monthly TP Concentration

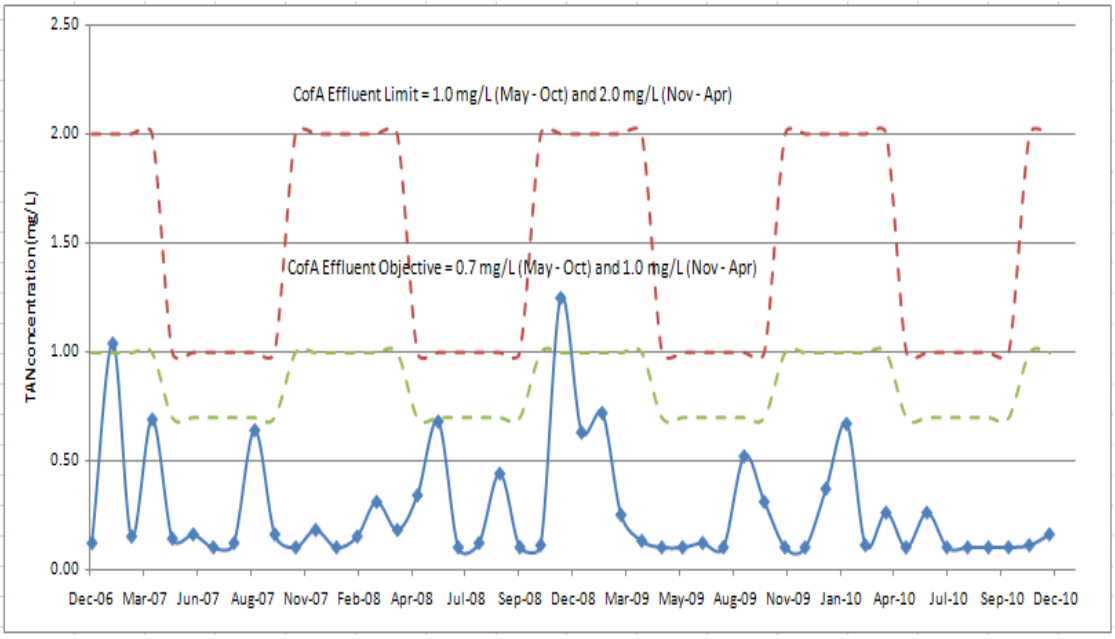


Figure 2.5 Final Effluent Average Monthly TAN Concentration

2.1.4 Process Limitations and Specific Issues

The following were noted as operational issues by OCWA staff:

- Cold weather conditions are a major process limitation at the St. Jacobs WWTP. The oxidation ditch is located outside and has no shield against the cold weather. During cold weather conditions, icing around the two rotors (see Figure 2.6) frequently occurs and causes problems with the proper functioning of the rotors. Extreme cold weather conditions seem to have an effect on the quality of the effluent from the plant, particularly TAN, based on the historic data.
- The secondary clarifiers also experience issues during cold weather conditions. The secondary clarifiers are covered with a semi-permanent structure; however, the clarifiers still get some floating ice at temperatures of about -10 °C, according to the operators at the plant.
- Inflow and Infiltration flows, resulting in large peak flows to the St. Jacobs WWTP, are another major issue that the plant operators have to manage.
- Volumes of wastewater are required to be estimated if they bypass the sand filters. A separate sensor for bypass volumes that are bypassing the filters is required in order to remedy this situation.

Overall, the main process limitation of the St. Jacobs WWTP is operation during cold weather conditions. Otherwise, this plant is simply designed and easy to operate.



Figure 2.6 Rotor #1 of the Oxidation Ditch - Icing Issues

3. ELMIRA WWTP

The Elmira WWTP is a biological nutrient removal (BNR) activated sludge system with tertiary filtration and UV disinfection that provides treatment for wastewater generated in the Town of Elmira. The plant is operated by the Ontario Clean Water Agency (OCWA) on behalf of the Regional Municipality of Waterloo. The plant is operated under Ministry of the Environment (MOE) Certificate of Approval (C of A) No. 2530-84BL9Q issued June 8, 2010. The Elmira WWTP has an average day C of A rated capacity of 7,800 m^3/d and a peak flow capacity of 19,500 m^3/d.

Raw sewage enters the Elmira WWTP from a wet well and pumping station, located south of the plant, consisting of four submersible pumps with a firm pumping capacity of 51,840 m^3/d. In 2000, equalization storage tanks #3 and #4 were added to the south end of the plant, adjacent to the wastewater pumping station (WWPS). The in-ground, open top, twin celled storage tank has an effective total volume of 2,600 m^3.

No additional septage or other flows are sent to the Elmira WWTP; however, Chemtura Canada pumps partially treated wastewater directly to the Primary Clarifiers all year round. The sewage is pumped through an influent screening system and to a vortex grit removal system.

The plant has two other equalization tanks (#1 and #2) that can store peak flows after preliminary treatment. These tanks can return wastewater to the primary influent or primary effluent; however, these tanks are not currently in service due to flow-splitting problems.

Screened, degritted wastewater is conveyed to the two primary clarifiers, where it is mixed with the incoming Chemtura Canada wastewater. Currently, only one primary clarifier is in operation due to the large retention time in the oversized primary clarifiers, causing some septic conditions under certain flows. This issue is being investigated by Cole Engineering as part of the current upgrades. Following primary clarification, flows undergo secondary treatment in two bioreactors with a total volume of about 2,730 m^3/d. Each bioreactor consists of two anaerobic cells, one anoxic cell (with aerobic capabilities), and two aerobic cells to allow for biological nutrient removal. The addition of ferric chloride for phosphorus removal is also provided, at times, to improve the performance of the BNR system.

Following biological treatment, the mixed liquor enters a chamber with five inlet weir channels, splitting the flows to the three final clarifiers. Final clarifier No. 1 has a 27.4 m diameter and a peak flow rate of 13,000 m^3/d, while the two smaller final clarifiers (13.7 m in diameter) each have a peak flow rate of 3,250 m^3/d. Each of the final clarifiers has a return activated sludge pumping station, complete with scum pumps.

The secondary effluent flows to the filter building through one common final clarifier effluent channel, and this channel has a bypass. The water is passed through one of the two low head automatic backwash sand filters having a total filter area of 130 m^3.

The filtered effluent passes through one of the two UV disinfection channels equipped with two banks of low pressure UV lamps and having a total peak flow capacity of 19,500 m^3/d. There is also a standby chlorine chemical feed system that is manually operated to provide for any occurrences such as sewage bypass, plant service and emergency effluent discharge disinfection. Following disinfection, the water is released into the Canagagigue Creek through a 450 mm diameter outfall.

Primary sludge from the primary clarifiers is sent to a single stage fermenter tank used to produce volatile fatty acids for the bio-P process. The WAS goes directly to holding tanks. The raw sludge and WAS is dewatered separately with the one automatic plate and frame press and chemical feed, mixing and conditioning system. The sludge is then disposed to landfill.

3.1.1 Treatment Objectives and Compliance Requirements

The C of A effluent objectives and criteria for the Elmira WWTP are presented in the Amended C of A Number 2530-84BL9Q issued June 8, 2010.

The C of A specifies concentration objectives and non-compliance limits for carbonaceous biochemical oxygen demand ($cBOD_5$), Total Suspended Solids (TSS), Total Phosphorous (TP), Total Ammonia Nitrogen (TAN) and *E. coli* concentrations. The C of A also specifies that the pH of the effluent should be between 6.0 and 9.5 and that the effluent shall not be acutely lethal to Rainbow Trout and *Daphnia Magna*. The C of A effluent requirements for the Elmira WWTP are summarized in Table 3.1.

Table 3.1 C of A Objectives and Non-compliance Limits (C of A No 2530-84BL9Q)

Parameter	Effluent Objectives	Non-Compliance Limits	
	Concentration (1)	Concentration	Total Loading (2)
$cBOD_5$	5.0 mg/L	10.0 mg/L	78.0 kg/d
TSS	5.0 mg/L	10.0 mg/L	78.0 kg/d
TP	0.2 mg/L	0.5 mg/L	3.9 kg/d
TAN (May-Oct)	0.4 mg/L	0.7 mg/L	5.5 kg/d
TAN (Nov-Apr)	1.0 mg/L	2.0 mg/L	15.6 kg/d
pH	Between 6.5 to 9.0 inclusive	Between 6.0 to 9.5 inclusive	-
E .coli (3)	-	200 counts/100 mL	-

Notes:
1. Based on monthly average concentration values.
2. Based on the annual average loading.
3. Based on monthly geometric mean density.

3.1.2 Raw Wastewater Flows and Characteristics

3.1.2.1 Historical Flow

A summary of the total annual effluent wastewater flows for January 2007 to December 2010 is presented in Table 3.2.

Table 3.2 Summary of Historical Plant Flow (2007 – 2010)

Year	Average Day Flow (m^3/d)	Maximum Day Flow	
		(m^3/d)	Factor
2007	3,473	10,331	3.0
2008	4,290	22,545	5.3
2009	4,098	11,835	2.9
2010	4,177	9,789	2.3
Average	4,010	-	-
C of A Rated Capacity	**7,800**	**-**	**-**

Notes:
Average day flow values based on monthly average flows.

The Elmira WWTP has an approved peak flow capacity of 19,500 m^3/d. This peak flow is equivalent to a design peak factor of 2.5. For comparison purposes, the Harmon Peaking factor was estimated to be 2.95 based on the 2009 serviced population of 10,011. This is higher than the peak factor of 2.5 based on the C of A approved peak flow capacity of 19,500 m^3/d.

Figure 3.1 presents the flows to the Elmira WWTP for the study period from January 2007 to December 2010.

It can be seen in Figure 3.1 that there no instances where the monthly average exceeds the current C of A rated capacity during the study period.

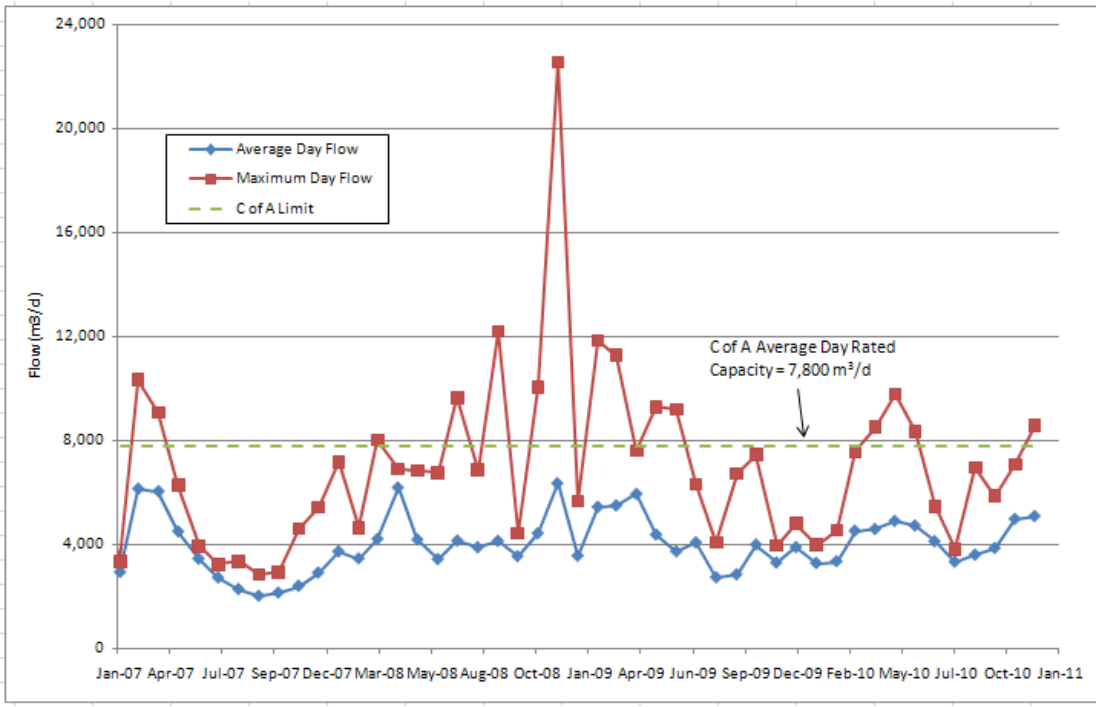


Figure 3.1 Elmira WWTP Flow (2007 - 2009)

The Elmira WWTP receives wastewater from five main industrial contributors including: Elmira Pet Products Limited, Krums Incorporated, Lashbrook Produce Limited, Chemtura Canada, and EFS-Plastics Incorporated. The overall 2007 to 2009 historic average daily flow from these industries was 319 m^3/d. Each of these five industrial wastewater contributors is briefly discussed below.

Elmira Pet Products Ltd. contributed a historic ADF of 64.8 m^3/d from 2007 to 2009. According to their industrial sewer use agreement, Elmira Pet Products Ltd. has an allowable maximum daily flow (MDF) of 120 m^3/d and a maximum hourly flow (MHF) of 8 m^3/hr.

Krums Inc. contributed a historic ADF of 5.5 m^3/d from 2007 to 2009. According to their industrial sewer use agreement, Krums Inc. has an allowable MDF of 20 m^3/d and a MHF of 2.5 m^3/hr.

Lashbrook Produce Ltd. contributed a historic ADF of 88.4 m^3/d from 2007 to 2009. According to their industrial sewer use agreement, Lashbrook Produce Ltd. has an allowable MDF of 150 m^3/d and a MHF of 6.25 m^3/hr.

Chemtura Canada contributed a historic ADF of 85.0 m^3/d from December 1, 2008 to October 31, 2009. A discharge agreement with Uniroyal (now Chemtura Canada) was executed in 1983 and amended in 1993. According to the Region, there have been no further amendments to this agreement. This agreement states that the annual average daily volume of industrial wastewater to be discharged by Chemtura to the Elmira WWTP cannot exceed 181.8 m^3/d.

According to the Region, EFS-Plastics Inc. contributed an estimated ADF of 75 m^3/d. EFS-Plastics Inc. does not have an industrial sewer use agreement and is planning on relocating their facility in 2011, according to the Region.

One bypass event occurred in March 2007 over a 21 hour period. Approximately 3,800 m^3 of chlorinated raw sewage was bypassed after the equalization tanks were filled due to high flows.

A number of bypass events occurred in 2008, mainly in the spring and winter months due to high flows caused by rain and snow melt. In January 2008, a total volume of 25,056 m^3 of influent was released with primary settling and disinfection over a five day period. Three bypass events occurred in February 2008. The first event released a total volume of 6,372 m^3 of influent flows receiving primary settling and disinfection. The second event released about 884 m^3 of chlorinated influent. The third event in February 2008 caused an additional 6,830 m^3 to be released with primary settling and disinfection. All flows not receiving full treatment in March 2008 only bypassed the sand filters; however, they received full treatment before the sand filters and received UV disinfection before being released. A final bypass event occurred in December 2008, with a total volume of 3,024 m^3 of primary effluent with disinfection being discharged over a 23 hour period due to above normal temperatures resulting in severe snow melt. All appropriate authorities were notified and samples were submitted to the laboratory for each of these events.

3.1.2.2 Raw Wastewater Quality

The raw wastewater entering the Elmira WWTP includes wastewater primarily from domestic and commercial sources; however, as stated in Section 3.1.2.1, there are five major industrial contributors including: Elmira Pet Products Limited, Krums Incorporated, Lashbrook Produce Limited, Chemtura Canada, and EFS-Plastics Incorporated.

Historical raw wastewater characteristics are shown in Table 3.3.

Table 3.3 Raw Wastewater Characteristics (2007 – 2010)

Year	Average Concentration (mg/L)			
	$cBOD_5$	TSS	TP	TKN
2007	390	607	10.3	79.9
2008	378	571 (1)	7.4	77.0
2009	395	326	5.2	51.2
2010	471	385	7.2	57.0
AVERAGE	**409**	**472**	**7.5**	**66.3**
Typical Raw Sewage Concentrations (2)	*110 mg/L (low)* *190 mg/L (med)* *350 mg/L (high)*	*120 mg/L (low)* *210 mg/L (med)* *400 mg/L (high)*	*4 mg/L (low)* *7 mg/L (med)* *12 mg/L (high)*	*20 mg/L (low)* *40 mg/L (med)* *70 mg/L (high)*

Notes:
1. August 2008 TSS data is missing and is therefore not included in the annual average for 2008.
2. Metcalf & Eddy (2003) for low, medium, and high strength sewage.

According to the typical literature values, the wastewater flowing to the Elmira WWTP would be characterized as high strength. The raw wastewater concentrations are representative of a high strength wastewater with respect to $cBOD_5$, TSS, and TKN, and medium strength with respect to TP (Metcalf & Eddy, 2003). This high strength of wastewater reflects the industrial contributor raw wastewater loads that the Elmira WWTP receives. The Region is working with a number of local industries to reduce their organic loading.

Table 3.4 provides a summary of the historic raw wastewater loadings at the plant.

Table 3.4 Historic Influent Wastewater Loadings

Parameter	2007	2008	2009	2010	Overall Average
$cBOD_5$ (kg/d)	1,177 (1,719)	1,571 (2,685)	1,560 (2,296)	1,887 (2,741)	1,549 (2,741)
TSS (kg/d)	1,940 (3,579)	2,335 (1) (4,643) (1)	1,354 (2,676)	1,547 (2,659)	1,794 (4,643)

Notes:
Values in parentheses represent maximum monthly average load values.
1. August 2008 TSS data is missing and is therefore not included in the annual average for 2008.

3.1.3 Effluent Wastewater Quality

Based on the historical plant effluent, the Elmira WWTP has been able to achieve its effluent compliance limits for the majority of the historic review period. There have been a few occasions when the effluent monthly average exceeds the C of A Non-Compliance limits for TSS, TP and TAN concentration parameters, as can be noticed in Table 3.5. The specific events are listed below.

- The TSS monthly average concentration exceeded the C of A non-compliance limit in March and April of 2008 (see Figure 3.3).
- The TP monthly average concentration exceeded the C of A non-compliance limit in July, August and September of 2007 (see Figure 3.4).
- The TAN monthly average concentration exceeded the C of A non-compliance limit in March, April, May and June of 2008 and February, March and April of 2009 (see Figure 3.5).

The historical effluent quality with respect to the key parameters, including $cBOD_5$, TSS, TP, and TAN is summarized in Table 3.5 for the plant effluent.

Table 3.5 Historical Effluent Quality (2007 - 2010)

Year	Average Concentration (mg/L)				
	$cBOD_5$	TSS	TP	TAN (May-Oct)	TAN (Nov-Apr)
2007	2.3 (3.0)	4.9 (9.2)	0.40 (1.44)	0.35 (0.68)	0.10 (0.10)
2008	3.4 (9.0)	6.6 (27.9)	0.18 (0.48)	4.01 (12.67)	2.44 (8.83)
2009	2.3 (3.9)	2.8 (4.5)	0.08 (0.11)	0.11 (0.17)	5.66 (11.50)
2010	2.3 (3.1)	2.8 (3.7)	0.14 (0.31)	0.11 (0.16)	0.63 (1.96)
C of A Objective	5	5	0.2	0.4	1.0
C of A Non-Compliance Limit (1)	*10*	*10*	*0.5*	*0.7*	*2.0*

Notes:
Values in parenthesis represent maximum monthly average concentrations.
1. Based on monthly average concentrations.

The historical effluent wastewater loading, with respect to $cBOD_5$, TSS, and TP is summarized in Table 3.6 for the plant effluent. All annual average loadings are within the C of A objectives and non-compliance limits for each of the parameters.

Table 3.6 Historic Effluent Wastewater Loadings

Year	Average Loadings (kg/d)		
	$cBOD_5$	TSS	TP
2007	7.8 (12.7)	16.6 (35.9)	1.06 (3.26)
2008	15.0 (49.6)	32.1 (172.0)	0.79 (2.96)
2009	9.2 (13.6)	11.6 (21.9)	0.33 (0.55)
2010	9.8 (13.0)	11.6 (15.6)	0.59 (1.03)
C of A Non-Compliance Limit (1)	*78.0*	*78.0*	*3.9*

Notes:
Values in parenthesis represent maximum monthly average load values.
1. Based on annual average loading.

Figure 3.2 to Figure 3.5 present the average final effluent concentrations for $cBOD_5$, TSS, TP, and TAN, respectively. The C of A Effluent Objectives and Non-Compliance Limits are also shown for reference.

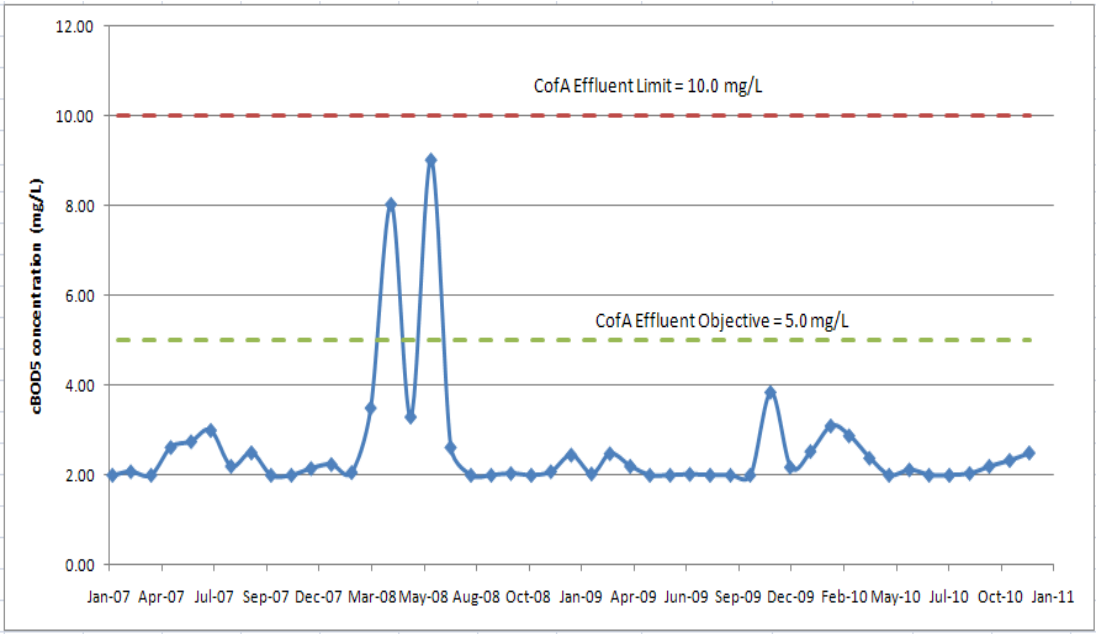


Figure 3.2 Final Effluent Average Monthly $cBOD_5$ Concentration

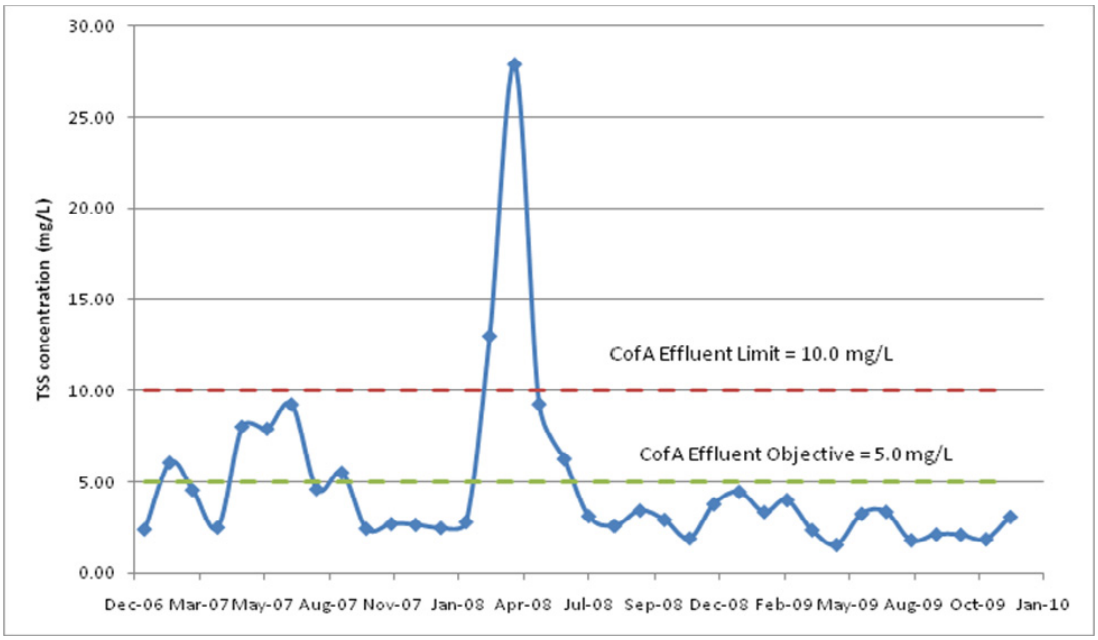


Figure 3.3 Final Effluent Average Monthly TSS Concentration

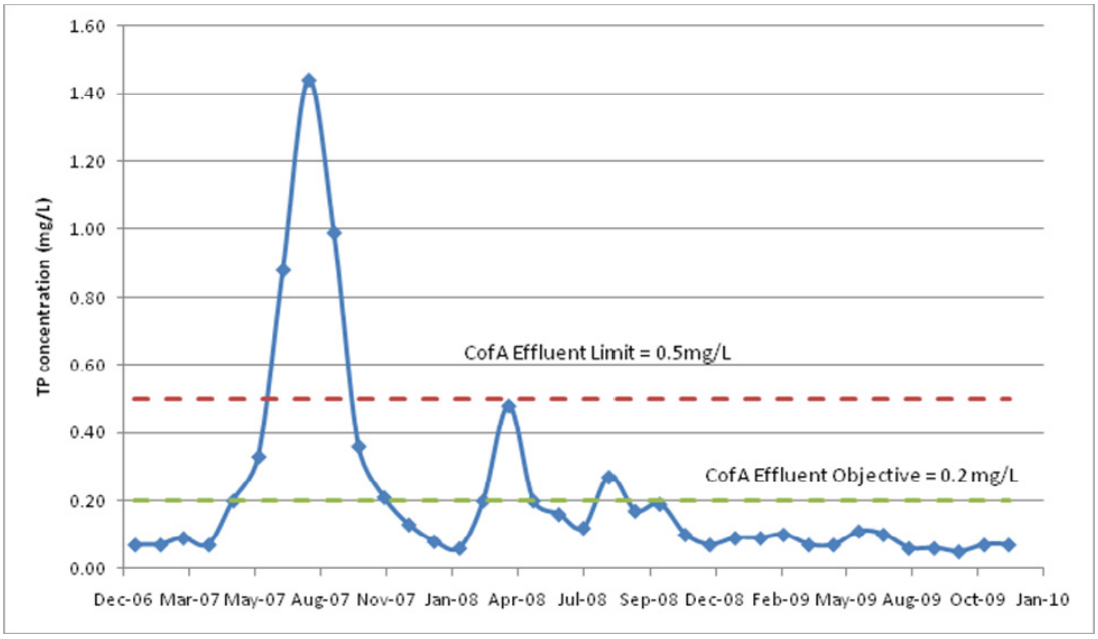


Figure 3.4 Final Effluent Average Monthly TP Concentration

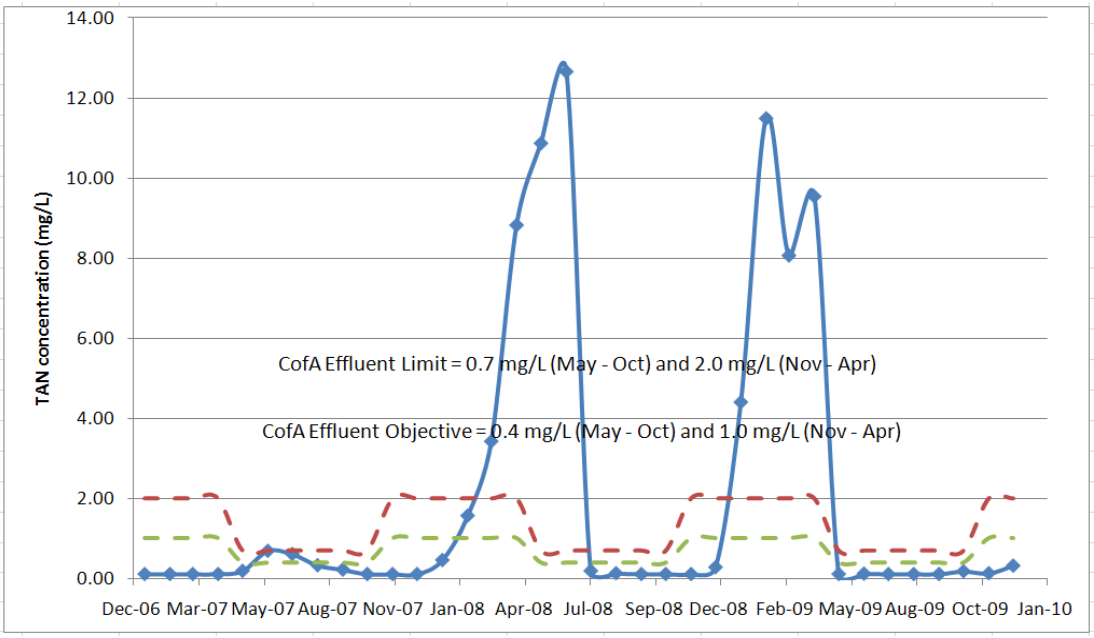


Figure 3.5 Final Effluent Average Monthly TAN Concentration

3.1.4 Current Upgrades or Expansions

The Elmira WWTP is currently expanding the equalization tank capacity due to the large variance in flows that have historically been received. Currently, equalization basins (#3 and #4) are used to divert flow from the pump station during peak flow periods.

Due to historic bypass events at the plant, the Region is constructing additional equalization storage in new 2,600 m^3 (total) equalization tanks #5 and #6 to increase wet weather storage and treatment capacity.

3.1.5 Process Limitations and Specific Issues

The following were noted as operational issues by OCWA staff:

- One of the main issues at the Elmira WWTP is the peak flows that are received at the plant. As was noted above, the Elmira WWTP is currently expanded the existing equalization tanks (see Figure 3.6) to include two additional equalization basins (#5 and #6) to add a total of 2,600 m^3 of equalization storage capacity. This will result in a total equalization volume of 5,200 m^3 between equalization basins #3 to #6. With this peak flow equalization at the Elmira WWTP, peak flows through the plant will be reduced, limiting the maximum velocity through the processes, piping, channels and hydraulics. This additional flow equalization will compound the already existing issue of reduced velocities through the plant (Cole Engineering, 2010).
- There is no metering of bypass volumes to the Canagagigue Creek. Currently, the volume of bypass flow is estimated by the operators during a wet weather event.
- According to operations staff, the distribution of flows to bioreactor #1 and #2 (see Figure 3.8) are unequal. In order to optimize the aeration process, the distribution of flows to bioreactors #1 and #2 need to be improved.
- The secondary clarifiers can become a process bottleneck under peak conditions due to challenges with the capacity of the return activated sludge (RAS) pumps (Cole Engineering, 2010) Secondary clarifier RAS pumping is included as a key upgrade for the Elmira WWTP in the report completed by Cole Engineering.
- Currently, the primary sludge and the waste activated sludge (WAS) cannot be dewatered at the same time. The sludge conditioning tank should be upgraded to allow blending fermented primary sludge and WAS prior to dewatering, and a new centrifuge along with associated polymer feed and sludge conveying system provided (Cole Engineering, 2010). This has been noted, in the report completed by Cole Engineering, to be a vital upgrade for the Elmira WWTP.



Figure 3.6 Equalization tanks - Peak flow issues



Figure 3.7 Chemtura Flow to Primary Clarifiers



Figure 3.8 Unequal Flow in the Bioreactors

4. HEIDELBERG WWTP

The Heidelberg WWTP is a biological nutrient removal (BNR) system with tertiary filtration and UV disinfection that provides treatment for wastewater from about 90 homes within the Community of Heidelberg. The plant is operated by the Ontario Clean Water Agency (OCWA) on behalf of the Regional Municipality of Waterloo. The plant is operated under MOE Certificate of Approval No. 7707-5NSKGL issued on August 6, 2003. The Heidelberg WWTP has an average day C of A rated capacity of 130 m^3/d and a peak flow capacity of 3.2 L/s (276 m^3/d).

Raw sewage enters the Heidelberg WWTP through an on-site lift station, consisting of two submersible sewage pumps with a firm pumping capacity of 540 m^3/d. No additional septage or other flows are sent to the Heidelberg WWTP. From the lift station, the raw sewage enters into one of the two equalization tanks and is pumped through the pump chamber to a splitter box for distribution into the aeration tanks.

Wastewater is treated in two bioreactors with a total volume of about 108 m^3. The bioreactors each consists of one anaerobic tank, one anoxic tank and one aerobic tank to allow for biological nutrient removal. Aeration and mixing are provided by coarse bubble diffusers and a submersible mixer. The chemical addition of acetic acid is used as a source for volatile fatty acids (VFAs) for the biological phosphorus removal process. Aluminum sulphate is also provided for further phosphorus removal purposes.

Following biological treatment, the mixed liquor enters one secondary clarifier with a volume of 60.8 m^3. The secondary clarifier is equipped with a settled sludge pump chamber with two submersible pumps for returning activated sludge to either the anaerobic or anoxic tanks or WAS to the aerated holding tank. Each of the submersible pumps has a rated capacity of 3.2 L/s, which is equivalent to the peak flow capacity to the Heidelberg WWTP.

Following secondary treatment, the wastewater is conveyed to two multimedia effluent filters. A 6.9 m^3 clear well is equipped with two filter backwash water pumps, each having a rated capacity of 11.1 L/s. The filtered effluent flows to an effluent channel equipped with a UV disinfection system comprising of three banks of two lamps each. Following UV disinfection, the treated wastewater is discharged through an outfall pipe with headwall and grating to Heidelberg Creek.

Biosolids pumped from the secondary clarifier are treated in a 4.5 m x 1.8 m aerated holding tank equipped with seven coarse bubble diffusers. Supernatant is returned to the equalization tank pump chamber and solids are hauled to the Waterloo WWTP for further conditioning.

4.1.1 Treatment Objectives and Compliance Requirements

The C of A effluent objectives and criteria for the Heidelberg WWTP are presented in the Amended C of A Number 7707-5NSKGL, issued August 6, 2003.

The C of A specifies concentration objectives and non-compliance limits for carbonaceous biochemical oxygen demand ($cBOD_5$), Total Suspended Solids (TSS), Total Phosphorous (TP), Total Ammonia Nitrogen (TAN), Nitrate Nitrogen (Nitrate-N), pH, and *E. coli* concentrations. The C of A effluent requirements for the Heidelberg WWTP are summarized in Table 4.1.

Table 4.1 C of A Objectives and Non-compliance Limits (C of A No 7707-5NSKGL)

Parameter	Effluent Objectives		Non-Compliance Limits	
	Average Concentration (1)	Daily Concentration	Concentration	Total Loading (2)
$cBOD_5$	5.0 mg/L	20 mg/L	7.5 mg/L	0.58 kg/d
TSS	5.0 mg/L	20 mg/L	10.0 mg/L	0.78 kg/d
TP	0.3 mg/L	1.2 mg/L	0.4 mg/L	0.03 kg/d
TAN (May-Oct)	1.5 mg/L	6.0 mg/L	2.0 mg/L	0.16 kg/d
TAN (Nov-Apr)	3.0 mg/L	12.0 mg/L	4.0 mg/L	0.31 kg/d
Nitrate - N	7.5 mg/L	30.0 mg/L	10.0 mg/L	0.78 kg/d
pH	Between 6.5 to 9.0 inclusive	-	Between 6.0 to 9.5 inclusive	
E .coli (3)	150 counts/100mL		200 counts/100 mL	

Notes:
1. Based on monthly average concentration values.
2. Based on the monthly average loading values.
3. Based on monthly geometric mean.

4.1.2 Raw Wastewater Flows and Characteristics

4.1.2.1 Historical Flow

A summary of the annual effluent wastewater flows for January 2007 to December 2009 is presented in Table 4.2.

Table 4.2 Summary of Historical Plant Flow (2007 – 2009)

Year	Average Day Flow (m^3/d)	Maximum Day Flow	
		(m^3/d)	Factor
2007	48	121	2.5
2008	58	133	2.3
2009 (1)	50	-	-
Average	52	-	-
C of A Rated Capacity	**130**	**-**	**-**

Notes:
Average day flow values based on monthly average flows.
1. Average daily flow data for 2009 was provided; however, no maximum daily flow data was provided.

The Heidelberg WWTP has a peak flow capacity of 3.2 L/s (276 m^3/d). This peak flow is equivalent to a design peak factor of 2.13.

For comparison purposes, the Harmon Peaking factor was estimated to be 4.09 based on the 2009 serviced population of 277. This is higher than the peak factor of 2.13 based on the C of A peak flow rate of 3.2 L/s.

Figure 4.1 presents the flows to the Heidelberg WWTP for the study period from January 2007 to December 2009.

It can be seen in Figure 4.1 that flows are consistently below the C of A rated capacity of 130 m^3/d and are approximately 50 percent of the C of A rated capacity over the study period.

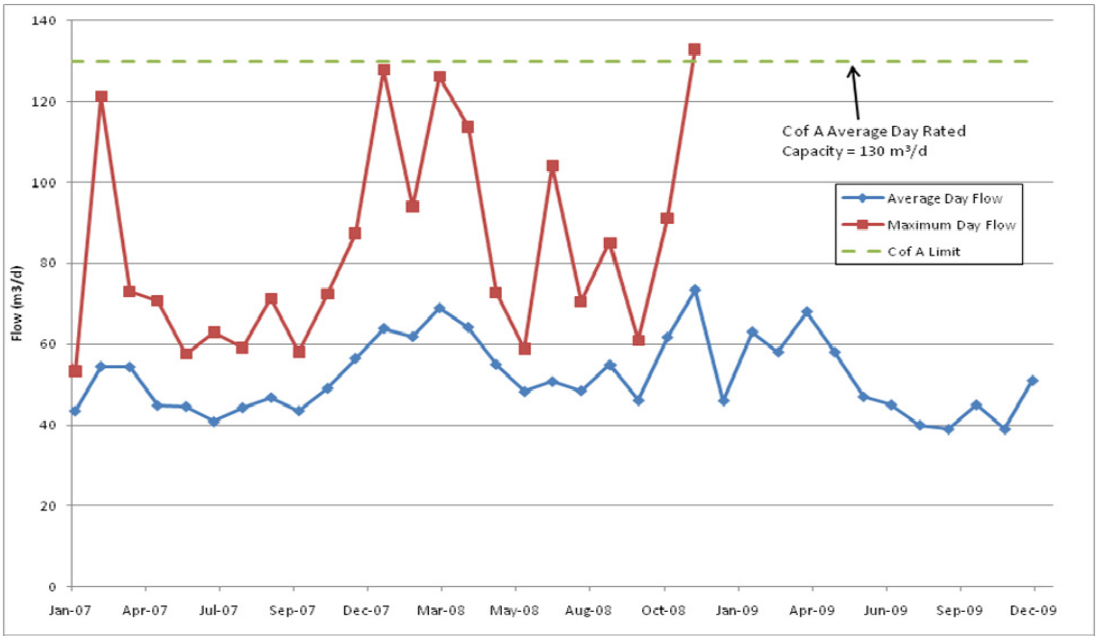


Figure 4.1 Heidelberg WWTP Flow (2007 - 2009)

No bypass events occurred during any portion of the study period.

4.1.2.2 Raw Wastewater Quality

The raw wastewater entering the Heidelberg WWTP is solely from domestic sources located in one development in Heidelberg. Historical raw wastewater characteristics are shown in Table 4.3.

Table 4.3 Raw Wastewater Characteristics (2007 – 2009)

Year	Average Concentration (mg/L)			
	$cBOD_5$	TSS	TP	TKN
2007	194	142	6.7	38.1
2008	201	174	7.0	44.7
2009	182	231	4.0	29.6
AVERAGE	**192**	**182**	**5.9**	**37.5**
Typical Raw Sewage Concentrations (1)	*110 mg/L (low)* *190 mg/L (med)* *350 mg/L (high)*	*120 mg/L (low)* *210 mg/L (med)* *400 mg/L (high)*	*4 mg/L (low)* *7 mg/L (med)* *12 mg/L (high)*	*20 mg/L (low)* *40 mg/L (med)* *70 mg/L (high)*

Notes:
1. Metcalf & Eddy (2003) for low, medium, and high strength sewage.

According to the typical literature values, the wastewater flowing to the Heidelberg WWTP would be characterized as medium strength with respect to $cBOD_5$, TSS, TP and TKN (Metcalf & Eddy, 2003).

Table 4.4 provides a summary of the historic raw wastewater loadings at the plant.

Table 4.4 Historic Influent Wastewater Loadings

Parameter	2007	2008	2009	Overall Average
$cBOD_5$ (kg/d)	9.0 (13.8)	11.7 (18.5)	9.3 (12.2)	10.0 (18.5)
TSS (kg/d)	6.6 (11.3)	10.5 (25.5)	13.5 (36.6)	10.2 (36.6)

Notes:
Values in parentheses represent maximum monthly average load values.

4.1.3 Effluent Wastewater Quality

Based on the historical plant effluent, the Heidelberg WWTP has been able to consistently achieve its effluent compliance limits for the historic review period. One non-compliance event occurred in February 2007 when the effluent monthly average for TP exceeded the C of A non-compliance limit of 0.5 mg/L.

The historical effluent quality with respect to the key parameters, including $cBOD_5$, TSS, TP, and TAN is summarized in Table 4.5 for the plant effluent.

Table 4.5 Historical Effluent Quality (2007 -2009)

Year	Average Concentration (mg/L)				
	$cBOD_5$	TSS	TP	TAN (May-Oct)	TAN (Nov-Apr)
2007	2.0 (2.0)	2.5 (4.9)	0.18 (0.80)	0.37 (1.44)	0.15 (0.41)
2008	2.1 (2.6)	3.7 (5.8)	0.13 (0.25)	0.13 (0.27)	0.17 (0.41)
2009	2.0 (2.0)	3.8 (6.4)	0.10 (0.17)	0.14 (0.23)	0.20 (0.62)
C of A Objective	5	5	0.2	0.4	1.0
C of A Non-Compliance Limit (1)	*10*	*10*	*0.5*	*0.7*	*2.0*

Notes:
Values in parenthesis represent maximum monthly average concentrations.
1. Based on monthly average concentrations.

The historical effluent wastewater loading, with respect to $cBOD_5$, TSS, and TP is summarized in Table 4.6 for the plant effluent. All monthly average loadings are within the C of A objectives and non-compliance limits for each of the parameters.

Table 4.6 Historic Effluent Wastewater Loadings

Year	Average Loadings (kg/d)		
	$cBOD_5$	TSS	TP
2007	0.10 (0.11)	0.12 (0.23)	0.01 (0.03)
2008	0.12 (0.18)	0.21 (0.32)	0.01 (0.01)
2009	0.10 (0.14)	0.20 (0.40)	0.01 (0.01)
C of A Non-Compliance Limit (1)	*0.58*	*0.78*	*0.03*

Notes:
Values in parenthesis represent maximum monthly average load values.
1. Based on monthly average loading.

Figure 4.2 to Figure 4.5 present the average final effluent concentrations for $cBOD_5$, TSS, TP, and TAN, respectively. The C of A Effluent Objectives and Non-Compliance Limits are also shown for reference.

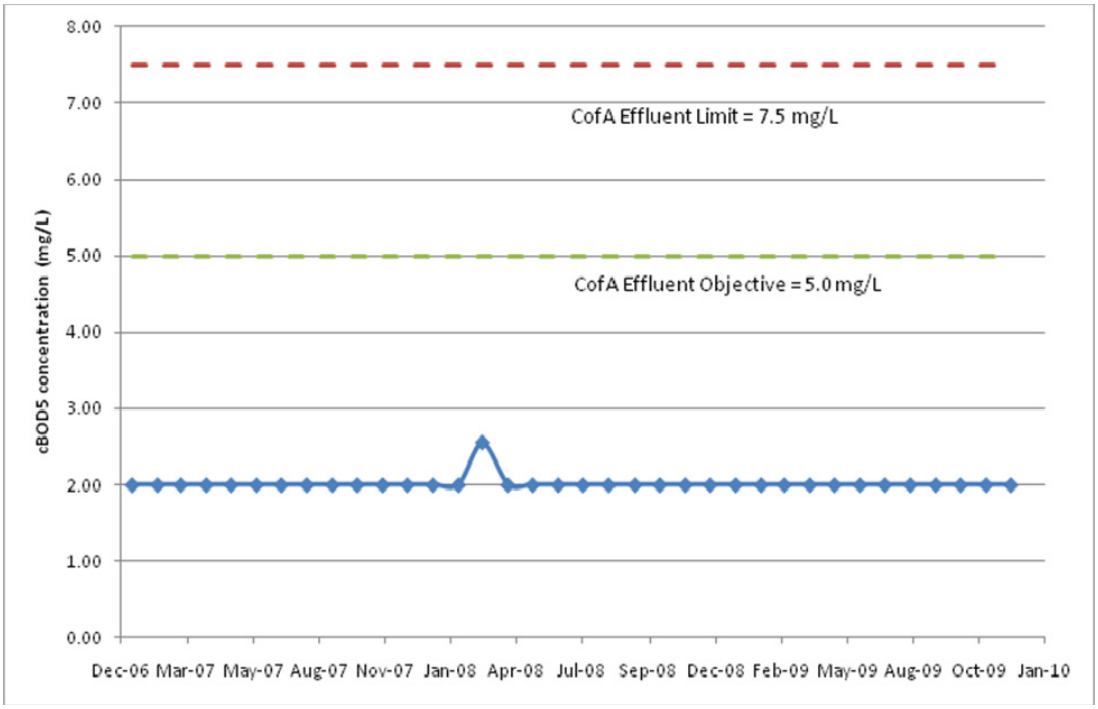


Figure 4.2 Final Effluent Average Monthly $cBOD_5$ Concentration

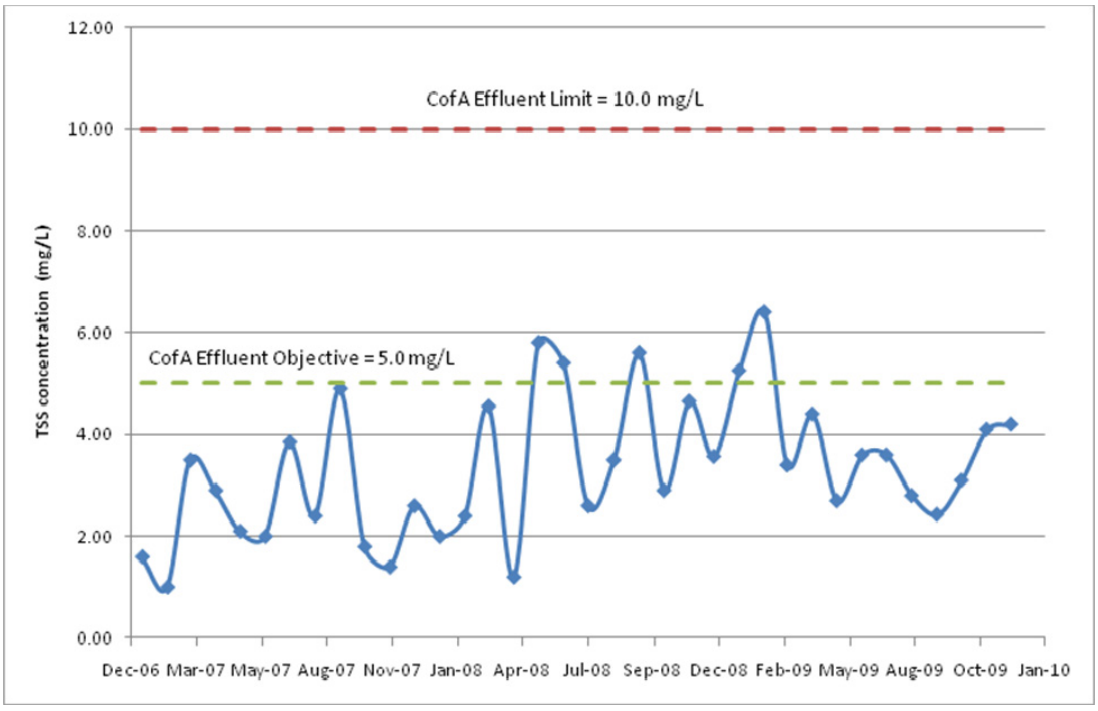


Figure 4.3 Final Effluent Average Monthly TSS Concentration

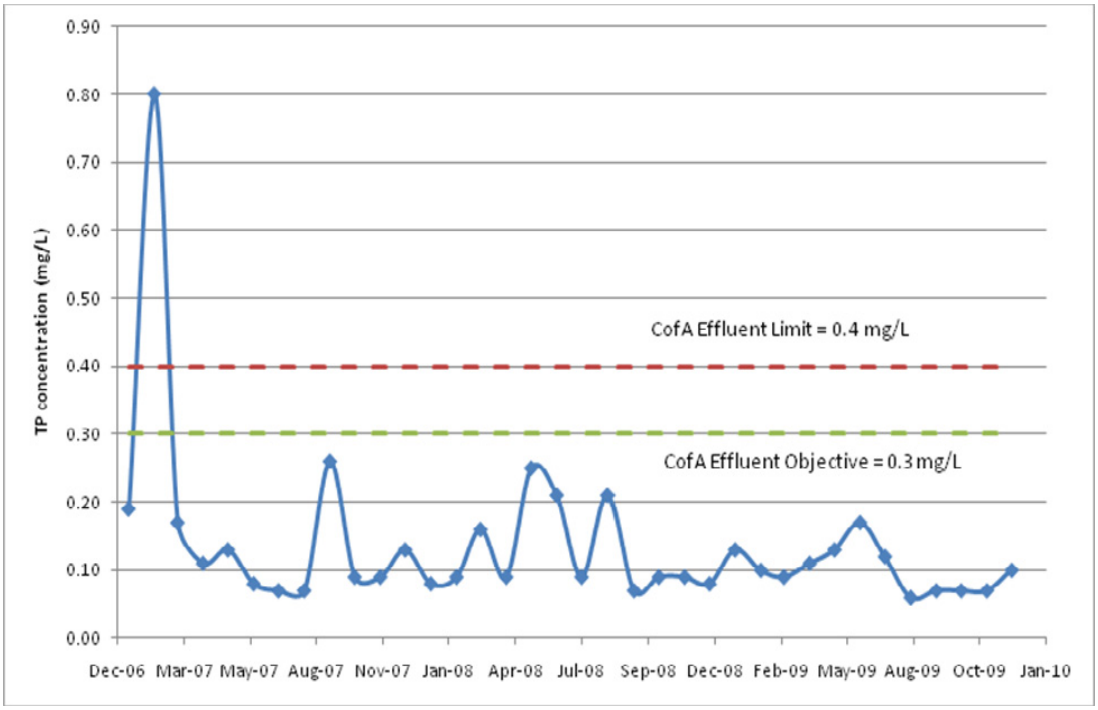


Figure 4.4 Final Effluent Average Monthly TP Concentration

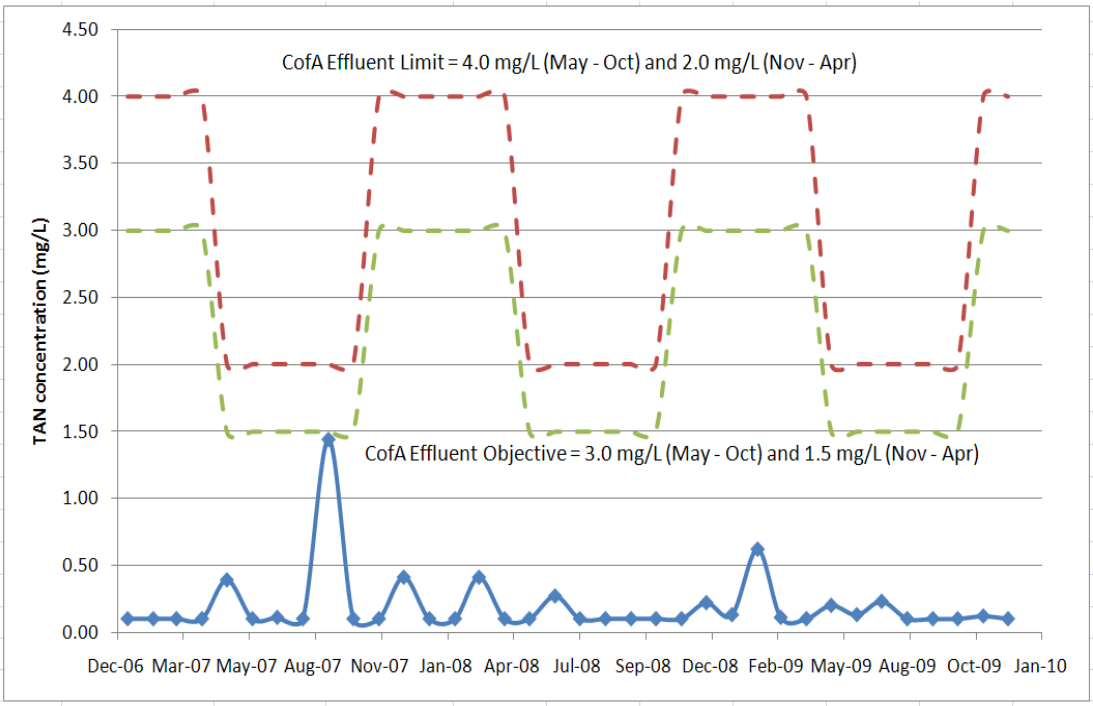


Figure 4.5 Final Effluent Average Monthly TAN Concentration

4.1.4 Process Limitations and Specific Issues

The following were noted as operational issues by OCWA staff:

- The Heidelberg WWTP has one secondary clarifier. As a result, the plant is limited in the event of cleaning or maintenance on the one clarifier because there is no redundancy.
- The plant is operating at less than 50 percent of its design flow and loading, resulting in long retention times in the process units, particularly the secondary clarifiers.
- Plant operators are still required to add alum for chemical phosphorus removal to satisfy MOE requirements, although the plant is designed to be a biological phosphorus removal plant. In addition, they add acetic acid as a source of volatile fatty acids (VFA) for biological phosphorus removal. This addition of alum and acetic acid adds ongoing operational costs to the plant. As well, the acetic acid is causing issues with the piping and electronics within the plant due to its corrosive nature.

Overall, the Heidelberg WWTP is a complex and expensive plant that requires considerable operator attention.



Figure 4.6 Alum dosing point

5. REFERENCES

Cole Engineering. Design Brief of Elmira WWTP Upgrades. February 23, 2010.

Ministry of the Environment. Design Guidelines for Sewage Works. 2008.

Metcalf & Eddy. Wastewater Engineering: Treatment and Reuse. Fourth Edition. Toronto. 2003.

Stantec. Elmira WWTP Storage Expansion - Preliminary Assessment. January 2009.

APPENDIX C
FUTURE FLOW PROJECTIONS

XCG CONSULTANTS LTD.
T 905 829 8880 F 905 829 8890 | toronto@xcg.com
2620 Bristol Circle, Suite 300, Oakville, Ontario, Canada L6H 6Z7

XCG File No.: 3-035-51-01
November 22, 2012

TECHNICAL MEMORANDUM NO. 2
ST. JACOBS – ELMIRA WASTEWATER TREATMENT MASTER PLAN
FUTURE FLOW PROJECTIONS

Prepared for:

REGION OF WATERLOO
150 Frederick Street, 7th Floor
Kitchener, Ontario
N2G 4J3

Attention: Pam Law, P.Eng.

Prepared by:

XCG CONSULTANTS LTD.
Suite 300, 2620 Bristol Circle
Oakville, Ontario
L6H 6Z7

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1. INTRODUCTION

1.1 Background

The Regional Municipality of Waterloo (the Region) is undertaking a Wastewater Treatment Master Plan for the Elmira and St. Jacobs communities concurrently, ensuring that Phases 1 and 2 of the Municipal Class Environmental Assessment (MCEA) are satisfied. This Master Plan will review wastewater treatment conditions for these communities since the implementation of the recommendations from the 1997 Class Environmental Assessment (EA) study and completion of the 2007 Region-wide Wastewater Treatment Master Plan (WWTMP), and recommend a wastewater treatment strategy to meet growth in the communities for the next 30 years.

The 2007 WWTMP recommended the completion of a separate master plan for Elmira WWTP and St. Jacobs WWTP where options for wastewater treatment of both communities would be considered together. This study will provide an opportunity to consider wastewater treatment requirements for Elmira and St. Jacobs together and will also provide an opportunity to consider the feasibility of incorporating flows from the Heidelberg WWTP into an overall solution.

The Elmira Wastewater Treatment Plant (WWTP) provides tertiary treatment for wastewater generated in the Town of Elmira. The plant is operated under Ministry of the Environment (MOE) Certificate of Approval (C of A) No. 2530-84BL9Q issued June 8, 2010. The Elmira WWTP has an average day C of A rated capacity of 7,800 m^3/d and a peak flow capacity of 19,500 m^3/d.

The St. Jacobs WWTP provides tertiary treatment for wastewater generated in the Town of St. Jacobs. The plant is operated under MOE Amended C of A No. 3-0690-99-006 issued October 21, 1999. The St. Jacobs WWTP has an average day C of A rated capacity of 1,450 m^3/d.

The Heidelberg WWTP provides tertiary treatment for wastewater generated in a small community of about 90 homes. The plant is operated under MOE Certificate of Approval No. 7707-5NSKGL issued on August 6, 2003. The Heidelberg WWTP has an average day C of A rated capacity of 130 m^3/d and a peak flow capacity of 3.2 L/s.

This Memorandum presents the future average day flow (ADF) projections to 2041, and the future wastewater treatment needs for the Elmira WWTP, St. Jacobs WWTP, and Heidelberg WWTP based on planning projections for growth within the wastewater treatment servicing area.

1.2 Objectives

The objectives of this technical memorandum are to:

1. Summarize current wastewater flows (total and per capita) for the three WWTPs; and
2. Calculate wastewater ADF flow projections for the study area to the year 2041.

2. EXISTING AND FUTURE WASTEWATER TREATMENT NEEDS

2.1 Basis for Population Projections

The population projections used in this technical memorandum are based on the following statement from the Regional Municipality of Waterloo, sent via e-mail correspondence on March 4, 2011.

"Township of Woolwich Staff had requested that a population range for St Jacobs be incorporated in the St. Jacobs - Elmira Wastewater Treatment Master Plan (WWTMP). The range requested was from the current projected population of 3,660 people, up to 5,364 people, the latter number being derived from a doubling of the current staging policies which provide for the development of 20 residential units per year. The reason for the request to have this population range incorporated in the WWTMP was to provide flexibility and thereby enable the Township of Woolwich to undertake a review of its staging and growth policies in St. Jacobs. However, Regional staff has noted that the upper end of the range as proposed by the Township cannot be accommodated within the land currently designated Township Urban Area or even within the Countryside Line as established in the Regional Official Plan (ROP) as recently approved by the Province. Regional staff has accordingly suggested that a projected population of 3,660 be used as the basis for the WWTMP, as it represents a population reasonably consistent with full build-out of the land within the Countryside Line. The Countryside Line is intended, as per Policy 2.B.1 of the ROP, to be the long term growth boundary for the St. Jacobs Township Urban Area. Regional staff note that the ROP and the associated master plans are reviewed and updated as appropriate every five years. If the results of the Township's review of its growth and staging policies are that greater population is required for St. Jacobs and if through a future review and update to the ROP it is determined, consistent with the policies of the ROP dealing with such matters, that revisions to the Countryside Line applicable to the St. Jacobs Township Urban Area are appropriate, the issue of how to service such population and lands will be addressed as part of the next review and update to the WWTMP. It should be noted that the figures of 3,660 for St Jacobs and 21,359 for Elmira in 2041, while used for the purposes of the St. Jacobs - Elmira Wastewater Treatment Master Plan (WWTMP) are adopted by the Region for this purpose only, and will not necessarily be used in population forecasting for the Region of Waterloo Regional Official Plan or its related Population and Employment Implementation Guideline, nor related policy development. Such population forecasting must be undertaken in the context of population growth anticipated in the township as a whole, and consider growth in designated settlement areas, such as Breslau, in other settlements including villages and hamlets, and on existing lots of record. Population growth is balanced by decreasing population in existing dwellings due to decreasing persons per unit (ppu). Regional forecasts will continue to balance growth on a regional scale, and within the policy requirements of Places to Grow as implemented in the Regional Official Plan."

2.2 St. Jacobs Future Wastewater Treatment Needs

The historic average day flows for the St. Jacobs WWTP from 2005 to 2009 are presented in Table 2.1. These flow values were obtained from the Region's annual reports and historic monthly data.

Table 2.1 Historic Average Day Flows to St. Jacobs WWTP

Year	2005	2006	2007	2008	2009	Average
Flow (m^3/d)	1,001	1,134	882	1,253	978	1,050

The existing wastewater treatment service population is based on the Region's reported 2009 wastewater treatment service population of 1,836. The projected wastewater treatment service populations to 2041 are based on population growth projections from the Region and the Township of Woolwich. These population growth projections include additional re-urbanization and future urban expansion areas.

The average flow value of 1,050 m^3/d, along with the 2009 service population of 1,836 was used to calculate a historic 2005 to 2009 average per capita flow value of 572 L/(cap·d). This value is considered to be slightly high compared to typical guidelines for domestic sewage flows. The MOE Design Guidelines for Sewage Works (2008) states that an *"average daily domestic flow (exclusive of extraneous flows) of 225 to 450 L/ (cap·d)"* should be used. For the purposes of this analysis, the historic per capita flow of 572 L/(cap·d), inclusive of extraneous flow, was multiplied by the updated population growth projections from the Region and the Township of Woolwich to project flows for future growth up until the year 2041.

The Region is currently reviewing the contributions of inflow and infiltration (I/I) to the system and its impact on the flow to St. Jacobs WWTP. The exact amount of I/I flow contribution is unknown at this stage; however, the Region is aware that there are significant extraneous flows and, in cooperation with the Township of Woolwich, is assessing opportunities for further I/I reduction in the sewage collection system.

The estimated existing and future residential wastewater treatment service population and projected flows for the St. Jacobs WWTP are presented in Table 2.2.

Table 2.2 Projected Wastewater Flows to 2041 – St. Jacobs WWTP

Year	Projected Residential Wastewater Treatment Service Population	Projected Total Flows (m^3/d)
Current (2005 - 2009)	1,836	1,050
2011	1,950	1,115
2016	2,235	1,278
2021	2,520	1,441
2026	2,805	1,604
2029	2,976	1,702
2031	3,090	1,767
2041	3,660	2,093

It should be noted that current Industrial, Commercial and Institutional (ICI) contributions in St. Jacobs are included in the per capita flows, and projections are based on the assumption that ICI growth in the future will be similar to the current proportion of ICI in the community.

Figure 2.1 graphically illustrates the projected average day flow (ADF) to 2041. It is anticipated that average day flows to the St. Jacobs WWTP will exceed the existing C of A rated capacity of 1,450 m^3/d in about the year 2021, based on maintaining current per capita flows for the existing population and applying a per capita flow of 572 L/(cap·d) for future growth.

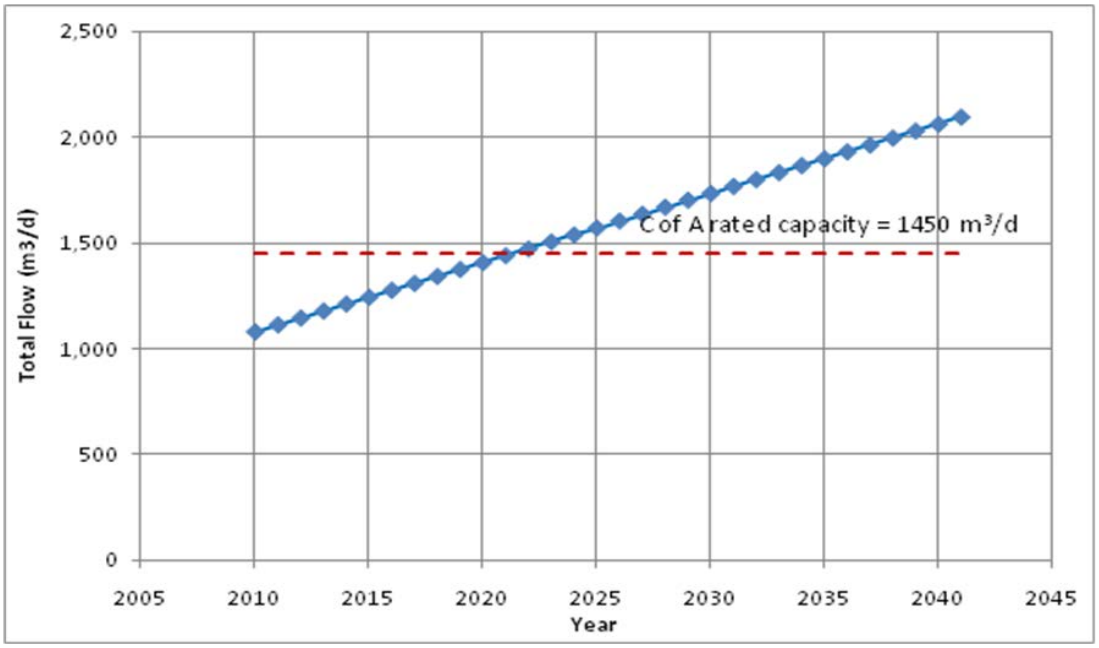


Figure 2.1 Projected ADF Values to 2041

2.3 Elmira Future Wastewater Treatment Needs

The historic average day flows for the Elmira WWTP from 2005 to 2009 are presented in Table 2.3. These flow values were obtained from the Region's annual reports and historic monthly data. The Elmira WWTP receives wastewater from five main industrial contributors (labelled as "Company A", "Company B", "Company C", "Company D", and "Company E"). The historic average day flows from each of these industrial contributors, as well as the historic total ADF industrial contribution of 318.7 m^3/d, are presented in Table 2.4.

Table 2.3 Historic Average Day Flows to Elmira WWTP

Year	2005	2006	2007	2008	2009	Average
Flow (m^3/d)	4,021	4,238	3,473	4,290	4,098	4,024

Table 2.4 Historic Average Day Flows from Industrial Contributors

Year	"Company A"	"Company B"	"Company C"	"Company D"	"Company E"	Total ADF (m^3/d)
2007	68.0	5.5	78.2	-	75.0	311.8
2008	69.8	5.5	98.0	-	75.0	333.4
2009	56.6	5.4	88.9	85.0	75.0	311.0
Average	64.8	5.5	88.4	85.0	75.0	318.7

The existing wastewater treatment service population is based on the Region's reported 2009 wastewater treatment service population of 10,011. The projected wastewater treatment service populations to 2041 are based on population growth projections from the Region and the Township of Woolwich. These population growth projections include additional re-urbanization and future urban expansion areas.

The average flow value of 4,024 m^3/d subtracting the average flow value from the industrial contributors of 319 m^3/d, along with the 2009 service population of 10,011 was used to calculate a historic 2005 to 2009 average per capita flow value of 370 L/(cap·d). This value is considered to be within the typical design guidelines for domestic sewage flows of 225 to 450 L/ (cap·d). The updated population growth projections from the Region and the Township of Woolwich were multiplied by this historic per capita flow value of 370 L/ (cap·d) to project flows for future growth up until the year 2041.

The estimated existing and future residential wastewater treatment service population and projected residential flows for the Elmira WWTP are presented in Table 2.5.

Table 2.5 Projected Residential Wastewater Flows to 2041 – Elmira WWTP

Year	Projected Residential Wastewater Treatment Service Population	Projected Residential Flows (m^3/d)
Current (2005 - 2009)	10,011	3,705
2011	10,639	3,938
2016	12,209	4,519
2021	14,039	5,196
2026	15,869	5,873
2029	16,967	6,279
2031	17,699	6,550
2041	21,359	7,904

It should be noted that current Industrial, Commercial and Institutional (ICI) contributions in Elmira, other than the five main industrial contributors, are included in the per capita flows, and projections are based on the assumption that ICI growth in the future will be similar to the current proportion of ICI in the community.

Flow from the five main industrial wastewater contributors must be added to the residential flow projections that incorporate the general ICI contributions. The overall 2007 to 2009 historic average daily flow from these industries was 319 m^3/d. Each of these five industrial wastewater contributors is briefly discussed below.

"Company A"

"Company A" contributed a historic ADF of 64.8 m^3/d from 2007 to 2009. According to their industrial surcharge agreement, "Company A" has an allowable maximum daily flow (MDF) of 120 m^3/d and a maximum hourly flow (MHF) of 8 m^3/hr. The MDF of 120 m^3/d was used to project future industrial flows from "Company A" up until the year 2041.

"Company B"

"Company B" contributed a historic ADF of 5.5 m^3/d from 2007 to 2009. According to their industrial surcharge agreement, "Company B" has an allowable MDF of 20 m^3/d and a MHF of 2.5 m^3/hr. The MDF of 20 m^3/d was used to project future industrial flows from "Company B" up until the year 2041.

"Company C"

"Company C" contributed a historic ADF of 88.4 m^3/d from 2007 to 2009. According to their industrial surcharge agreement, "Company C" has an allowable MDF of 150 m^3/d and a MHF of 6.25 m^3/hr. The MDF of 150 m^3/d was used to project future industrial flows from "Company C" up until the year 2041.

"Company D"

"Company D" contributed a historic ADF of 85.0 m^3/d from December 1, 2008 to October 31, 2009. A discharge agreement with "Company D" was executed in 1983 and amended in 1993. According to the Region, there have been no further amendments to this agreement. This agreement states that the annual average daily volume of industrial wastewater to be discharged by "Company D" to the Elmira WWTP cannot exceed 181.8 m^3/d. This flow was used to project future industrial flows from "Company D" up until the year 2041.

"Company E"

According to the Region, "Company E" contributed an estimated ADF of 75 m^3/d. "Company E" does not have an industrial surcharge agreement and is planning on relocating their facility in 2011 according to the Region. Based on this information, the "Company E" ADF flow of 75 m^3/d has not been included in the overall projected industrial flows from these sources from 2011 up until the year 2041.

According to the industrial surcharge agreements and the relocation of "Company E", these five industries have an overall projected industrial flow of 472 m^3/d. This daily flow was used to project future industrial flows from these sources up until the year 2041.

Total Flow Projections

The total flow projections for the Elmira WWTP, for both residential and industrial, are presented in Table 2.6.

Table 2.6 Projected Total Wastewater Flows to 2041 – Elmira WWTP

Year	Projected Residential Flows (m^3/d)	Projected Industrial Flows (m^3/d)	Projected Total Flows (m^3/d)
Current (2005 - 2009)	3,705	319	4,024
2011	3,938	472	4,410
2016	4,519	472	4,991
2021	5,196	472	5,668
2026	5,873	472	6,345
2029	6,279	472	6,751
2031	6,550	472	7,022
2041	7,904	472	8,376

Figure 2.2 graphically illustrates the projected average day flow (ADF) to 2041. It is anticipated that average day flows to the Elmira WWTP will exceed the existing C of A rated capacity of 7,800 m^3/d by about the year 2037, based on maintaining current per capita flows for the existing population and applying a historic per capita flow of 370 L/(cap·d) for future growth.

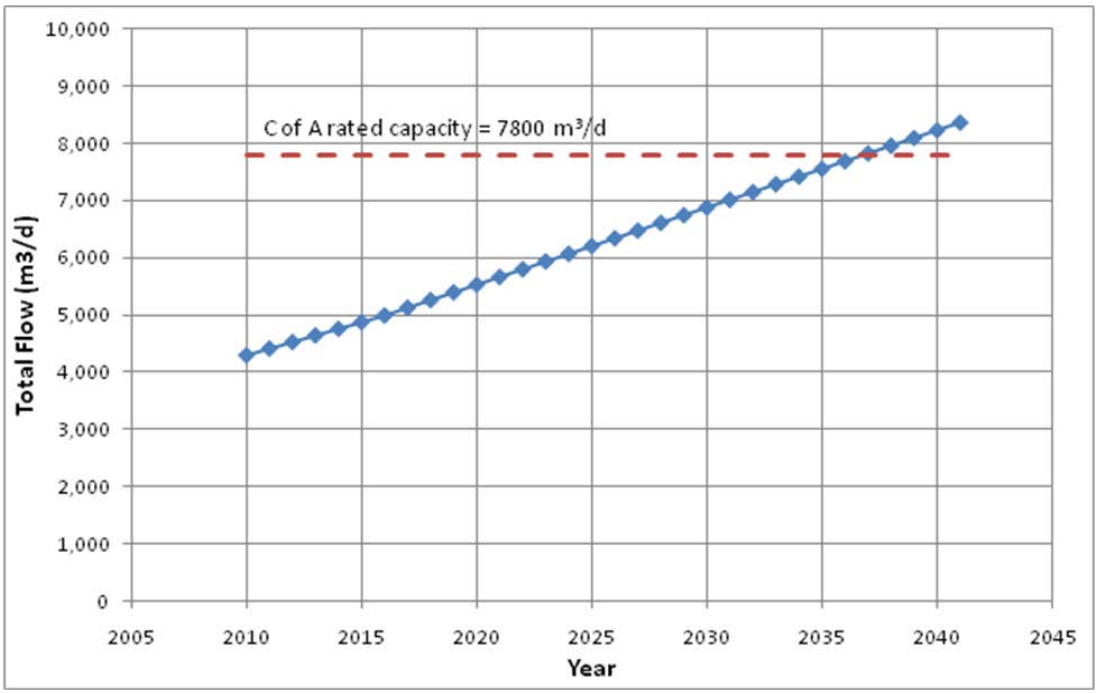


Figure 2.2 Projected ADF Values to 2041

2.4 Heidelberg Future Wastewater Treatment Needs

The historic average day flows for the Heidelberg WWTP from 2005 to 2009 are presented in Table 2.7. These flow values were obtained from the Region's annual reports and historic monthly data.

Table 2.7 Historic Average Day Flows to Alt Heidelberg WWTP

Year	2005	2006	2007	2008	2009	Average
Flow (m^3/d)	47	51	48	58	50	51

The existing wastewater treatment service population is based on the Region's reported 2009 wastewater treatment service population of 277. There are no future expansion plans for this small settlement area of 90 homes. Hence, the projected wastewater treatment service populations to 2041 will remain the same as the current wastewater treatment service population of 277.

Based on the average flow value of 51 m^3/d and the 2009 wastewater treatment service population of 277, the average per capita flow to the Heidelberg WWTP is approximately 183 L/ (cap·d). This is at the low end of typical values and reflects the relatively new sewage collection system and small wastewater treatment service area.

It should be noted that there are no Industrial, Commercial and Institutional (ICI) contributions to the Heidelberg WWTP and it is assumed that there will be no ICI loading in the future.

The projected 2041 average wastewater flow of 51 m^3/d is less than half of the existing Heidelberg WWTP ADF rated capacity of 130 m^3/d.

3. SUMMARY

3.1 Overall Future Wastewater Treatment Needs

Table 3.1 presents a summary of flow projections, based on growth projections and a design period to 2041 for the three communities within the study area. This summary table compares the projected 2041 total flow for each of the three wastewater treatment facilities to its C of A rated capacity. Based on the projected population growth and per capita flows:

- The St. Jacobs WWTP 2041 projected total flow will exceed its existing C of A rated capacity;
- The Elmira WWTP 2041 projected total flow will exceed its existing C of A rated capacity; and
- The Heidelberg WWTP 2041 projected total flow will be less than half of its existing C of A rated capacity.

The overall wastewater treatment service area projected 2041 flow of 10,520 m^3/d exceeds the total C of A rated capacity of the three service area wastewater treatment plants of 9,380 m^3/d.

Table 3.1 Summary of 2041 Flow Projections

Year	Projected Total Flows – St. Jacobs WWTP (m^3/d)	Projected Total Flows – Elmira WWTP (m^3/d)	Projected Total Flows – Heidelberg WWTP (m^3/d)	Projected Total Flows – Wastewater Treatment Service Area (m^3/d)
Current (2005 - 2009)	1,050	4,024	51	5,125
2011	1,115	4,410	51	5,576
2016	1,278	4,991	51	6,320
2021	1,441	5,668	51	7,160
2026	1,604	6,345	51	8,000
2029	1,702	6,751	51	8,504
2031	1,767	7,022	51	8,840
2041	2,093	8,376	51	10,520
C of A Rated Capacity	**1,450**	**7,800**	**130**	**9,380**

4. REFERENCES

MOE (2008). Design Guidelines for Sewage Works.

Population Projection Data from the Regional Municipality of Waterloo (Pam Law) via e-mail correspondence on March 4, 2011.

Sewer Use Agreements from the Regional Municipality of Waterloo (Pam Law) via e-mail correspondence on October 26, 2010.

APPENDIX D
ASSIMILATIVE CAPACITY STUDY

XCG CONSULTANTS LTD.
T 613 542 5888 F 613 542 0844 | kingston@xcg.com
6 Cataraqui Street, Woolen Mill, West Wing, Suite 105, Kingston, Ontario, Canada K7K 1Z7

XCG File No.: 3-035-51-01
September 12, 2011

TECHNICAL MEMORANDUM #3
DETERMINATION OF EFFLUENT REQUIREMENTS FOR THE ELMIRA AND ST. JACOBS WASTEWATER TREATMENT PLANTS

Prepared for:

REGION OF WATERLOO
150 Frederick Street
P.O. Box 9051 Station 'C'
Kitchener, Ontario
N2G 4J3

Attention: Pam Law

Prepared by:

XCG CONSULTANTS LTD.
6 Cataraqui Street, Woolen Mill, West Wing, Suite 105
Kingston, Ontario
K7K 1Z7

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1. INTRODUCTION

The Regional Municipality of Waterloo (the Region) is carrying out wastewater treatment master plans for the Elmira and St. Jacobs Wastewater Treatment Plants (WWTP). In support of the Master Plan, an assimilative capacity study of the receiving waters was undertaken to determine the effluent limits that would apply to these WWTPs in the future should either or both of the facilities be expanded.

The Elmira WWTP currently discharges into the Canagagigue Creek and the St. Jacobs plant discharges into the Conestogo River. Both of these water bodies flow eastward to discharge into the Grand River, upstream of the Waterloo/Kitchener area.

The St. Jacobs WWTP is an extended aeration activated sludge WWTP that provides tertiary treatment for wastewater generated in the Town of St. Jacobs. The plant is operated by the Ontario Clean Water Agency (OCWA) on behalf of the Regional Municipality of Waterloo. The plant is operated under Ministry of the Environment (MOE) Amended Certificate of Approval (C of A) No. 3-0690-99-006 issued October 21, 1999. The St. Jacobs WWTP has an average day C of A rated capacity of 1,450 m^3/d.

The Elmira WWTP is a biological nutrient removal (BNR) activated sludge system with tertiary filtration and UV disinfection that provides treatment for wastewater generated in the Town of Elmira. The plant is operated by the Ontario Clean Water Agency (OCWA) on behalf of the Regional Municipality of Waterloo. The plant is operated under Ministry of the Environment (MOE) Certificate of Approval (C of A) No. 2530-84BL9Q issued June 8, 2010. The Elmira WWTP has an average day C of A rated capacity of 7,800 m^3/d and a peak flow capacity of 19,500 m^3/d.

1.1 Objectives

The objectives of this analysis are:

- To review and summarize the assimilative capacity analysis approach applied in the Region of Waterloo Wastewater Treatment Master Plan (WWTMP, 2007) for the St. Jacobs and Elmira WWTPs;
- to review end-of-pipe acute toxicity analysis including zone of passage requirements for un-ionized ammonia and summarize;
- to update ambient water quality, wastewater quality and flow datasets with any available new information;
- to conduct an assimilative capacity assessment of the receiving waters; and
- to formulate reasonable recommendations for effluent limits for the future expanded Elmira and St. Jacobs WWTPs.

1.2 General Approach

1. *Define Background Water Quality:* Representative background water quality can be defined by examining water quality in the vicinity of the wastewater discharge. For analysis purposes, the 75th percentile threshold is applied to

characterize ambient conditions, as recommended by the MOE. The MOE (1994b) states "Normally the 75th percentile is used to determine background quality…".

The receiving water quality is assigned Policy 1 if the ambient concentration is less than the Provincial Water Quality Objective (PWQO) and Policy 2 if the ambient concentration exceeds the PWQO. The implications of being a Policy 1 or Policy 2 receiver is described briefly below.

Policy 1

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

Policy 2

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

2. *Define Low Flow Condition:* Using standard low-flow frequency analysis techniques, estimates of seasonal low-flows are generated. 7Q20 (the minimum 7-day average flow which is equalled or exceeded on average 95% of the time) low-flow estimates were generated for nearby Water Survey of Canada (WSC) gauging stations.
3. *Assimilative Capacity Analysis:* Receiver water quality impacts are determined for each water quality parameter based on the effluent limits determined to be in compliance with MOE Guideline F-5, in-stream provincial water quality objectives (MOE, 1994a), Canadian Environmental Protection Act (CEPA) requirements and the Municipal Wastewater Effluent (MWWE) regulations under the Fisheries Act.
4. *Formulation of Recommended Effluent Limits*: Based on the work completed in steps one through three, future effluent limits for the Elmira and St. Jacobs WWTPs can be proposed.

2. REVIEW OF WWTMP (2007) ASSIMILATIVE CAPACITY ANALYSIS

The Region of Waterloo Wastewater Treatment Master Plan (2007) evaluated receiving water quality and quantity (flow) for each of the *Large and Small* WWTPs owned by the Region. The approach applied varied depending on the size of the plant. Both St. Jacobs and Elmira were classified as small WWTPs and were evaluated using a mass balance approach. Seasonal (winter/summer) flow and annual 75th percentile concentrations were used to represent the ambient conditions. Four separate wastewater discharge scenarios were evaluated of which only the results of Scenario 2 & 4 are presented below because they are the most applicable to the current study. Scenario 2 evaluated increased effluent flows for the 2031 and 2041 projections and would require treatment upgrades to the WWTPs to provide nitrification at the plants which are not currently nitrifying. Scenario 4 is the most stringent effluent criteria proposed and would require treatment upgrades to provide nitrification, denitrification and reduced effluent phosphorus. The base effluent criteria for the 5 main Regional WWTPs are summarized in Table 1 and Table 2 for both Scenarios.

Table 1 Scenario 2 Effluent Quality

BOD Comp / Obj (mg/L)	SS Comp / Obj (mg/L)	TAN Summer Comp / Obj (mg/L)	TAN Winter Comp / Obj (mg/L)	TP Comp / Obj (mg/L)
15 / 7	15 / 10	2 / 1	6 / 3	0.8 / 0.4

Table 2 Scenario 4 Effluent Quality

BOD Comp / Obj (mg/L)	SS Comp / Obj (mg/L)	TAN Summer Comp / Obj (mg/L)	TAN Winter Comp / Obj (mg/L)	TP Comp / Obj (mg/L)	Total N Summer Comp/ Obj (mg/L)	Total N Winter Comp/ Obj (mg/L)
15 / 7	15 / 10	2 / 1	6 / 3	0.4 / 0.2	14/7	N/A/15

If the existing C of A and effluent objectives were less than the values presented in the above scenarios, they were left at the present values. The specifics of the St. Jacobs and Elmira analyses are summarized in Section 2.1.1 and 2.1.2, respectively.

2.1.1 St. Jacobs Review

Ambient water quality for total phosphorus (TP), total ammonia-N (TAN), pH and temperature were taken from the Waterloo Wastewater Treatment Plant (Gore and Storrie, 1995); the period of record of the data was from 1980 - 1991. No nitrate data were summarized in the aforementioned report so the 75th percentile was calculated from Provincial Water Quality Monitoring Network (PWQMN) Station 16018407802; the period of record of this data was from 1975 - 1978. The ambient water quality applied for St. Jacobs is summarized in Table 3.

Table 3 Previous Study Ambient Water Quality - Conestogo River

Parameter	Value	Receiver Policy
75th percentile un-ionized ammonia-N	0.002	Policy 1
75th percentile total phosphorus	0.12	Policy 2
75th percentile nitrate-N	2.15	N/A Below CCME Guideline
25th percentile dissolved oxygen	10.8	Policy 1

Notes:
Annual value applied for all seasons.
PWQO for TP is 0.03 mg/L for streams.
PWQO for unionized ammonia is 0.02 mg/L as ammonia.
Canadian Council of Ministers of the Environment (CCME) guideline for nitrate is 2.93 mg/L-N.

At the time of the study, no pH and temperature data were available for the WWTP discharge. Therefore as an alternative, the stream pH and temperature were applied.

The low flow in the Conestogo River was assumed to be 2.1 m^3/s, which is the target outflow maintained by the Grand River Conservation Authority (GRCA) under low flow conditions. The location that this flow is measured was not described in the text. XCG has assumed that the flow is measured at the Glen Allan dam.

Effluent quality and flows for the described Scenarios 2 and 4 for the St. Jacobs WWTP applied for the mass balance are summarized in Table 4. The existing TAN and TP compliance limits for St. Jacobs were lower than those defined in the standard Scenario 2 application. As such, the existing compliance limits were substituted for TAN and TP for application of Scenario 2. For Scenario 4 the St. Jacobs TP compliance limit was lower than the standard Scenario 4 value and as such, the Scenario 4 objective limit was applied to evaluate Scenario 4. The resultant mass balance calculated stream concentrations for Scenarios 2 and 4 are presented in Table 5.

Table 4 St. Jacobs Effluent Quantity and Quality Scenarios

Scenario	Flow (m^3/d)	TAN (mg/L)	TP (mg/L)	Nitrate (mg/L)
2	1,900 (2031 flow) 2,200 (2041 flow)	1 summer 2 winter	0.3	N/A
4	1,900 (2031 flow) 2,200 (2041 flow)	1 summer 2 winter	0.2	8

Notes:
Only the results for scenarios 2 and 4 were reported

Table 5 St. Jacobs Mass Balance Calculated Stream Concentrations

Scenario	Flow (m3/d)	Un-ionized Ammonia (mg/L)	Total Phosphorus (mg/L)	Total Phosphorus (kg/d)	Nitrate (mg/L)
2 summer	1,900 (2031 flow) 2,200 (2041 flow)	0.005 0.005	0.127 0.128	0.57 0.66	N/A
2 winter	1,900 (2031 flow) 2,200 (2041 flow)	0.008 0.009	0.127 0.128	0.57 0.66	
4 summer	1,900 (2031 flow) 2,200 (2041 flow)	0.005 0.005	0.123 0.124	0.38 0.44	2.385 2.421
4 winter	1,900 (2031 flow) 2,200 (2041 flow)	0.008 0.009	0.123 0.124	0.38 0.44	2.385 2.421

Notes:
Loadings were calculated for TP because the receiver is Policy 2 for TP. The allowable loading under the Certificate of Approval (C of A) is 0.44 kg/d.

Mixing zone analysis was completed for ammonia. It was found that, in all seasons, the mixing zone (concentration higher than the PWQO) was contained within 25 percent of the channel width.

The main conclusions from the 2007 WWTMP analysis were as follows:

- Receiver is Policy 1 with respect to un-ionized ammonia and DO.
- Receiver is Policy 2 with respect to TP.
- To ensure that TP loads remained consistent with the C of A, TP limits would have to be reduced.
- Un-ionized ammonia mixing zones are met within 25 percent of the channel width.
- Nitrate concentrations remain below the CCME guideline.

2.1.2 Elmira Review

All ambient water quality information was obtained from four PWQMN stations. These stations encompassed data from 1974 - 2002. The ambient water quality applied for the mass balance for Elmira is summarized in Table 6.

Table 6 Previous Study Ambient Water Quality - Canagagigue Creek

Parameter	Value	PWQO status
75th percentile un-ionized ammonia-N	0.001	Policy 1
75th percentile total phosphorus	0.16	Policy 2
75th percentile nitrate-N	6.89	N/A Above CCME Guideline
25th percentile dissolved oxygen	10.25	Policy 1

Notes:
Annual value applied for all seasons.
PWQO for TP is 0.03 mg/L for streams.
PWQO for unionized ammonia is 0.02 mg/L as ammonia.
CCME guideline for nitrate is 2.93 mg/L-N.

There is no discussion in the 2007 WWTMP regarding the low flow used in the analysis. XCG conducted a back calculation which suggests that the low flow applied was approximately 0.4 m^3/s for all seasons.

Effluent quality and flows for Scenarios 2 and 4 for the Elmira WWTP that were applied for the mass balance are summarized in Table 7. The existing TAN and TP compliance limits for Elmira were lower than those defined in the standard Scenario 2 application, as such, the existing compliance limits were substituted for TAN and TP for application of Scenario 2. Scenario 2 and Scenario 4 evaluated projected future flows and possible effluent limits. Scenario 4 had more stringent limits than Scenario 2. The resultant mass balance calculated stream concentrations for Scenarios 2 and 4 are displayed in Table 8.

Table 7 Elmira Effluent Quantity and Quality Scenarios

Scenario	Flow (m^3/d)	TAN (mg/L)	TP (mg/L)	Nitrate (mg/L)
2	7,400 (2031 flow) 9,300 (2041 flow)	0.7 summer 2 winter	0.5	N/A
4	7,400 (2031 flow) 9,300 (2041 flow)	0.7 summer 2 winter	0.4	8

Notes:
Only the results for Scenarios 2 and 4 were reported.

Table 8 Elmira Mass Balance Calculated Stream Calculations

Scenario	Flow (m^3/d)	Un-ionized Ammonia (mg/L)	Total Phosphorus (mg/L)	Total Phosphorus (kg/d)	Nitrate (mg/L)
2 summer	7,400 (2031 flow) 9,300 (2041 flow)	0.05 0.05	0.22 0.23	3.70 4.65	N/A
2 winter	7,400 (2031 flow) 9,300 (2041 flow)	0.07 0.09	0.22 0.23	3.70 4.65	
4 summer	7,400 (2031 flow) 9,300 (2041 flow)	0.05 0.05	0.20 0.21	2.96 3.72	7.10 7.14
4 winter	7,400 (2031 flow) 9,300 (2041 flow)	0.07 0.09	0.20 0.21	2.96 3.72	7.10 7.14

Notes:
Loadings were calculated for TP because the receiver is Policy 2 for TP. The allowable loading under the Certificate of Approval (C of A) is 3.90 kg/d.

Mixing zone analysis was completed for ammonia. It was found that, in all seasons, the mixing zone (concentration higher than the PWQO) exceeded 25 percent of the channel width, which was within the desired 75 percent zone of passage.

The main conclusions from the analysis are as follows:

- Receiver is Policy 1 with respect to un-ionized ammonia and DO.

- Receiver is Policy 2 with respect to TP.
- To ensure that TP loads remained consistent with the C of A, TP limits would have to be reduced for the 2041 flows.
- Un-ionized ammonia mixing zones are not met within 25 percent of the channel width. The summarized mass balance data suggests that under fully mixed conditions that the PWQO for un-ionized ammonia is not met.
- Insufficient data exist to evaluate nitrate.

3. UPDATED ASSIMILATIVE CAPACITY ANALYSIS

3.1 Water Quality Analysis

Ideally, in establishing ambient water quality for a receiver, there are recent data available at a location upstream of the discharge location. In the case of Canagagigue Creek, there are several data sources that can be combined in order to determine the ambient water quality. The data sources that were applied in this study are summarized for each receiver in Table 9.

Worth noting is that the Provincial Water Quality Monitoring Network (PWQMN) stations located upstream of the outfalls on the respective receiving streams are located significant distances upstream as listed in Table 9. At the time of this report, these are the best available data but XCG understands that the Region is currently conducting a detailed monitoring program that should provide more relevant data. When this data becomes available, it is recommended that this assimilative capacity study be updated with the additional data.

Before calculating the 75th percentile concentration, which is to be used to represent the ambient condition, each dataset is reviewed for increasing or decreasing trends. A trend in the dataset can vastly affect the calculated 75th percentile concentration. To remove the trend from the dataset it is truncated at a point in the data series such that a trend is no longer identified. This new truncated dataset then provides a more realistic 75th percentile concentration to represent existing ambient conditions.

Table 9 Data Sources for Ambient Water Quality

Receiver	Source	Location relative to outfall	Period of record	Parameters of interest
Canagagigue Creek	Chemtura data collection location SS+855	5 - 10 m upstream of outfall	1995 - 2007	Temperature, pH, ammonia, nitrate and total phosphorus
	Chemtura data collection location SS+770	90 - 100 m upstream of outfall	1997 - 2010[1]	Temperature, pH, ammonia, nitrate and total phosphorus
	Provincial Water Quality Monitoring Station 16018405102	4,000 - 4,500 m upstream of outfall	1973 - 2010	BOD_5, dissolved oxygen, fecal coliforms, *E.coli* and total suspended solids.
Conestogo River	Provincial Water Quality Monitoring Station 16018407702	28 km upstream of outfall	1975 - 2010	Temperature, pH, ammonia, nitrate, BOD_5, total phosphorus, dissolved oxygen, fecal coliforms, E.coli and total suspended solids

Notes:
1. Only the years 2008 - 2010 were used to supplement the data collected at SS+855 for the parameters listed.

3.1.1 Total Phosphorus

According to the MOE PWQO, the interim guideline for total phosphorus (TP) in rivers is 0.03 mg/L to eliminate excessive plant growth.

Seasonal 75th percentile TP concentrations were calculated and compared to the PWQO. Table 10 and Table 11 show that, in all cases, seasonal concentrations are above the PWQO, therefore, both Canagagigue Creek and the Conestogo River are Policy 2 with respect to TP.

For Canagagigue Creek, based on the limited number of samples collected per season, it is more realistic to use the annual 75th percentile TP concentration to represent the ambient TP concentration for all seasons.

Table 10 TP Data Summary - Canagagigue Creek

Season	Mean TP (mg/L)	75th percentile TP (mg/L)	Number of observations
Winter (Jan - Mar)	0.085	0.103	9
Spring (Apr - Jun)	0.057	0.060	10
Summer (Jul- Sep)	0.141	0.126	10
Fall (Oct - Dec)	0.106	0.115	9
Annual	0.097	0.115	38
Notes: Annual value recommended to represent ambient conditions due to small seasonal sample sizes.			

Table 11 TP Data Summary - Conestogo River

Season	Mean TP (mg/L)	75th percentile TP (mg/L)	Number of observations
Winter (Jan - Mar)	0.108	0.149	22
Spring (Apr - Jun)	0.062	0.076	42
Summer (Jul- Sep)	0.070	0.078	53
Fall (Oct - Dec)	0.081	0.086	30
Notes: Data truncated prior to 1993 to remove decreasing trend.			

These updated datasets have advantages over those applied in the WWMTP (2007). The data for Canagagigue Creek represents water quality directly upstream of the discharge location and provides a more representative ambient condition; note that this dataset was not included in the previous work. For the Conestogo River, the dataset applied has information up to 2010 which is much more recent than that applied in the WWTMP. The only disadvantage for the Conestogo River is the distance (28 km) upstream to the closest PWQMN station. Despite the differences in datasets, in both cases this study produced similar TP concentrations to that of the 2007 WWTMP.

3.1.2 Un-ionized Ammonia

The percentage of un-ionized ammonia in aqueous solution varies depending on the temperature and pH of the water. In order to determine the 75th percentile in stream

un-ionized ammonia, it is necessary to calculate the 75th percentile of the ammonia dissociation percentage that would be un-ionized ammonia based on synoptic measurements of pH and temperature (taken at the same time). These seasonal values combined with seasonal 75th percentile concentrations of ammonia provide the basis for the 75th percentile estimation of un-ionized ammonia. Table 12 and Table 13 present the seasonal un-ionized ammonia concentrations for Canagagigue Creek and the Conestogo River respectively as well as the 75th percentile dissociation and ammonia values.

The MOE PWQO for un-ionized ammonia is 0.02 mg/L-NH_3 (20 µg/L). For both Canagagigue Creek and the Conestogo River, the seasonal concentrations are below the PWQO and therefore, both receivers are Policy 1 with respect to un-ionized ammonia.

Table 12 Un-ionized Ammonia Data Summary - Canagagigue Creek

Season	75th Percentile Dissociation (%)	75th percentile ammonia (mg/L-N)	75th percentile un-ionized ammonia (mg/L-NH_3)
Winter (Jan - Mar)	1.1	0.650	0.009
Spring (Apr - Jun)	4.7	0.158	0.009
Summer (Jul- Sep)	5.6	0.179	0.012
Fall (Oct - Dec)	2.5	0.535	0.016

Table 13 Un-ionized Ammonia Data Summary - Conestogo River

Season	75th Percentile Dissociation (%)	75th percentile ammonia (mg/L-N)	75th percentile un-ionized ammonia (mg/L-NH_3)
Winter (Jan - Mar)	1.4	0.201	0.003
Spring (Apr - Jun)	10	0.101	0.013
Summer (Jul- Sep)	11	0.110	0.015
Fall (Oct - Dec)	4.0	0.168	0.008
Notes: Ammonia data was truncated prior to 1995 to remove decreasing trend.			

The same advantages of the datasets used in this study for ammonia apply as cited for TP. In general, un-ionized ammonia concentrations were higher than those used in the 2007 WWTMP.

3.1.3 Dissolved Oxygen and BOD_5

For dissolved oxygen (DO), low concentrations are indications of degraded water quality; therefore, 25th percentiles are typically used, rather than 75th percentiles, to characterize ambient conditions. The PWQO for DO, for warm water fisheries, varies from 4 mg/L to 7 mg/L depending on the water temperature.

The DO concentrations reported in Table 14 and Table 15 show that the 25th percentile concentrations are higher than the PWQO for all months. Accordingly, the receiver is Policy 1 with respect to DO which is consistent with the 2007 WWTMP.

It should be noted that the dissolved oxygen values are spot measurements taken during the day and are likely not reflective of worst case conditions in the summer (e.g. at dawn when dissolved oxygen is lowest).

Seasonal statistics for BOD_5 are summarized in Table 16 and Table 17 for Canagagigue Creek and Conestogo River, respectively. The datasets for both receivers end over ten years ago; the available data suggest that the concentrations of BOD_5 are likely in the low to low/medium range.

Low concentrations of BOD_5 with high concentrations of DO suggest that there is substantial assimilative capacity available for BOD_5.

Table 14 DO Data Summary - Canagagigue Creek

Month	75th percentile temperature (°C)	25th percentile DO (mg/L)	Number of observations
January	1.6	12.9	20
February	0.9	12.8	22
March	2.2	12.5	25
April	9.5	11.7	24
May	14.1	10.6	29
June	20.3	9.3	34
July	23.0	7.6	37
August	20.6	7.6	34
September	17.5	8.7	33
October	10.6	10.3	27
November	6.5	12.1	24
December	3.0	12.6	23

Notes:
Data truncated prior to 1977 to remove increasing trend.
PWQO for DO ranges from 4 - 7 mg/L for warm water biota and varies based on water temperature.

Table 15 DO Data Summary - Conestogo River

Month	75th percentile temperature (°C)	25th percentile DO (mg/L)	Number of observations
January	1.1	12.6	17
February	2.0	12.1	23
March	3.3	13.7	23
April	8.1	13.0	21
May	13.5	12.1	27
June	17.7	11.2	33
July	19.8	9.3	31
August	22.2	8.5	32
September	20.8	9.1	31
October	13.3	10.4	26
November	6.1	12.1	23
December	2.3	13.4	20
Notes: PWQO for DO ranges from 4 - 7 mg/L for warm water biota and varies based on water temperature			

Table 16 BOD_5 Data Summary - Canagagigue Creek

Season	Mean BOD_5 (mg/L)	75th percentile BOD_5 (mg/L)	Number of observations
Winter (Jan - Mar)	2.8	3.3	62
Spring (Apr - Jun)	2.5	3.0	62
Summer (Jul- Sep)	3.9	5.1	64
Fall (Oct - Dec)	2.7	3.6	67
Notes: Dataset ends in 1996.			

Table 17 BOD_5 Data Summary - Conestogo River

Season	Mean BOD_5 (mg/L)	75th percentile BOD_5 (mg/L)	Number of observations
Annual	1.78	2.10	15
Notes: Dataset ends in 1988. Annual value presented due to small dataset.			

3.1.4 E.coli

The *E.coli* datasets for each of the stations have a limited number of samples. However, there is a longer dataset of fecal coliform data of which *E.coli* is a subset. To increase the amount of available data, historic fecal coliform observations were

used to estimate *E.coli* counts. USGS (2003) calculated the ratio between *E.coli* and fecal coliforms for 28 water bodies in Kansas. The calculated ratios were found to vary by the water body and the ratio ranged from 0.48 – 0.96 with a geometric mean value of 0.77. For the purposes of this analysis the ratio 0.77 was applied; it is possible that the ratio could be higher or lower but regardless it does provide a reasonable estimate for to aid in determining the required statistics.

Table 18 and Table 19 show the combined Fecal Coliform/*E.coli* dataset statistics for Canagagigue Creek and the Conestogo River. The seasonal bacteria statistics exceed the PWQO of 100 CFU/100 mL for *E.coli* for all seasons for both receivers with the exception of spring in the Conestogo River. Accordingly, both receivers in the vicinity of the Elmira and St. Jacobs outfalls are Policy 2 with respect to *E.coli*. To ensure that these estimates were reasonable the lower bound ratio of 0.48 was also applied; it was found that while the concentrations did decrease the assigned Policy 2 status remained unchanged.

Table 18 Fecal Coliform/E.coli Data Summary - Canagagigue Creek

Season	Geometric mean Fecal Coliform/*E.coli* (cfu/100mL)	75th percentile Fecal Coliform/*E.coli* (cfu/100mL)	Number of observations
Winter (Jan - Mar)	141	411	43
Spring (Apr - Jun)	140	735	52
Summer (Jul- Sep)	1230	3080	45
Fall (Oct - Dec)	345	1093	59
Notes: A factor of 0.77 was applied to all fecal coliform measurements to estimate *E.coli* concentrations			

Table 19 Fecal Coliform/E.coli Data Summary - Conestogo River

Season	Geometric mean Fecal Coliform/*E.coli* (cfu/100mL)	75th percentile Fecal Coliform/*E.coli* (cfu/100mL)	Number of observations
Winter (Jan - Mar)	65	210	36
Spring (Apr - Jun)	21	38	39
Summer (Jul- Sep)	345	797	31
Fall (Oct - Dec)	152	293	41
Notes: A factor of 0.77 was applied to all fecal coliform measurements to estimate *E.coli* concentrations			

3.1.5 Total Suspended Solids

Total Suspended Solids (TSS) data are summarized in Table 20 and Table 21 for Canagagigue Creek and the Conestogo River. The 75th percentile concentrations for both receivers are relatively high. No PWQO exists for TSS, however, concentrations less than 5 mg/L are generally considered good.

Table 20 TSS Data Summary - Canagagigue Creek

Season	Mean TSS (mg/L)	75th percentile TSS (mg/L)	Number of observations
Winter (Jan - Mar)	36.7	43.4	25
Spring (Apr - Jun)	22.5	27.9	47
Summer (Jul- Sep)	31.9	42.7	56
Fall (Oct - Dec)	36.9	39.3	28
Notes: Data truncated prior to 1992 to remove decreasing trend.			

Table 21 TSS Data Summary - Conestogo River

Season	Mean TSS (mg/L)	75th percentile TSS (mg/L)	Number of observations
Winter (Jan - Mar)	22.5	24.5	16
Spring (Apr - Jun)	9.5	15.5	36
Summer (Jul- Sep)	12.1	14.4	47
Fall (Oct - Dec)	13.6	15.5	22
Notes: Data truncated prior to 1995 to remove decreasing trend.			

3.1.6 Nitrates

There is currently no PWQO for nitrate; however, there is a Canadian Water Quality Guideline (CWQG) for the protection of aquatic life of 2.93 mg/l-N. Review of Table 22 and Table 23 shows that the guideline is exceeded during all seasons in the Conestogo River and all seasons in Canagagigue Creek with the exception of the summer. The WWTMP (2007) identified lower concentrations based on data from the late 1970's for the Conestogo River. The dataset applied for this study is more representative of existing conditions.

There is also an Environment Canada Ideal Performance Standard (IPS) for nitrate of 4.7 mg/L-N. This value is based on the application of existing environmentally-beneficial agricultural production and management practices. Given the large agricultural pressures in both of the watersheds, the IPS is more appropriate to apply than the CWQG. The Conestogo River meets this standard in all seasons except winter. Canagagigue Creek meets the standard in summer only.

Table 22 Nitrate Data Summary - Canagagigue Creek

Season	Mean Nitrate (mg/L)	75th percentile Nitrate (mg/L)	Number of observations
Winter (Jan - Mar)	8.80	11.0	21
Spring (Apr - Jun)	6.48	7.85	22
Summer (Jul- Sep)	1.51	1.95	23
Fall (Oct - Dec)	4.58	6.10	22

Table 23 Nitrate Data Summary - Conestogo River

Season	Mean Nitrate (mg/L)	75th percentile Nitrate (mg/L)	Number of observations
Winter (Jan - Mar)	4.92	5.35	16
Spring (Apr - Jun)	4.09	4.63	36
Summer (Jul- Sep)	2.36	3.12	49
Fall (Oct - Dec)	2.75	3.91	27

3.2 Low Flow Analysis

3.2.1 Canagagigue Creek

Ideally, an assimilative capacity analysis is undertaken using low-flow estimates generated for the receiving water immediately upstream of the WWTP discharge. Unfortunately, for Canagagigue Creek the closest station is located downstream of the discharge and includes the flows contributed by the WWTP.

The station ID for the flow gauge is 02GA023 and is operated by the Water Survey of Canada (WSC). The station has a period of record from 1956 - 2006. A review of the annual 7-day low flow time series (see Figure 1) shows that low flows appear to increase around 1980. This increase is likely caused by regulation of Canagagigue Creek at the Woolwich Dam. As such, 7Q20 seasonal statistics were calculated on a truncated dataset that extended from 1980 - 2006 using the lowest observed drought methodology (see Table 24).

The Woolwich Dam is operated by the GRCA under permit to take water number 1464-63SRDV for the purposes of flood control and low flow augmentation. The minimum target low flow from the reservoir is 0.3 m^3/s. A review of Figure 1 shows that it is not uncommon for the target to not be met which implies that there is some difficulty in maintaining the minimum flow. Further, the station depicted is further downstream and includes outflows from the Elmira WWTP. As such, the calculated 7Q20 statistics include the flows discharged by the Elmira WWTP plant. To generate a conservative 7Q20 flow estimate upstream of the WWTP, the Elmira WWTP ADF (3950 m^3/day or 0.046 m^3/s based on average daily flow of 2007 - 2009) was subtracted from the calculated 7Q20 statistics for station 02GA023.

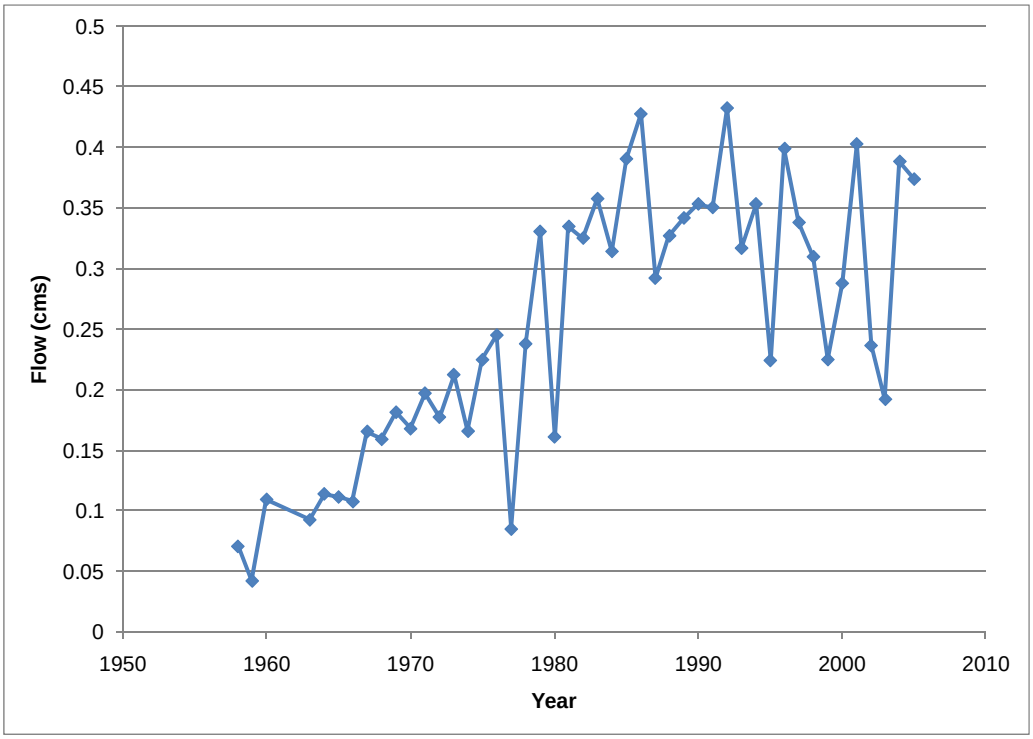


Figure 1 Annual Minimum 7-Day Low Flow - Canagagigue Creek

Table 24 7Q20 Estimates for Canagagigue Creek at Elmira Outfall

Season	7Q20 (m^3/s)	Estimated 7Q20 upstream of Elmira WWTP (m^3/s)
Winter (Jan - Mar)	0.194	0.148
Spring (Apr - Jun)	0.357	0.311
Summer (Jul- Sep)	0.293	0.247
Fall (Oct - Dec)	0.266	0.220
Notes: 7Q20 statistics based on the dataset from 1984 – 2006. 7Q20 upstream of Elmira WWTP = 7Q20 - Elmira WWTP ADF.		

These updated 7Q20 values are much lower than the back calculated value of 0.4 m^3/s that was applied in the 2007 WWTMP

3.2.2 Conestogo River.

Low flows upstream of the St. Jacobs WWTP were estimated based on three data sources:

1. WSC station 02GA006 (Conestogo River at St. Jacobs);
2. Grand River Conservation Authority (GRCA) station Conestogo River at St. Jacobs; and

3. WSC station 02GA028 (Conestogo River at Glen Allan).

Data sources 1) and 2) are located at the exact same location; therefore, these two data sources were combined to provide a longer period of record. Discussion with GRCA revealed that the GRCA data were not adjusted for ice effects and that the ice covered months would likely provide poor quality low flow data (despite this, seasonal values were calculated). Given the close proximity of the gauge to the outfall, it was not necessary to adjust the flows based on additional contribution areas.

Of the three data sources only the Conestogo River at Glen Allan had a sufficiently long period of complete record (all seasons) to evaluate the stationarity (e.g. do trends or jumps exist, if so the period of record is not stationary) of the annual low flow time series. A review of the annual 7Q20 low flow time series (see Figure 2) for the station revealed that there was a sharp shift in low flows in the 1980's. This shift is due to changing regulation policies made on the Conestogo River. The current regulation policies have been in place from 1984 to present, as such only data collected after 1983 were used in the low flow frequency analysis.

The Grand River Conservation Authority operates the Conestogo Dam for flood control and low flow augmentation; the minimum target low flow is the lesser of inflow into the reservoir or 2.1 m^3/s. The Glen Allan station is located a significant distance upstream of the St. Jacobs outfall; to estimate what the flow would be in the vicinity of the outfall the Glen Allan flows were pro-rated by area (i.e. [drainage area to St. Jacobs outfall] / [drainage area to Glen Allan] x [flow at Glen Allan]).

The resultant 7Q20 flows the stations evaluated are presented in Table 25. The table shows that the 7Q20 estimates for the Conestogo River in the vicinity of the St. Jacobs outfall align very well with the exception of the winter estimate. As the winter data has not be adjusted for ice affects it is not surprising that the 7Q20 estimate is higher. For the purposes of the assimilative capacity analysis the pro-rated value for Glen Allan was used to represent winter conditions. However, it is noted that there are distinct differences between the upstream and downstream portions of the basin. These differences include a highly regulated upper portion of the basin and the lower part having a split between high groundwater discharge and a flashy response. Despite these differences the Glen Allan winter estimate remains the best available.

Table 25 7Q20 Estimates for Conestogo River at St. Jacobs Outfall

Season	7Q20 Conestogo River at Glen Allan (m^3/s)	7Q20 Conestogo River at Glen Allan pro-rated to St. Jacobs[1] (m^3/s)	7Q20 Conestogo River at St. Jacobs (m^3/s)
Winter (Jan - Mar)	0.706	*0.965*[2]	1.80
Spring (Apr - Jun)	1.54	2.10	*1.96*[2]
Summer (Jul- Sep)	2.02	2.76	*2.96*[2]
Fall (Oct - Dec)	0.881	1.20	*1.37*[2]

Notes:
1. Pro-rate factor determined as (drainage area to St. Jacobs) / (drainage area to Glen Allan) = 790/578
2. Italicized values used for analysis

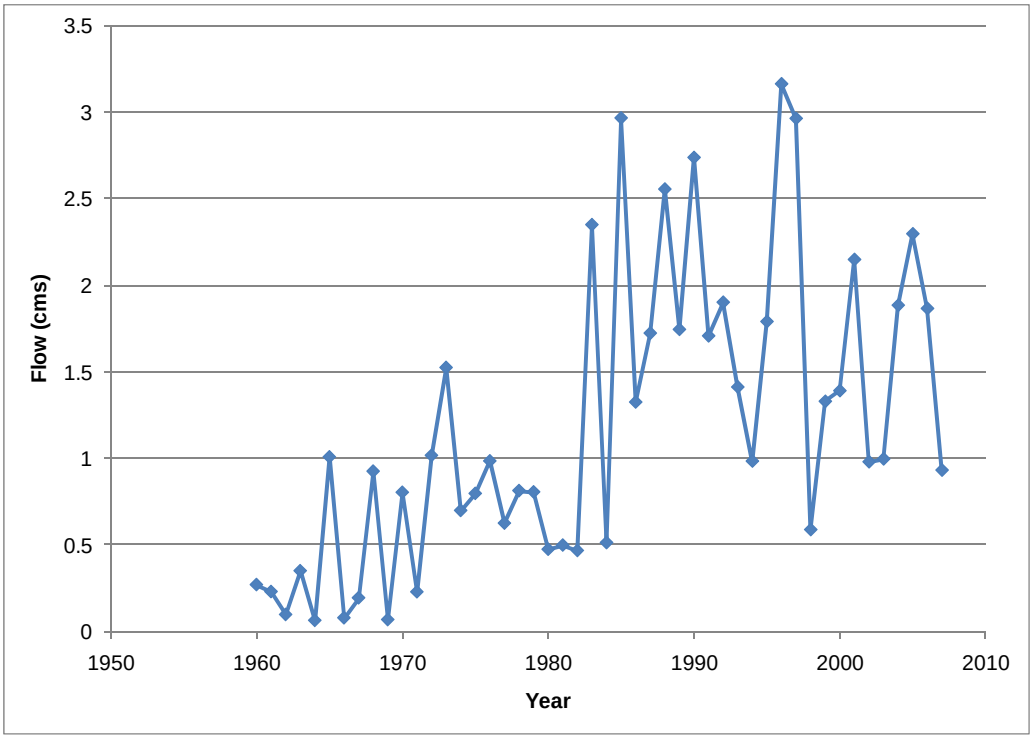


Figure 2 Annual Minimum 7-Day Low Flow - Conestogo River (Glen Allan)

The updated 7Q20 analysis shows that it is common for the 7 day low flow to drop below the 2.1 m^3/s applied in the 2007 WWTMP. For the purposes of this work the new seasonal estimates were deemed to be more appropriate and were therefore applied.

4. DETERMINATION OF EFFLUENT REQUIREMENTS

The goal of this section is to develop reasonable effluent limits for an expanded St. Jacobs WWTP based on the updated water quality and flow data. For St. Jacobs, two effluent limit sets were determined. The first is for St. Jacobs solely and the second is for St. Jacobs plus flows from Heidelberg if those flows are transferred to the St. Jacobs WWTP in the future for treatment. The projected flows for each of the WWTP's were developed in TM2 "St. Jacobs – Elmira Wastewater Treatment Master Plan Future Flow Projections" and are summarized in Table 26.

No effluent limits have been developed for the Elmira WWTP. TM7 "St. Jacobs – Elmira Wastewater Treatment Master Plan – Alternative Solutions" identified that the preferred alternative was to continue to reduce inflow / infiltration and to implement water efficiency programs in Elmira rather than expand the plant capacity. With these plans in place it is anticipated that the current C of A capacity would be adequate to meet the 2041 projected flows.

Table 26 Proposed Wastewater Flows

Plant	2041 Projected Flow (m^3/d)
Elmira	8,376 (7,842*)
St. Jacobs	2,093
St. Jacobs + Heidelberg	2,144
Notes: * 2041 projected flow with I/I and water efficiency programs in place.	

4.1 Current C of A Limits and Effluent Objectives

For a basis of comparison the current effluent compliance limits and effluent objectives for the Elmira and St. Jacobs WWTPs are summarized in Table 27 to Table 30, respectively. Elmira has a rated capacity of 7,800 m^3/d and St. Jacobs has a rated capacity of 1,450 m^3/d.

Table 27 Effluent Compliance Limits - Elmira WWTP

Effluent Parameter	Average Concentration (mg/L)	Average Waste Loading (kg/d)
$CBOD_5$	10.0	78.0
Total Suspended Solids	10.0	78.0
Total Phosphorus	0.5	3.9
Total Ammonia Nitrogen	0.7 (May 1 to Oct 31) 2.0 (Nov 1 to Apr 30)	5.5 (May 1 to Oct 31) 15.6 (Nov 1 to Apr 30)
E. Coli less than 200 organisms per 100 mL		
Non-Acutely Lethal to Rainbow Trout and *Daphnia Magna*		
pH of the effluent between 6.0 - 9.5, inclusive		
Non-compliance occurs if monthly averages are exceeded		

Table 28 Effluent Objectives - Elmira WWTP

Effluent Parameter	Concentration Objective (mg/L)
$CBOD_5$	5.0
Total Suspended Solids	5.0
Total Phosphorus	0.2
Total Ammonia Nitrogen	0.4 (May 1 to Oct 31) 1.0 (Nov 1 to Apr 30)
Maintain the pH off the effluent from the works within the range of 6.5 to 9.0, inclusive, at all times.	

Table 29 Effluent Compliance Limits - St. Jacobs WWTP

Effluent Parameter	Average Concentration (mg/L)	Average Waste Loading (kg/d)
BOD_5	10.0	14.5
Suspended Solids	10.0	14.5
Total Phosphorus	0.3	0.44
(Ammonia + Ammonium)-N	1.0 (May to Oct) 2.0 (Nov to Apr)	1.5 (May to Oct) 2.9 (Nov to Apr)
E. Coli less than 200 organisms per 100 mL		
Non-compliance occurs if monthly averages are exceeded		

Table 30 Effluent Objectives - St. Jacobs WWTP

Effluent Parameter	Average Concentration (mg/L)	Average Waste Loading (kg/d)
BOD_5	5.0	7.3
Suspended Solids	5.0	7.3
Total Phosphorus	0.2	0.3
(Ammonia + Ammonium)-N	0.7 (May to Oct) 1.0 (Nov to Apr)	1.0 (May to Oct) 1.5 (Nov to Apr)
E.Coli	100 organisms / 100 mL (monthly geometric mean density)	N/A

4.2 Total Phosphorus

As discussed in Section 2, the Conestogo River at St. Jacobs is Policy 2 with respect to TP. Therefore TP loadings must be maintained or reduced from existing levels. The existing C of A for the St. Jacobs WWTP has a compliance loading limit of 0.44 kg/d (i.e., 1,450 m^3/d x 0.3 mg/L). Accordingly, the expanded plant cannot exceed this 0.44 kg/d threshold. Effluent concentrations of total phosphorus required to maintain existing C of A loading with the future flows for each of the St. Jacob WWTP scenarios is summarized in Table 31.

Table 31 Future TP Effluent Limits – Based on C of A

Plant	Flow (m^3/d)	TP (mg/L)
St. Jacobs	2,093	0.20
St. Jacobs + Heidelberg	2,144	0.20

This compliance limit of 0.2 mg/L is near the limits of those achievable using best available technology (BAT). A further reduction in TP limits would likely require a more sophisticated level of treatment.

4.3 Ammonia

For ammonia limits, it was assumed that current MOE policy requiring a non-toxic effluent would apply. Extensive research by the US EPA and others has demonstrated that a non-toxic limit for un-ionized ammonia ranges between 0.1 and 0.5 mg/L depending on the fish species of interest. Therefore, a conservative non-toxic limit for un-ionized ammonia in the St. Jacobs WWTP effluent is 0.1 mg/L-NH_3.

In the proposed federal Wastewater Systems Effluent Regulations under the Fisheries Act, effluent toxicity limits are set to 1.25 mg/L un-ionized ammonia (at 15ºC). The assumption of un-ionized toxicity at 0.1 mg/L as discussed above is more stringent and thus the effluent limits discussed below are more conservative than required by the proposed federal regulation and would comply with the new regulation, once in effect.

The 75th percentile effluent un-ionized ammonia concentrations for the St. Jacobs WWTP was calculated following the same methodology described in Section 2.2.2. The resultant seasonal 75th percentiles are shown in Table 32.

Table 32 Existing Effluent Un-ionized Ammonia - St. Jacobs

Season	75th Percentile Dissociation (%)	75th percentile ammonia (mg/L-N)	75th percentile un-ionized ammonia (mg/L-NH_3)
Winter (Jan - Mar)	0.4	0.50	0.002
Spring (Apr - Jun)	0.5	0.13	0.001
Summer (Jul- Sep)	0.9	0.11	0.001
Fall (Oct - Dec)	0.5	0.12	0.001
Notes: The period of analysis is for the years 2008 and 2010.			

The maximum seasonal ammonia limits for the proposed expanded plant was determined as follows:

- identifying the critical dissociation ratio (ambient or effluent) for calculation of a non-acutely lethal discharge and ambient concentration of un-ionized ammonia;
- iterating the effluent ammonia to ensure that
  a. a non-acutely lethal un-ionized ammonia concentration does not occur; and
  b. under fully mixed conditions that the un-ionized ammonia concentration does not exceed the PWQO.
  c. for St. Jacobs the critical dissociation was found to be the ambient condition. The ambient dissociation ratio was used to calculate un-ionized ammonia concentrations for iterated effluent ammonia concentrations.

Table 33 shows the un-ionized ammonia percentages as well as the maximum ammonia that could be discharged without exceeding the end of pipe limit of 0.1 mg/L-NH_3 and maintaining a fully mixed un-ionized ammonia concentration less than 0.02 mg/L-NH_3 for the expanded St. Jacobs WWTP.

Table 33 Ammonia Effluent Limit Determination - St. Jacobs

Season	75th Percentile of River Percent Un-ionized Ammonia (%)	Maximum Allowable Ammonia Concentration (mg/L-N)	End of Pipe Un-ionized Ammonia Concentration (mg/L-NH_3)	Mixed Stream Un-ionized Ammonia Concentration (mg/L-NH_3)
Winter (Jan - Mar)	1.4	5.9	0.1	0.006
Spring (Apr - Jun)	10	0.81	0.1	0.014
Summer (Jul- Sep)	11	0.75	0.1	0.016
Fall (Oct - Dec)	4.0	2	0.1	0.010
Notes: These values are applicable to both the St. Jacobs and the St. Jacobs + Heidelberg flows.				

For St. Jacobs, the effluent ammonia concentration is controlled by toxicity at the end of pipe rather than the totally mixed downstream un-ionized ammonia. The final proposed Ammonia effluent limits are shown in Table 34.

Table 34 Proposed Ammonia Compliance Limits

Discharge Period	St. Jacobs Ammonia Limit (mg/L)
November 1 - April 30	2.0
May 1 - October 31	0.75

Notes:
Discharge concentrations were modified from the original seasons to account for the varying ambient water temperatures. Cooler water temperatures are often observed in November, December and April which results in a smaller dissociation ratio and therefore higher limits are appropriate.

Canadian Environmental Protection Act (CEPA) requirements for ammonia were also considered. CEPA defines ammonia as "toxic" under Section 64 due to its deleterious effect on several species of freshwater organisms, and ammonia appears on the Priority Substances List (PSL). Also, if total ammonia (NH_3 + NH_4) in the effluent exceeds 20 mg/L (or 16 mg/L NH_3-N) during the months of June through the end of September, and pH exceeds 7.5, CEPA would require preparation of a pollution prevention plan. These limits are applicable for wastewater flows in excess of 5,000 m^3/d. The final proposed ammonia limits for the St. Jacobs WWTP will meet CEPA requirements.

4.4 BOD_5

As discussed above, the Conestogo River is Policy 1 with respect to DO and the concentrations of BOD_5 are low it is expected that there is significant assimilative capacity available for BOD_5. It is therefore proposed to maintain the existing effluent BOD_5 compliance limit of 10 mg/L.

4.5 Total Suspended Solids

It is proposed that the current effluent limit of 10 mg/L be maintained. A review of the ambient water quality shows that under 75th percentile concentrations that the plant will actually dilute in-stream TSS concentrations.

4.6 Effluent Disinfection

Sewage discharges to surface waters can constitute a significant input source of pathogens to the receiving waters. Therefore, to protect the recreational use of the Conestogo River in the vicinity of the WWTP outfall, it is recommended that the expanded plant continue to include a compliance limit for *E.coli* of 200 CFU/100 mL with a design objective of 100 CFU/100 mL.

The St. Jacobs filtered effluent passes through an ultraviolet (UV) disinfection system. The plant also has backup chlorination for disinfection of any occurrences such as raw sewage bypass, influent works bypass, plant service and emergency effluent discharge disinfection.

The Canadian Environmental Protection Act (CEPA) pollution prevention plans legislate effluent total residual chlorine limits of 0.02 mg/L. There are no total residual chlorine limits in the current C of As as the main disinfection process is through UV irradiation. This disinfection process would continue to be used for the future expansion and therefore, it is recommended that no compliance limits for total residual chlorine be set for the St. Jacobs WWTP.

5. MIXING ZONE ANALYSIS

5.1 Introduction

An analysis was conducted to determine the extent of the St. Jacobs WWTP effluent mixing zone for ammonia. A mixing zone is defined as an area of water contiguous to a point source where water quality does not comply with one or more of the PWQOs. A mixing zone must be designed to be as small as possible and is one factor in establishing effluent requirements. Conditions within a mixing zone must not result in toxic conditions or interfere with water supply, recreational or other water uses[1]. The analysis was conducted for projected future operating conditions.

5.2 Methodology

The analysis was conducted using the U.S. Environmental Protection Agency (EPA) mixing zone model Cornell Mixing Zone Expert System CORMIX Version 6.0. The St. Jacobs WWTP has a surface discharge outfall and based on this CORMIX3 was applied for plume delineation. The model was used to predict the extent of the mixing zone in terms of both length and width downstream of the discharge.

Four ammonia scenarios were modelled for the St. Jacobs WWTP, winter, spring, summer and fall. The model was populated using the ammonia limits described in Section 4.3, 75th percentile monthly temperatures collected in the stream and wastewater and 7Q20 streamflows. Stream velocities and cross sectional areas were estimated using historical HEC-RAS models obtained from the GRCA for the Conestogo River.

It is noted that the modelling discussed below is in reference to the existing outfall configuration. Assessing effects of different outfall configurations on the mixing plume was beyond the scope of this report. It is noted that different outfall configurations would have an impact on the mixing zones.

5.3 St. Jacobs WWTP Model

Mixing zone analysis for total ammonia was completed for St. Jacobs and Heidelberg flows combined. Mixing zones for St. Jacobs only would be marginally smaller.

The St. Jacobs WWTP outfall consists of a pipe and concrete headwall that discharges at approximately 45 degrees towards the upstream flow. The pipe diameter is 0.525 metres. The parameters applied for the St. Jacobs model are summarized in Table 35.

[1] Ministry of Environment, 1994. "Water Management: - Policies, Guidelines and Provincial Water Quality Objectives".

Table 35 CORMIX3 Parameters - St. Jacobs

Model Input	Winter	Spring	Summer	Fall
Ambient Parameters				
7Q20 Flow (m^3/s)	0.965	1.96	2.96	1.37
Average depth at discharge (m)	0.85	0.9	1.1	0.88
Depth at discharge (m)	0.60	0.69	0.89	0.67
Ambient 75th percentile temperature (ºC)	3.3[1] (Mar)	17.7 (Jun)	22.4 (Jul)	6.1 (Nov)
Wind speed (m/s)	2.0			
Manning's n	0.03			
Ambient 75th percentile NH_3 (mg/L-N)	0.201	0.101	0.110	0.168
Outfall Parameters				
Discharge located on bank	Right			
Discharge configuration	flush			
Outfall Angle relative to flow (degrees)	135			
Channel side slope (degrees)	30[2]			
Local depth at discharge (m)	0.60	0.69	0.89	0.67
Discharge outlet	Pipe			
Pipe diameter/channel width (m)	0.525			
Depth in pipe/channel (m)	0.1			
Discharge Parameters and PWQO				
Proposed ADF (m^3/d)	2,144			
Proposed $NH_{3\text{-}N}$ compliance limits (mg/L-N)	2	0.75	0.75	2
Effluent Temperature (ºC)	7.4	17.8	20.7	11.7
NH_3 concentration that results in an unionized ammonia concentrations equal to the PWQO[3] (mg/L-N)	1.17	0.161	0.148	0.410

Notes:
Concentrations in table are actual values; to convert to excess concentrations for use in CORMIX subtract the ambient value from the proposed ammonia limit and calculated PWQO.
For instances when the effluent was cooler than the ambient water the temperatures were switched.
1. Temperature value of 4.7 was applied in model as water has equivalent density at this temperature.
2. Assumed channel slope value.
3. NH_3-N concentration was solved by iterating ammonia concentrations with the 75th percentile dissociation ratio to calculate an un-ionized ammonia concentration of 0.02 mg/L

5.4 CORMIX Modeling Results

The extent of the mixing is summarized in Table 36. For all scenarios the constraint of a non-acutely lethal toxic effluent was satisfied; under the compliance limits un-ionized ammonia concentrations are expected to be about 0.1 mg/L-N. The mixing zone is expected to be less than 25 percent of the channel for all seasons.

Based on the small mixing zones and ease of passage, the proposed limits are reasonable.

Table 36 CORMIX Outputs - St. Jacobs

Scenario	Mixing Zone Length (m)	Mixing Zone Width (m)	Percent Zone of Passage
Winter	1.17	1.02	97
Spring	1.26	2.48	92
Summer	0.9	2.76	91
Fall	2.68	3.38	89

It is worth noting that these proposed Total Ammonia – Nitrogen (TAN) limits are at or near the Limit of Technology (LOT).

6. SUMMARY

- The WWTMP (2007) was reviewed and summarized in general for the two plants of interest: St. Jacobs and Elmira. The data sources applied were outdated and analyses were conducted using annual data as opposed to seasonal. The level of detail for the Elmira and St. Jacobs was much less than that provided for the larger WWTPs.
- Ambient water quality and quantity datasets were updated with more recent information since the completion of the 2007 WWTMP.
- Policy status was defined for several parameters.
  - Canagagigue Creek and the Conestogo River were both MOE Policy 2 for TP and *E.coli.*
  - Canagagigue Creek and the Conestogo River were both MOE Policy 1 for un-ionized ammonia and dissolved oxygen.
- The CWQG (2.93 mg/L-N) for nitrate was exceeded for most seasons for both receivers. Given the agricultural setting for both receivers, it is suggested that the Environment Canada Ideal Performance Standard (4.7 mg/L-N) be applied rather than the CWQG guideline. If the IPS is used, the Conestogo River exceeds this value only in the winter, while Canagagigue Creek exceeds this value in most seasons still.
- TAN mixing zone analysis was completed for the St. Jacobs WWTP. The mixing zones are reasonable in extent and are less than 25 percent of the channel width.
- Based on this analysis, effluent compliance limits and effluent objectives for the St. Jacobs WWTP are summarized below in Table 37 and Table 38.
- TP limits are at or near BAT; TAN limits are at or near LOT.

Table 37 Effluent Compliance Limits - St. Jacobs WWTP

Effluent Parameter	Average Concentration (mg/L)	Average Waste Loading (kg/d)
$CBOD_5$	10.0	21.4
Total Suspended Solids	10.0	21.4
Total Phosphorus	0.2	0.43
Total Ammonia Nitrogen	0.75 (May to Oct) 2.0 (Nov to Apr)	1.6 (May to Oct) 4.3 (Nov to Apr)
E. Coli less than 200 organisms per 100 mL		
Note: The determined effluent limits assume that the flows presented in Table 26 will be used for the design; other options of pumping all or some of St. Jacobs flows to other locations has not been evaluated.		

Table 38 Effluent Objectives - St. Jacobs WWTP

Effluent Parameter	Average Concentration (mg/L)	Average Waste Loading (kg/d)
$CBOD_5$	5.0	10.7
Total Suspended Solids	5.0	10.7
Total Phosphorus	0.15	0.32
Total Ammonia Nitrogen	0.5 (May to Oct) 1.0 (Nov to Apr)	1.1 (May to Oct) 2.2 (Nov to Apr)
E.Coli less than 100 organisms / 100 mL (monthly geometric mean density)		
pH of the effluent between 6.5 - 9.0, inclusive		

7. REFERENCES

Earth Tech Canada Inc. (August 2007), Region of Waterloo: Wastewater Treatment Master Plan - Final Report.

Gore & Storrie (March 1995). Regional Municipality of Waterloo Wastewater Treatment Master Plan 1991-2021.

Ministry of Environment and Energy (July 1994), Deriving Receiving-Water Based Point-Source Effluent Limits for Ontario Waters.

Ministry of Environment and Energy (July 1994), Water Management: Policies, Guidelines, Provincial Water Quality Objectives.

United States Geological Survey (2003). Comparison and Continuous Estimates of Fecal Coliform and Escherichia Coli Bacteria in Selected Kansas Streams, May 1999 Through April 2002. Water Resources Investigations Report 3-4056.

XCG Consultants Ltd. (March, 2011). Technical Memorandum No. 2 St. Jacobs – Elmira Wastewater Treatment Mater Plan Future Flow Projections.

XCG Consultants Ltd. (July, 2011). Technical Memorandum No. 7 St. Jacobs – Elmira Wastewater Treatment Mater Plan Alternative Solutions.

EXCELLENCE IN ENVIRONMENTAL CONSULTING SERVICES

Date: December 2, 2010 **XCG File No.: 3-035-51-01**

To: Pam Law (Region of Waterloo)

cc: Stephen Nutt (XCG)

From: Janet Noyes (XCG)

Re: St. Jacobs and Elmira WWTP Monitoring Program

1. INTRODUCTION

As laid out in the St. Jacobs - Elmira Wastewater Treatment Master Plan Technical Proposal/Detailed Workplan (XCG & HMM, 2010), there is a requirement to develop and execute a water quality monitoring program as part of the Master Plan. Information collected under the program is to be used to develop a database for future use by the Region. The collected data will be useful for future projects wherein data are required to define ambient water quality conditions and a source of information for mixing zone analysis. It should be noted that this data is not intended to be used in the concurrent assimilative capacity analysis.

The following memorandum provides details on the proposed sample locations and the sampling methodology. Sampling protocol was set up to closely reflect the Surface Water Quality Monitoring Program - Standard Operating Procedures (SOP) developed by LGL Ltd. (October 2010).

2. SAMPLING LOCATIONS

On November 8. 2010, representatives from the Region of Waterloo, XCG and LGL field staff conducted field reconnaissance in the vicinity of the St. Jacobs and Elmira wastewater treatment plants (WWTPs). The goal of this field work was to select locations that would provide representative water quality data for future assimilative capacity analysis. The representative data to be collected at each location is described below:

Upstream of the St. Jacobs WWTP on the Conestogo River (STATION ID: ST JACOBS US): this location is to be used to define stream water quality conditions upstream of the St. Jacobs WWTP discharge.

XCG Consultants Ltd.
6 Cataraqui Street
Woolen Mill
West Wing, Suite 105
Kingston, Ontario
K7K 1Z7
Tel: (613) 542-5888
Fax: (613) 542-0844
E-mail:
kingston@xcg.com

Downstream of the St. Jacobs WWTP on the Conestogo River (STATION ID: ST JACOBS DS NEAR): this location is to be used to formulate a dataset of water quality conditions within the St. Jacobs WWTP effluent mixing zone.

Upstream of the Elmira WWTP on Canagagigue Creek (STATION ID: ELMIRA US): this location is to be used to define stream water quality conditions upstream of the Elmira WWTP discharge.

Downstream of the Elmira WWTP on Canagagigue Creek (STATION ID: ELMIRA DS NEAR): this location is to be used to formulate a dataset of water quality conditions within the Elmira WWTP effluent mixing zone.

Several candidate locations were examined for each sampling point. The final locations were agreed to by both XCG and LGL staff (the approximate UTM co-ordinates for the proposed sample locations are summarized in Table 1).

Table 1 Approximate co-ordinates of proposed sampling stations.

STATION ID	Zone	Easting	Northing
ST JACOBS US	17 T	536091	4821015
ST JACOBS DS NEAR	17 T	536578	4820497
ELMIRA US	17 T	536360	4826615
ELMIRA DS NEAR	17 T	536368	4826564
Notes: Detailed description of STATION ID provided below			

Another goal of the sampling program was to make it consistent with the "Surface Water Quality Monitoring Program for the Grand and Nith Rivers Standard Operating Procedures" (LGL Limited, 2010). Table 2 has been populated with the required station information; the reader is referred to the aforementioned document for clarification.

Table 2 Water quality station details.

STATION ID	Location	Seasonal Notes	Sample Type	Sample Collection
ST JACOBS US	From bridge on King St., upstream side.	If frozen in winter do not sample.	Composite	Bridge
ST JACOBS DS NEAR	Access via walking trail from community centre.	If frozen in winter do not sample.	Discrete	Reaching pole
ELMIRA US	Access via access road from Elmira WWTP	If frozen in winter do not sample.	Composite	Wading
ELMIRA DS NEAR	Access via access road from Elmira WWTP	If frozen in winter do not sample. Not sampled if stream flows are unsafe.	Discrete	Reaching Pole

Composite samples will be collected as described in the LGL SOP: a stainless steel bucket is used to collect three discrete samples across the width of the river and are

mixed in another stainless steel bucket. The composite sample will be collected from the mixed bucket.



Figure 1 Sampling Locations for Elmira WWTP

Of note, the Elmira DS Near Station is located directly upstream of the Chemtura Outfall.

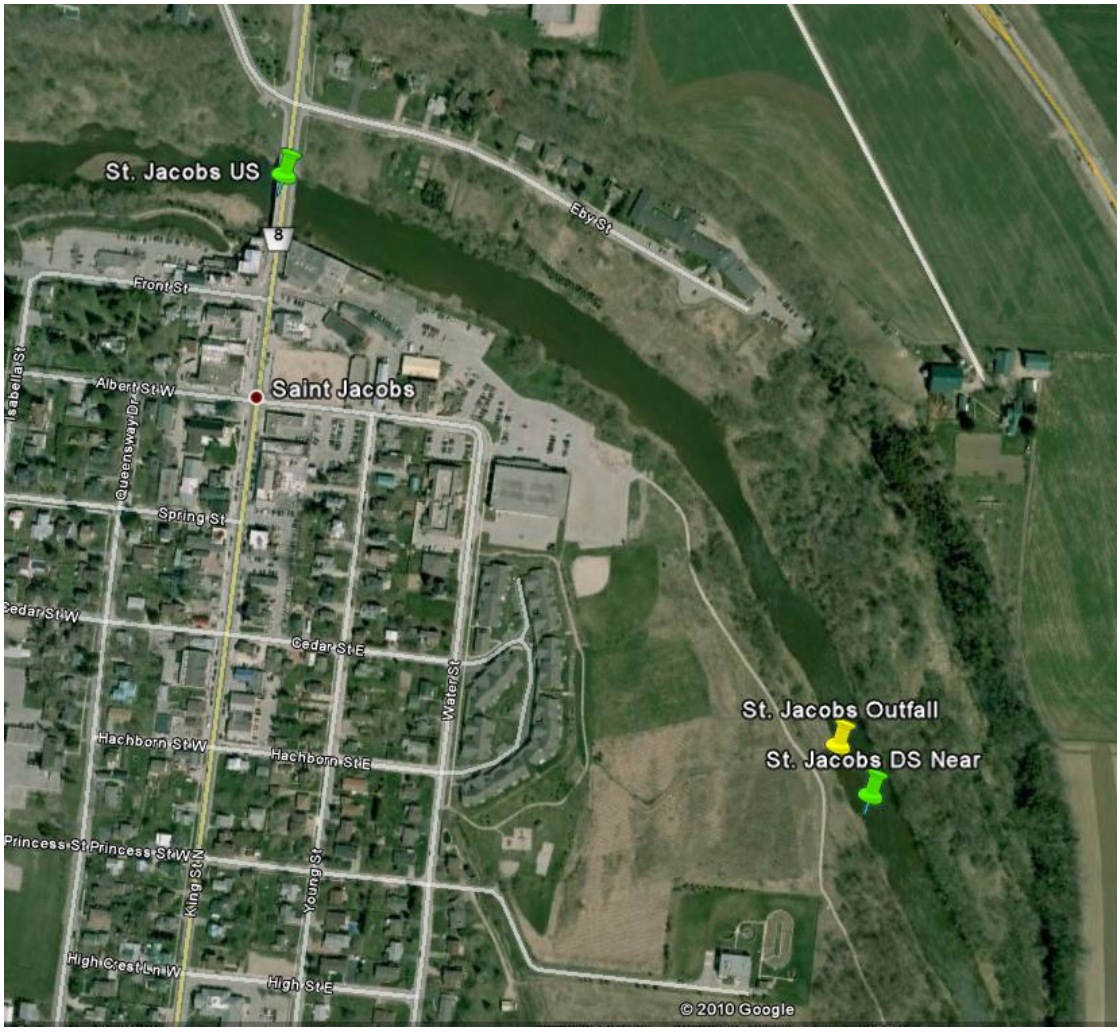


Figure 2 Sampling Locations for St. Jacobs WWTP

3. WATER QUALITY PARAMETERS OF INTEREST

The sampling program that will be used for the assimilative capacity study for the Master Plan is administered by the Grand River Conservation Authority (GRCA) as part of the Provincial Water Quality Monitoring Network (PWQMN). The sampling program described in this memorandum will be used to refine future assimilative capacity investigations and the parameter list required for assimilative capacity analysis is shorter than the required parameter list for the PWQMN samples. Required in-stream parameters for assimilative capacity analysis are summarized in Table 3 while parameters measured through stream sampling and submissions to a certified laboratory are summarized in Table 4. There are a few parameters in addition to those required specifically for the assimilative capacity assessment but these had been added to the parameter list to be consistent with the LGL SOP and the parameters requested by the Region.

Table 3 Required In-Stream Sampling Parameters

Parameter	PWQMN Code	Rationale
Field temperature	FWTEMP	Necessary to determine un-ionized ammonia.
Field pH	FWPH	Necessary to determine un-ionized ammonia.
Dissolved Oxygen	DO	Necessary for defining Policy conditions of receiver.
Conductivity	CONDAM	For consistency with other Region of Waterloo stations.

Table 4 Required Laboratory Sampling Parameters

Parameter	PWQMN Code	Rationale
5-day Biological oxygen demand	BOD5	Necessary for defining ambient conditions.
Total suspended solids	TSS	Necessary for defining ambient conditions.
Total phosphorus	PPUT	Necessary for defining Policy conditions of receiver.
Total ammonia	NNHTUR	Necessary to determine un-ionized ammonia.
E.coli	EC	Necessary for defining Policy conditions of receiver.
Nitrate	NN03UR	Currently not necessary. Likely to have a PWQO in the near future.
Nitrite	NNO2UR	For consistency with other Region of Waterloo stations.
Total Kjeldahl Nitrogen	NNTKUR	For consistency with other Region of Waterloo stations.
Chloride	CLIDUR	For consistency with other Region of Waterloo stations.
Orthophosphate	PPO4FR	For consistency with other Region of Waterloo stations.

Samples will be collected following the Standard Operating Procedures with the exception that an equivalent to the YSI 600QS sonde will be used.

4. CLOSING

The presented brief monitoring program will provide a database for future assimilative capacity analysis information. Further, the program will easily integrate within the existing monitoring program being executed by the Region of Waterloo.

XCG CONSULTANTS LTD.
T 613 542 5888 F 613 542 0844 | kingston@xcg.com
6 Cataraqui Street, Woolen Mill, West Wing, Suite 105, Kingston, Ontario, Canada K7K 1Z7

Date: March 6, 2012 **XCG File No.: 3-035-50-01**

To: Pam Law, RoW

cc: Stephen Nutt, XCG

From: Janet Noyes, XCG; Colin Clarke, XCG

Re: Conestogo River Water Quality Data Comparison:
St. Jacobs Monitoring Program Data vs. Data Collected at the Glen Allan PWQMN Station

1. INTRODUCTION

XCG Consultants Ltd. (XCG) is pleased to submit the following memo detailing the water quality data comparison between the Provincial Water Quality Monitoring (PWQMN) station 16018407702 (herein referred to as Glen Allan) versus the St. Jacobs monitoring program data. This work was commissioned by Ms. Pam Law of the Region of Waterloo on February 14, 2012.

As part of previous work for the St. Jacobs and Elmira Wastewater Treatment Master Plan, XCG collected biweekly water quality data both upstream and downstream of the St. Jacobs WWTP outfall in the Conestogo River (December 2010 to November 2011). The water quality data used in the Master Plan assimilative capacity study for the St. Jacobs WWTP was from the Glen Allan station, which is 28 km upstream of the WWTP outfall, had recent data (1975 to 2010).

This memo presents a comparison (statistically where possible) between the data collected at the Glen Allan and St. Jacobs stations. It was completed to identify whether or not the background data used for the effluent limit determination for the St. Jacobs WWTP in TM#3: *Determination of Effluent Requirements for the Elmira and St. Jacobs Wastewater Treatment Plants* (XCG, 2011) was valid and if the data collected at St. Jacobs would result in changes to the proposed effluent limits.

2. COMPARISON OF MONITORING DATA BETWEEN GLEN ALLAN AND ST. JACOBS

2.1 Total Phosphorus

The mean TP concentration for the 23 samples collected at St. Jacobs was 0.105 mg/L with a 75th percentile concentration of 0.120 mg/L (n = 23).

The seasonal data used in the original assessment from the Glen Allan station is shown in Table 1; an annual value is now also included in the table.

Table 1 TP Data Summary for Glen Allan

Season	Mean TP (mg/L)	75th percentile TP (mg/L)	Number of observations
Winter (Jan - Mar)	0.108	0.149	22
Spring (Apr - Jun)	0.062	0.076	42
Summer (Jul- Sep)	0.070	0.078	53
Fall (Oct - Dec)	0.081	0.086	30
Annual	0.076	0.086	147
Notes: Data truncated prior to 1993 to remove decreasing trend.			

Because the data was not normally distributed, a non-parametric analysis was required. To compare if there was a statistically significant difference between the annual means of the data collected at the Glen Allan and St. Jacobs stations the Mann-Whitney non-parametric test was applied. Using a two-tailed test at a 95% level of significance there was no statistically significant difference between the means.

Given that there is no statistically significant difference in the means, the data from Glen Allan should provide a reasonable estimate of TP concentrations upstream of the St. Jacobs WWTP. The receiver is Policy 2 with respect to TP.

Even though there were small differences noted in the calculated 75th percentile concentrations there would be no impact on the proposed TP limit of 0.2 mg/L, which is near the limits using best available technology (BAT), as the proposed limit was based on maintaining the existing loading to the stream.

2.2 Unionized Ammonia

In both the Glen Allan data and the St. Jacobs data, the un-ionized ammonia was synoptically calculated using data for total ammonia, pH and temperature. The seasonal and annual concentrations of unionized ammonia are summarized in Table 2 for the Glen Allen data. The mean and the 75th percentile unionized ammonia concentrations for St. Jacobs were 0.006 and 0.009 respectively (n = 23).

To compare if there was a statistically significant difference between the annual means of the data collected at the Glen Allan and St. Jacobs stations the Mann-Whitney non-parametric test was applied; again due to the fact that the data was not normally distributed. Using a two-tailed test at a 95% level of significance there was no statistically significant difference between the means. As such, the data from Glen Allan should provide a reasonable estimate of conditions upstream of the St. Jacobs WWTP.

Table 2 Unionized Ammonia Data Summary for Glen Allan

Season	Mean Un-NH3 (mg/L-NH3)	75th percentile Un-NH3 (mg/L-NH3)	Number of observations
Winter (Jan - Mar)	0.003	0.003	15
Spring (Apr - Jun)	0.007	0.007	36
Summer (Jul- Sep)	0.007	0.008	46
Fall (Oct - Dec)	0.006	0.007	21
Annual	0.006	0.007	118
Notes: Data truncated prior to 1995 to remove decreasing trend.			

Qualitatively the means are the same on an annual basis (comparing on a seasonal basis is less than ideal due to the small sample sizes); the 75th percentiles are also similar. It should be noted that due to ice conditions three samples during the winter season could not be collected, it is expected that these samples likely would have been lower and if included would have reduced the 75th percentile concentration.

The data confirms that the receiver is Policy 1 with respect to unionized ammonia.

2.2.1 Dissociation Ratio

From the earlier study the critical dissociation ratio for use in determining acceptable effluent ammonia limits was found to be the ambient condition. The applied dissociation ratios from the Glen Allan station are summarized in Table 3 along with the dissociation ratios calculated from the new data collected at St. Jacobs. With the exception of the winter value the dissociation ratio at St. Jacobs is always lower (a statistical comparison was not completed due to the small seasonal sample sizes at St. Jacobs).

Table 3 Dissociation Data Summary for Glen Allan

Season	Glen Allan 75th Percentile Dissociation (%)	St. Jacobs 75th Percentile Dissociation (%)
Winter (Jan - Mar)	1.4	2.0
Spring (Apr - Jun)	10	5.3
Summer (Jul- Sep)	11	7.8
Fall (Oct - Dec)	4.0	3.0

If the St. Jacobs winter 75th percentile dissociation ratio is combined with the proposed effluent limit for winter was 2.0 mg/L-N which would result in an end of pipe concentration of 0.048 mg/L-NH_3 and a fully mixed in stream concentration of 0.006 mg/L-NH_3. Accordingly, the proposed effluent limits of 2.0 mg/L from Nov 1 - Apr 30 and 0.75 mg/L from May to Oct 31 are still appropriate. However, given the

lower observed summer dissociation ratios there may be an argument for less stringent summer effluent limits.

2.3 BOD_5

All BOD_5 samples (n = 23) collected at St. Jacobs were less than the 2 mg/L detection limit, with the exception of two samples, one of which had a BOD_5 concentration of 3 mg/L and the other had a concentration of 2 mg/L. A conservative estimate of the 75th percentile BOD_5 concentration based on the collected monitoring data is 2.0 mg/L.

The 75th percentile concentration from the Glen Allan data was 2.10 mg/L; there were 15 data points and the dataset ended in 1988. A statistical comparison of the Glen Allan mean and the monitoring data mean was not completed due to the large amount of censored data in the monitoring dataset.

The monitoring data confirms that that the 2.10 mg/L used in the previous study was a conservative estimate of the 75th percentile. There would be no impact on the proposed BOD_5 limits.

2.4 Dissolved Oxygen

All dissolved oxygen concentrations measured (n = 23) at St. Jacobs were above the PWQO; the range of concentrations was 6.33 - 17.69 mg/L. A similar range was observed at the Glen Allan Station 6.10 - 22.00 mg/L. Both stations suggest the receiver is Policy 1 with respect to dissolved oxygen. However, as noted earlier by the MOE reviewer no diurnal measurements of dissolved oxygen have been made at either location. It is expected that diurnal measurements will be required before acceptance of the final assimilative capacity assessment.

2.5 Total Suspended Solids

Approximately 50% of the samples collected (n = 23) at St. Jacobs were less than the detection limit of 10 mg/L. If the non-detects are replaced with the detection limit of 10 mg/L the resultant mean is 19.7 mg/L and the 75th percentile is 19.0 mg/L.

The 75th percentile seasonal and annual concentrations from the Glen Allan data are shown in Table 4. A statistical comparison of the Glen Allan mean and the monitoring data mean was not completed due to the large amount of censored data in the monitoring dataset.

The monitoring data does suggest that the 75th percentile concentrations at Glen Allan would be representative of conditions directly upstream of the St. Jacobs WWTP. This suggests that there would be no impact on the proposed TSS limits.

Table 4 TSS Data Summary for Glen Allan

Season	Mean TSS (mg/L)	75th percentile TSS (mg/L)	Number of observations
Winter (Jan - Mar)	22.5	24.5	16
Spring (Apr - Jun)	9.5	15.5	36
Summer (Jul- Sep)	12.1	14.4	47
Fall (Oct - Dec)	13.6	15.5	22
Annual	13.0	17.0	121

Notes:
1. Data truncated prior to 1995 to remove decreasing trend.

2.6 Nitrates

The mean nitrate concentration for the 23 samples collected at St. Jacobs was 4.49 mg/L with a 75th percentile concentration of 5.95 mg/L (n = 23).

The seasonal data used in the original assessment from the Glen Allan station is shown in Table 5; an annual value is now also included in the table.

To compare if there was a statistically significant difference between the annual means of the data collected at the Glen Allan and St. Jacobs stations the Mann-Whitney non-parametric test was applied. Using a two-tailed test at a 95% level of significance there was a statistically significant difference between the means.

The result is that the data previously used is not representative of the conditions upstream of the St. Jacobs WWTP.

However, the nitrate concentrations continue to exceed the Canadian Water Quality Guideline (CWQG) for the protection of aquatic life (2.93 mg/L-N). No limits were set for nitrate so there is no impact on the proposed effluent limits.

Table 5 Nitrate Data Summary for Glen Allan

Season	Mean Nitrate (mg/L)	75th percentile Nitrate (mg/L)	Number of observations
Winter (Jan - Mar)	4.92	5.35	16
Spring (Apr - Jun)	4.09	4.63	36
Summer (Jul- Sep)	2.36	3.12	49
Fall (Oct - Dec)	2.75	3.91	27
Annual	3.25	4.32	128

3. SUMMARY

The data from Glen Allan and St. Jacobs were compared and the following was found:

- There is no statistical difference between the TP means at the two monitoring locations. The receiver is Policy 2 with respect to TP. There is no impact on the proposed TP effluent limit.
- There is no statistical difference between the unionized ammonia means at the two monitoring locations. The receiver is Policy 1 with respect to unionized ammonia.
- There were some small differences in the dissociation ratio used to determine the proposed effluent ammonia concentration. In general, the St. Jacobs dissociation ratio was always smaller with the exception of winter. Despite this the proposed limits would still be acceptable for winter conditions. There may be a case to have less stringent ammonia limits in the summer.
- Nearly all of the BOD_5 values measured at St. Jacobs were below the detection limit (2 mg/L); a conservative value of 2.0 mg/L was used as the 75th percentile concentration. This is very similar to that observed at Glen Allan. There is expected to be no impact on the proposed BOD_5 effluent limit.
- Dissolved oxygen concentrations at Glen Allan and St. Jacobs were in the same range. Both stations support that the receiver is Policy 1 with respect to dissolved oxygen. It is anticipated that before a more detailed assimilative capacity is finalized that continuous diurnal dissolved oxygen measurements will be required.
- TSS concentrations were similar at both Glen Allan and St. Jacobs. Approximately half of the TSS observations at St. Jacobs were less than the detection limit of 10 mg/L. Due to the large number of non-detects a statistical comparison was not complete. Despite this no impacts on the proposed TSS effluent limit is expected.
- There was significant difference in nitrate concentrations between the Glen Allan and St. Jacobs nitrate concentrations. Concentrations at both locations exceed the CWQG. No limit was set for nitrate.

Ministry of the Environment
West Central Region

119 King Street West
12th Floor
Hamilton, Ontario L8P 4Y7
Tel.: 905 521-7640
Fax: 905 521-7820

Ministère de l'Environnement

119 rue King ouest
12e étage
Hamilton (Ontario) L8P 4Y7
Tél. : 905 521-7640
Téléc. : 905 521-7820

Ontario

October 31, 2011

Ms P. Law
Water Services, Region of Waterloo
150 Frederick Street, 7th Floor
Kitchener, Ontario
N2G 4J3

Dear Ms. Law:

Re: St. Jacobs – Elmira Wastewater Treatment Master Plan
Technical Review of Draft Technical Memorandum #3

Further to our meeting of October 25, 2011, we trust that the following comments will assist you in subsequent stages of this Master Plan. It is understood that the Regional Municipality of Waterloo is anticipating development in the St. Jacobs area which would present a wastewater servicing demand beyond the plant's current hydraulic capacity. To meet this demand, expansion of the St. Jacob's facility is being considered. Accordingly, XCG has completed preliminary work to determine effluent requirements for an expanded facility. XCG's findings to date were presented in Draft Technical Memorandum #3 which we have now reviewed.

Comments on the Draft Technical Memorandum #3

The comments in the following are a combination of questions, requests for clarification or comments which we feel are relevant to the assessment:

1. The approach taken in the 2007 Wastewater Master Plan was to limit assessment of the Region's smaller plants to a mass balance evaluation. While a simple mass balance exercise, if done properly (good database at appropriate locations), can provide ball-park assessment of the impact of a discharge, it is unlikely to be suitable as an assimilative capacity study.

2. Should expansion of the current plant be determined as the preferred alternative, a true assimilative capacity study will have to be conducted and include ground-truthing of assimilative parameters. Past studies and historical data collections can be used to supplement current data collections, providing it can be demonstrated that they are part of the same dataset or that a scientific and statistically valid relational equation can be made between the datasets.

3. Ambient water quality was taken from the Waterloo WPCP (p.3) and it is unclear as to why this data is being used to represent ambient water quality. Ambient water quality is that of the receiver. Nitrate data was assumed from a PWQMN station, for a 3-year period, collected 30 years ago and unacceptable. Similarly, given the historic issue of ammonia levels in the discharge, use of ambient (28 km. upstream?) data for effluent calculations is unacceptable.

4. The low flow in the Conestogo (Glen Allan) was assumed to be 2.1 m^3/s (p.4) because it is the GRCA target outflow. For the period 1960-1988, the lowest actual minimum flow below the dam was 0.048 m^3/s on December 1, 1969 and highest minimum flow in any year during that period is only 2.90 m^3/s (May, 1985). There are historical WSC stations

at Conestogo (02GA013) and St. Jacobs (02GA006) which are better located; however, the data record for these is poor unless GRCA has restarted them.

5. It is indicated that the concentration of phosphorus in the Conestogo River is 0.12 (mg/L presumably) from a "previous study". The previous study needs to be identified along with the dataset used to determine this concentration (same comment for the other parameters in table 3). If in fact the 0.12 mg/L is a valid ambient (background) concentration, that value is the one to which Policy 2 applies. Table 5 indicates that, for TP at least, Scenario 2 would not meet this policy, while Scenario 4 might. Without seeing the origin of these numbers, it is not possible to make a more definitive statement. There is also an issue of what constitutes Scenario 4 and whether or not a Ministry Review Engineer would concur with the projected discharge levels identified in Table 5.

6. The draft memo indicates a "mixing zone analysis" was done but no details are provided as to how it was done. The 2007 WWMP indicates that CORMIX is only being run on the large plants. If a mathematical model was used on the St. Jacobs WWTP it should be identified along with the input data (in appendix) and identification of the assumptions made including those relating to geomorphology, curves and channel braiding. There is a conclusion that the mixing zone (concentration higher than the PWQO) was contained within 25% of the channel width. The mixing zone is not solely associated with PWQO but to a point (PCM) where complete cross-channel mixing occurs (and the "plume" cannot be differentiated). There is also a question of how this statement can be made when Phosphorus exceeds the PWQO throughout the entire area upstream and downstream of St. Jacobs. It must also be noted that the mixing zone is only applicable to conservative substances. Biologically active contaminants, particularly oxygen-demanding substances and ammonia require a far-field determination of impact (to the sag point) if it occurs between St. Jacobs and the confluence with the Grand.

7. In the updated water quality analysis, it is indicated that the Region is currently conducting a detailed monitoring program. We would appreciate receiving more information on the program.

8. Flow projections for the Nith at St. Jacobs have been area-yield projected from Glen Allan. Normally this is an acceptable methodology in a naturally flowing watershed or between similar watersheds; however, the Glen Allan station is one concession downstream of the Conestogo Reservoir and overwhelmingly dominated by releases from the dam control structure rather than area yield. The Ministry attempted to determine what relationship existed between Glen Allan and St. Jacobs in the late 1970's by monitoring both locations and at that time, it appeared there was no simple ratio of flows between the stations, probably reflecting the combination of relatively steady reservoir release from the upper Conestogo with precipitation runoff from the area between St. Jacobs and Glen Allan.

9. It is unclear why TP at Glen Allan is highest in the winter unless it is associated with the reservoir acting as a sink in the spring and summer before releasing the pool in the fall and allowing sparsely regulated flow-thru until spring fill-up. These P-levels once-again may not be reflective of concentrations at St. Jacobs.

10. The use of 75^{th} percentile (75^{o}) concentrations is normally accepted by the Ministry for environmental purposes; however, this applies only to contaminants. The Ministry does not use percentile assessment of Dissolved Oxygen levels. Similarly, for calculated concentrations (such as un-ionized ammonia (UIA)) the 75^{o} applies only to the calculated UIA dataset, not to individual temperature, pH or total ammonia nitrogen (TAN) concentrations or combination thereof. Similarly, UIA concentration is to be calculated

using the pH and temperature measured at the time of collecting the TAN sample and not using average or monthly values.

11. It should be noted that in the 1986 impact assessment of this discharge based on Ministry field work around the outfall, it was felt that the critical contaminant was ammonia due to elevated pH in the Conestogo River. That may be related to the higher dissociation of TAN to UIA during the summer in the Conestogo (table 13) compared to the seasonal pattern in Canagagigue Creek (Table 12).

12. The use of the dissolved oxygen data from any station must be treated warily. In the case of using the Glen Allan data, the measurements are all grab samples and ignore diurnal fluctuation. The fact that the 25th percentile concentrations for March-July and September are all above saturation are indicative that the samples were probably obtained mid-day at surface. One also has to remember that the sampling location is only a kilometer or so downstream of the dam gate and tailrace, so even diurnal activity may not be noticeable at this location.

12. Equally, the dataset for BOD5 used to calculate Table 17 are dated and ended 11 years prior to the initial issuance of the Certificate of Approval. Use of this data to extrapolate conditions in 2011 or into the future are highly suspect and would have to be thoroughly vetted to demonstrate that they are still applicable.

13. Nitrate is not currently a regulated parameter in most Certificates of Approval. It may appear where a discharger is a specific high source of Nitrates, particularly if Ontario adopts the CWQG limit of 2.93 mg/L as nitrogen. In a practical sense, when that is done and a Policy 1/Policy 2 determination is made of a receiver, the issue of nitrate sources will likely be viewed holistically to identify major sources. Should a discharger be identified under the Policy 1/ 2 determination, the Ministry could be looking toward denitrification at the next upgrade. It may pay to analyze the effluent for nitrate to see if it could be an issue during this assessment. As for the NAESI IPS number, even Ag Canada is not promoting it because it is not an enforceable number.

14. Since the Upper Conestogo River (above Drayton) has a pattern of running dry for prolonged periods in the summer, GRCA's target flows of 2.1 m^3/s or the inflow to the reservoir whichever is lower, means the 2.1 m^3/s is unreliable as a "guaranteed flow" for assimilation and the traditional $_7Q_{20}$ determination on the in-situ data set should be used. Obtaining an accurate flow regime at St. Jacobs may be a problem. The historical period of record and only active WSC station on the Conestogo is at Glen Allan, too far upstream (28 km.) to use directly and difficult to extrapolate to St. Jacobs because of the influence of the Conestogo dam. A station needs to be established (or re-established) at St. Jacobs or Conestogo so that a dataset can be created which can then be related to the flow record at Glen Allan and a representative $_7Q_{20}$ flow determined. In Table 25, the 4th column presents $_7Q_{20}$ flows for "Conestogo River at St. Jacobs". We are only aware of one station at St. Jacobs (WSC station 02GA006) which operated between August 1913 and August 1916 but whose data is insufficient to generate a traditional $_7Q_{20}$ assessment.

15. XCG suggests that the flow dataset be truncated due to "a sharp shift in flows due to changing regulation policies". This is insufficient information to support data elimination. The memo needs to explain exactly what changed and why this establishes a new status quo for flows before data can be eliminated. Even if truncated, the lowest $_7Q_{20}$ flow identified in column 2 of table 25 (0.706 m3/s) appears wrong since Figure 2 (immediately below) shows a minimum 7-day low flow value ~0.6 m3/s in 1998 (which would likely be the $_7Q_{20}$ value).

16. In section 4 (p.19), reference is made to data calculated in TM2 and TM7. In order to be accepted, this data needs to be made available for our review.

Conclusions and Recommendations

The current exercise, a Discharge Impact Calculation rather than an Assimilative Capacity Study, provides information on what parameters would likely be issues either already existent in the Conestogo River or potentially to become so if additional contaminant is added to the system. In order to proceed to effluent numbers, those calculated in this exercise would have to be substantiated by field work in the River at the outfall. At this time a number of the proposed effluent numbers are based on projections which may or may not be valid.

The effluent limits for BOD5 and Suspended Solids are within acceptable bounds and are being met by current plant performance. These can be carried over in a plant expansion.

Of particular concern is the assumption that water quality data from Glen Allan can represent water quality at the point of impingement of the WPCP discharge. The "ambient" values thus obtained are critical to the establishment of limits for PWQO parameters (N, P, O), if the extrapolation is erroneous, any determinations calculated based on them could also be erroneous and may affect the scenario options available at this location. Only if monitoring of the effluent and the river at St. Jacobs verify the projections used in this technical memorandum, should the proposed effluent limits be considered.

Similarly, any summary conclusions made should be supported by the relevant data in an appendix with source, location and timeframe identified.

During a previous expansion, the Ministry operated PWQMN station 16018407802 (Conestogo River at King Street, St. Jacobs) between 1975 and 1978. That station needs to be restarted (as the ambient (upstream) station), if expansion of the St. Jacobs WPCP is seriously being considered. Similarly appropriate downstream and mixing zone stations need data collections begun. Our practice is to heavily weigh the past 5 years of water quality (and effluent) data in our assessment of what should be authorized in moving forward to expansion of an existing or construction of a new facility. If existing water quality stations or datasets are to be used for this purpose, it must be definitively shown that they are accurate for any extrapolation (eg. That the Glen Allan water quality is the same as that in the Conestogo at the King St. bridge or that a mathematical relationship can be proven to create that dataset).

If the Region is planning on a detailed monitoring of the lower Conestogo River, any stations in the St. Jacobs area should be identified to the Ministry and agreement obtained if they are to be used in a proposal for expanding the St. Jacobs plant (location, frequency and parameters).

A more detailed methodology needs to be developed to generate receiver flows at St. Jacobs. As indicated previously, a straight area yield extrapolation from the WSC gauging site at Glen Allan does not seem to be accurate and some mathematical relationship (equation) may be necessary to generate sufficient record for determination of the requisite $_7Q_{20}$ flows needed for the development of effluent concentrations. Existing flow records for St. Jacobs and Conestogo do not appear to be of sufficient duration to generate $_7Q_{20}$ flows

Any truncation of datasets used must be statistically justified and should only exclude data from earlier years. There must be scientifically sound justification for truncating recent data and statistically valid argument for identifying "outliers".

The validity of the dataset and analysis for dissolved oxygen is questionable. This supports the suggestion that some term of continuous monitoring of at least DO is warranted just upstream of the St. Jacobs outfall.

A specific assessment of bacterial contamination impact is unnecessary: 100/200 cfu/100 ml *E. coli* are standard criteria in every WPCP approval; similarly, any new C of A is likely to require an effluent pH range of 6.5 – 8.5 as a standard condition.

This concludes our comments on the Draft Technical Memo #3. Questions arising from these comments should be directed to Paul Odom either at Paul.Odom@ontario.ca or by calling (905) 521-7674.

Sincerely,

Original signed by

Barbara Slattery
EA/Planning Coordinator

cc. Mr. S. Nutt and Ms J. Noyes, XCG (Via email only)

XCG CONSULTANTS LTD.
T 613 542 5888 F 613 542 0844 | kingston@xcg.com
6 Cataraqui Street, Woolen Mill, West Wing, Suite 105, Kingston, Ontario, Canada K7K 1Z7

Date: December 8, 2011 **XCG File No.: 1-035-51-01**

To: Pam Law (RoW)

cc: Stephen Nutt (XCG)

From: Janet Noyes (XCG)

Re: Response to MOE Comments re: St. Jacobs - Elmira WWT MP

XCG has reviewed the comments provided by the Ministry of Environment (MOE) reviewer, Mr. Paul Odom, dated October 31, 2011, regarding XCG's Technical Memorandum (TM) #3 - Determination of Effluent Requirements for the Elmira and St. Jacobs Wastewater Treatment Plants, dated September 12, 2011. To address the MOE's comments, we have reproduced the individual comments and provided our response below. We have also provided additional discussion regarding the MOE comments in the Conclusions and Recommendations.

For clarification purposes, Chapter 2 of XCG's report involved a summary of the review of the 2007 Region of Waterloo Wastewater Treatment Master Plan, as it refers to the St. Jacob and Elmira WWTPs. The first six (6) comments from the MOE refer to content in this Chapter. XCG provided clarification to the MOE comments/questions except where a more detailed and critical review of the work completed for the 2007 WWMP would be required in order to properly respond.

MOE Comment #1

The approach taken in the 2007 Wastewater Master Plan was to limit assessment of the Region's smaller plants to a mass balance evaluation. While a simple mass balance exercise, if done properly (good database at appropriate locations), can provide ball-park assessment of the impact of a discharge, it is unlikely to be suitable as an assimilative capacity study.

XCG Comment #1

XCG agrees with this statement. We recognize that a more detailed assimilative capacity study will be needed as part of a Schedule C Class Environmental Assessment to support the development of effluent limits if any of the subject WWTPs are to be expanded.

MOE Comment #2

Should expansion of the current plant be determined as the preferred alternative, a true assimilative capacity study will have to be conducted and include ground-truthing of

assimilative parameters. Past studies and historical data collections can be used to supplement current data collections, providing it can be demonstrated that they are part of the same dataset or that a scientific and statistically valid relational equation can be made between the datasets.

XCG Comment #2

XCG agrees with this statement. As noted above, we recognize that a more detailed assimilative capacity study will be needed as part of a Schedule C Class Environmental Assessment to support the development of effluent limits if any of the subject WWTPs are to be expanded.

MOE Comment #3

Ambient water quality was taken from the Waterloo WPCP (p.3) and it is unclear as to why this data is being used to represent ambient water quality. Ambient water quality is that of the receiver. Nitrate data was assumed from a PWQMN station, for a 3-year period, collected 30 years ago and unacceptable. Similarly, given the historic issue of ammonia levels in the discharge, use of ambient (28 km. upstream?) data for effluent calculations is unacceptable.

XCG Comment #3

This was a typographic error on XCG's behalf. The ambient water quality data for the St. Jacob's review in the 2007 WWMP was taken from the previous study by Gore & Storrie (March 1995) - Waterloo Wastewater Treatment Master Plan - not the Waterloo WWTP. This error will be corrected in the final TM.

MOE Comment #4

The low flow in the Conestogo (Glen Allan) was assumed to be 2.1 m^3/s (p.4) because it is the GRCA target outflow. For the period 1960-1988, the lowest actual minimum flow below the dam was 0.048 m^3/s on December 1, 1969 and highest minimum flow in any year during that period is only 2.90 m^3/s (May, 1985). There are historical WSC stations at Conestogo (02GA013) and St. Jacobs (02GA006) which are better located; however, the data record for these is poor unless GRCA has restarted them.

XCG Comment #4

No comment required on the flow assessment used in the 2007 WWMP. XCG has addressed these flow considerations further in Section 3.2 of the draft TM.

MOE Comment #5

It is indicated that the concentration of phosphorus in the Conestogo River is 0.12 (mg/L presumably) from a "previous study". The previous study needs to be identified along with the dataset used to determine this concentration (same comment for the other parameters in table 3). If in fact the 0.12 mg/L is a valid ambient (background) concentration, that value is the one to which Policy 2 applies. Table 5 indicates that, for TP at least, Scenario 2 would not meet this policy, while Scenario 4 might. Without seeing the origin of these numbers, it is not possible to make a more definitive statement. There is also an issue of what constitutes Scenario 4 and whether

or not a Ministry Review Engineer would concur with the projected discharge levels identified in Table 5.

XCG Comment #5

As noted in Comment #4, there was a typo in referring to the Gore & Storrie Waterloo Wastewater Treatment Master Plan (1995). This is the "previous study" referred to in the 2007 report. The actual data from the G&S 1995 report was not provided to XCG for review purposes. As noted previously, we recognize that a more detailed assimilative capacity study will be needed as part of a Schedule C Class Environmental Assessment if any of the subject WWTPs are to be expanded. This study will update the historic information and provide proposed effluent limits for the expanded works for review and comment by MOE.

MOE Comment #6

The draft memo indicates a "mixing zone analysis" was done but no details are provided as to how it was done. The 2007 WWMP indicates that CORMIX is only being run on the large plants. If a mathematical model was used on the St. Jacobs WWTP it should be identified along with the input data (in appendix) and identification of the assumptions made including those relating to geomorphology, curves and channel braiding. There is a conclusion that the mixing zone (concentration higher than the PWQO) was contained within 25% of the channel width. The mixing zone is not solely associated with PWQO but to a point (PCM) where complete cross-channel mixing occurs (and the "plume" cannot be differentiated). There is also a question of how this statement can be made when Phosphorus exceeds the PWQO throughout the entire area upstream and downstream of St. Jacobs. It must also be noted that the mixing zone is only applicable to conservative substances. Biologically active contaminants, particularly oxygen-demanding substances and ammonia require a far-field determination of impact (to the sag point) if it occurs between St. Jacobs and the confluence with the Grand.

XCG Comment #6

In the 2007 WWMP, the following statement is found in Appendix C6: "*For the smaller treatment plants, mass balances were completed for un-ionized ammonia, nitrate and total phosphorus, where sufficient background data was available. A 25% mixing zone (75% zone of passage) was applied to the receiving streams for these smaller WWTPs, including the Nith River, Canagagigue Creek and Conestogo River. The selection of a 25% mixing zone was based on previous assimilative capacity studies done for individual plants upgrades or expansions.*"
There was no other documentation on how these mixing zones were "applied".

MOE Comment #7

In the updated water quality analysis, it is indicated that the Region is currently conducting a detailed monitoring program. We would appreciate receiving more information on the program.

XCG Comment #7

The Region will provide the updated dataset at the conclusion of the sampling program (November 2011).

MOE Comment #8

Flow projections for the Nith at St. Jacobs have been area-yield projected from Glen Allan. Normally this is an acceptable methodology in a naturally flowing watershed or between similar watersheds; however, the Glen Allan station is one concession downstream of the Conestogo Reservoir and overwhelmingly dominated by releases from the dam control structure rather than area yield. The Ministry attempted to determine what relationship existed between Glen Allan and St. Jacobs in the late 1970's by monitoring both locations and at that time, it appeared there was no simple ratio of flows between the stations, probably reflecting the combination of relatively steady reservoir release from the upper Conestogo with precipitation runoff from the area between St. Jacobs and Glen Allan.

XCG Comment #8

XCG did not include a table illustrating the period of record for the flow stations of interest. This table will be included in the final TM. As discussed in Section 3.2.2 of the XCG report, the flow station in St. Jacobs (GRCA/WSC) and the flow station at Glen Allan were reviewed for low flow determination for the Conestogo River at St. Jacobs. It is acknowledged that the Glen Allan station is a significant distance upstream and these flows reflect the controlled discharge from the Glen Allan dam. As noted by the MOE reviewer, an area pro-rated relationship or other mathematical relationship between flows at Glen Allan and St. Jacobs could not be derived from earlier work. XCG also assessed the low flows at the stations in St. Jacobs both the early WSC gauge data as well as the GRCA data. The WSC dataset was limited in period of record and was quite dated. The GRCA St. Jacobs data was substantially longer however, the data had not been adjusted for ice effects in the winter season. A comparison of the area pro-rated Glen Allan 7Q20 flows and the St. Jacobs 7Q20 flows from the data set are listed in columns 3 and 4 in Table 25. The pro-rated Glen Allan flows were only used for the winter statistic as they provided a smaller flow (more conservative) and the higher St. Jacobs measured flow did not account for ice conditions. The statistics from the closer St. Jacobs station were used for the spring, summer and fall flow estimate. There is no other available flow data for this site.

MOE Comment #9

It is unclear why TP at Glen Allan is highest in the winter unless it is associated with the reservoir acting as a sink in the spring and summer before releasing the pool in the fall and allowing sparsely regulated flow-thru until spring fill-up. These P-levels once-again may not be reflective of concentrations at St. Jacobs.

XCG Comment #9

A review of the historic data indicated that the highest TP concentrations at Glen Allan typically occurred in the winter season. The field data collected in 2010/2011

will provide a better indication of the water quality directly upstream of the St. Jacobs outfall compared to the PWQMN station data (28 km upstream).

MOE Comment #10

The use of 75th percentile (75º) concentrations is normally accepted by the Ministry for environmental purposes; however, this applies only to contaminants. The Ministry does not use percentile assessment of Dissolved Oxygen levels. Similarly, for calculated concentrations (such as un-ionized ammonia (UIA)) the 75º applies only to the calculated UIA dataset, not to individual temperature, pH or total ammonia nitrogen (TAN) concentrations or combination thereof. Similarly, UIA concentration is to be calculated using the pH and temperature measured at the time of collecting the TAN sample and not using average or monthly values.

XCG Comment #10

XCG will apply the above mentioned approach for ambient UIA calculations in the final TM.

MOE Comment #11

It should be noted that in the 1986 impact assessment of this discharge based on Ministry field work around the outfall, it was felt that the critical contaminant was ammonia due to elevated pH in the Conestogo River. That may be related to the higher dissociation of TAN to UIA during the summer in the Conestogo (table 13) compared to the seasonal pattern in Canagagigue Creek (Table 12).

XCG Comment #11

No comment required.

MOE Comment #12

Equally, the dataset for BOD_5 used to calculate Table 17 are dated and ended 11 years prior to the initial issuance of the Certificate of Approval. Use of this data to extrapolate conditions in 2011 or into the future are highly suspect and would have to be thoroughly vetted to demonstrate that they are still applicable.

XCG Comment #12

As noted above, the field data collected in 2010/2011 will provide a better indication of the water quality directly upstream of the St. Jacobs outfall compared to the PWQMN station data (28 km upstream).

MOE Comment #13

Nitrate is not currently a regulated parameter in most Certificates of Approval. It may appear where a discharger is a specific high source of Nitrates, particularly if Ontario adopts the CWQG limit of 2.93 mg/L as nitrogen. In a practical sense, when that is done and a Policy 1/Policy 2 determination is made of a receiver, the issue of nitrate sources will likely be viewed holistically to identify major sources. Should a discharger be identified under the Policy 1/ 2 determination, the Ministry could be looking toward denitrification at the next upgrade. It may pay to analyze the effluent

for nitrate to see if it could be an issue during this assessment. As for the NAESI IPS number, even Ag Canada is not promoting it because it is not an enforceable number.

XCG Comment #13

XCG will remove the reference to the IPS as an enforceable number or benchmark. As noted in the report, if the CWQG limit is adopted in Ontario, the receiving streams would both be designated as Policy 2 receivers. For the purposes of addressing the MOE comment, XCG will review the effluent nitrate data and conduct a mass balance assessment for nitrate loadings.

MOE Comment #14

Since the Upper Conestogo River (above Drayton) has a pattern of running dry for prolonged periods in the summer, GRCA's target flows of 2.1 m3/s or the inflow to the reservoir whichever is lower, means the 2.1 m3/s is unreliable as a "guaranteed flow" for assimilation and the traditional 7Q20 determination on the in-situ data set should be used. Obtaining an accurate flow regime at St. Jacobs may be a problem. The historical period of record and only active WSC station on the Conestogo is at Glen Allan, too far upstream (28 km.) to use directly and difficult to extrapolate to St. Jacobs because of the influence of the Conestogo dam. A station needs to be established (or re-established) at St. Jacobs or Conestogo so that a dataset can be created which can then be related to the flow record at Glen Allan and a representative 7Q20 flow determined. In Table 25, the 4th column presents 7Q20 flows for "Conestogo River at St. Jacobs". We are only aware of one station at St. Jacobs (WSC station 02GA006) which operated between August 1913 and August 1916 but that data is insufficient to generate a traditional 7Q20 assessment.

XCG Comment #14

As noted in our response to Comment #8, there is more recent data for the station at St. Jacobs but XCG did not include the period of record information in the report. We will include additional information on the period of record for the closer St. Jacobs flow station.

MOE Comment #15

XCG suggests that the flow dataset be truncated due to "a sharp shift in flows due to changing regulation policies". This is insufficient information to support data elimination. The memo needs to explain exactly what changed and why this establishes a new status quo for flows before data can be eliminated. Even if truncated, the lowest 7Q20 flow identified in column 2 of table 25 (0.706 m^3/s) appears wrong since Figure 2 (immediately below) shows a minimum 7-day low flow value ~0.6 m^3/s in 1998 (which would likely be the 7Q20 value).

XCG Comment #15

XCG will contact the GRCA for additional detail regarding the changes in regulation. The 7Q20 statistic is sensitive to all data that is used in its calculation. The figure is rightly referenced at approximately 0.6 m^3/s; it should be noted that this figure shows the annual lowest flow and that an annual 7Q20 flow was not estimated. The value

mentioned occurred in the fall (October - December) all other values were at least 1.5 times greater than the 0.6 m^3/s value, this explains why the 7Q20 value is greater than 0.6 m^3/s in the fall.

MOE Comment #16

In section 4 (p.19), reference is made to data calculated in TM2 and TM7. In order to be accepted, this data needs to be made available for our review.

XCG Comment #16

The referenced Technical Memoranda will be included as appendices in the final Master Plan Report.

MOE Conclusion Comment #1

The current exercise, a Discharge Impact Calculation rather than an Assimilative Capacity Study, provides information on what parameters would likely be issues either already existent in the Conestogo River or potentially to become so if additional contaminant is added to the system. In order to proceed to effluent numbers, those calculated in this exercise would have to be substantiated by field work in the River at the outfall. At this time a number of the proposed effluent numbers are based on projections which may or may not be valid.

XCG Conclusion Comment #1

The field data collected in 2010/2011 will provide a better indication of the water quality directly upstream of the St. Jacobs outfall compared to the PWQMN station data (28 km upstream).

MOE Conclusion Comment #2

The effluent limits for BOD_5 and Suspended Solids are within acceptable bounds and are being met by current plant performance. These can be carried over in a plant expansion.

XCG Conclusion Comment #2

No comment required.

MOE Conclusion Comment #3

Of particular concern is the assumption that water quality data from Glen Allan can represent water quality at the point of impingement of the WPCP discharge. The "ambient" values thus obtained are critical to the establishment of limits for PWQO parameters (N, P, O), if the extrapolation is erroneous, any determinations calculated based on them could also be erroneous and may affect the scenario options available at this location. Only if monitoring of the effluent and the river at St. Jacobs verify the projections used in this technical memorandum, should the proposed effluent limits be considered.

XCG Conclusion Comment #3

The field data collected in 2010/2011 will provide a better indication of the water quality directly upstream of the St. Jacobs outfall compared to the PWQMN station data (28 km upstream).

MOE Conclusion Comment #4

Similarly, any summary conclusions made should be supported by the relevant data in an appendix with source, location and timeframe identified.

XCG Conclusion Comment #4

This information will be included in the final TM.

MOE Conclusion Comment #5

During a previous expansion, the Ministry operated PWQMN station 16018407802 (Conestogo River at King Street, St. Jacobs) between 1975 and 1978. That station needs to be restarted (as the ambient (upstream) station), if expansion of the St. Jacobs WPCP is seriously being considered. Similarly appropriate downstream and mixing zone stations need data collections begun. Our practice is to heavily weigh the past 5 years of water quality (and effluent) data in our assessment of what should be authorized in moving forward to expansion of an existing or construction of a new facility. If existing water quality stations or datasets are to be used for this purpose, it must be definitively shown that they are accurate for any extrapolation (eg. That the Glen Allan water quality is the same as that in the Conestogo at the King St. bridge or that a mathematical relationship can be proven to create that dataset).

XCG Conclusion Comment #5

See XCG Comments #7, 9, 12, 14 and XCG Conclusion Comments #1, 3, 4.

MOE Conclusion Comment #6

If the Region is planning on a detailed monitoring of the lower Conestogo River, any stations in the St. Jacobs area should be identified to the Ministry and agreement obtained if they are to be used in a proposal for expanding the St. Jacobs plant (location, frequency and parameters).

XCG Conclusion Comment #6

No comment required.

MOE Conclusion Comment #7

A more detailed methodology needs to be developed to generate receiver flows at St. Jacobs. As indicated previously, a straight area yield extrapolation from the WSC gauging site at Glen Allan does not seem to be accurate and some mathematical relationship (equation) may be necessary to generate sufficient record for determination of the requisite 7Q20 flows needed for the development of effluent concentrations. Existing flow records for St. Jacobs and Conestogo do not appear to be of sufficient duration to generate 7Q20 flows.

XCG Conclusion Comment #7

A detailed review of the operation of the Glen Allan dam, including the PTTW, and an attempt to develop a relationship between the Glen Allan and St. Jacobs datasets would be a component of a full assimilative capacity study as part of a Schedule C Class EA if expansion of the St. Jacobs WWTP is identified as the preferred solution in the Master Plan.

MOE Conclusion Comment #8

Any truncation of datasets used must be statistically justified and should only exclude data from earlier years. There must be scientifically sound justification for truncating recent data and statistically valid argument for identifying "outliers".

XCG Conclusion Comment #8

Data truncation was only completed on datasets that exhibited a statistically significant trend. The process was to systematically remove one year at a time from the beginning of the record and re-evaluate for a trend. This process was conducted until no statistically significant trend was identified; this truncated dataset was then used estimate the 75th percentiles. The datasets were not censored for outliers. This description of the statistical assessment will be included in the final TM.

MOE Conclusion Comment #9

The validity of the dataset and analysis for dissolved oxygen is questionable. This supports the suggestion that some term of continuous monitoring of at least DO is warranted just upstream of the St. Jacobs outfall.

XCG Conclusion Comment #9

It is expected that if the expansion is to go through a Class EA assessment, a more detailed look at dissolved oxygen in the receiving stream will be included. It is expected that as part of the assessment aquatic and benthic assessments and detailed DO modelling will be required to determine downstream impacts as well.

MOE Conclusion Comment #10

A specific assessment of bacterial contamination impact is unnecessary: 100/200 cfu/100 ml E. coli are standard criteria in every WPCP approval; similarly, any new C of A is likely to require an effluent pH range of 6.5 – 8.5 as a standard condition.

XCG Conclusion Comment #10

No comment required.

Region of Waterloo

TRANSPORTATION AND
ENVIRONMENTAL SERVICES
Water Services

150 Frederick Street
Kitchener ON Canada N2G 4J3
Telephone: (519) 575-4426
Fax: (519) 575-4452
www.region.waterloo.on.ca

December 21, 2011
File: E12-40/8294-60

Ministry of the Environment
West Central Region
119 King Street West, 12th Floor
Hamilton, Ontario L8P 4Y7

Attention: Ms. Barbara Slattery,
EA/Planning Coordinator

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Draft Technical Memorandum #3 – Determination of Effluent Requirements
for the Elmira and St. Jacobs WWTPs

Dear Ms. Slattery:

Thank you for providing MOE comments on the above noted XCG Draft Technical Memorandum prepared as part of the St. Jacobs – Elmira Wastewater Treatment Master Plan in your letter dated 31 October 2011. Your expedient response after our meeting of 25 October 2011 is very much appreciated.

XCG has prepared the attached responses to MOE's comments. As noted by XCG, many of MOE's comments relate to additional studies that will be needed as part of a Schedule C Class Environmental Assessment if expansion of the St. Jacobs WWTP is selected as part of the preferred alternative for wastewater treatment. Hence, this work will not be completed as part of this Master Plan.

If you have any further comments or questions regarding these responses, please feel free to contact the undersigned. Meanwhile, thank you again for your comments. The Region will keep you informed as the Master Plan proceeds to conclusion in 2012.

Yours very truly,

Ms. Pam Law, P.Eng.
Project Engineer
Water Services,
Region of Waterloo

cc: Stephen Nutt, XCG Consultants Ltd.
Janet Noyes, XCG Consultants Ltd.

XCG

Date: December 8, 2011 **XCG File No.: 1-035-51-01**

To: Pam Law (RoW)

cc: Stephen Nutt (XCG)

From: Janet Noyes (XCG)

Re: Response to MOE Comments re: St. Jacobs - Elmira WWT MP

XCG has reviewed the comments provided by the Ministry of Environment (MOE) reviewer, Mr. Paul Odom, dated October 31, 2011, regarding XCG's Technical Memorandum (TM) #3 - Determination of Effluent Requirements for the Elmira and St. Jacobs Wastewater Treatment Plants, dated September 12, 2011. To address the MOE's comments, we have reproduced the individual comments and provided our response below. We have also provided additional discussion regarding the MOE comments in the Conclusions and Recommendations.

For clarification purposes, Chapter 2 of XCG's report involved a summary of the review of the 2007 Region of Waterloo Wastewater Treatment Master Plan, as it refers to the St. Jacob and Elmira WWTPs. The first six (6) comments from the MOE refer to content in this Chapter. XCG provided clarification to the MOE comments/questions except where a more detailed and critical review of the work completed for the 2007 WWMP would be required in order to properly respond.

MOE Comment #1

The approach taken in the 2007 Wastewater Master Plan was to limit assessment of the Region's smaller plants to a mass balance evaluation. While a simple mass balance exercise, if done properly (good database at appropriate locations), can provide ball-park assessment of the impact of a discharge, it is unlikely to be suitable as an assimilative capacity study.

XCG Comment #1

XCG agrees with this statement. We recognize that a more detailed assimilative capacity study will be needed as part of a Schedule C Class Environmental Assessment to support the development of effluent limits if any of the subject WWTPs are to be expanded.

MOE Comment #2

Should expansion of the current plant be determined as the preferred alternative, a true assimilative capacity study will have to be conducted and include ground-truthing of assimilative parameters. Past studies and historical data collections can be used to supplement current data collections, providing it can be demonstrated that they are part of the same dataset or that a scientific and statistically valid relational equation can be made between the datasets.

XCG Comment #2

XCG agrees with this statement. As noted above, we recognize that a more detailed assimilative capacity study will be needed as part of a Schedule C Class Environmental Assessment to support the development of effluent limits if any of the subject WWTPs are to be expanded.

MOE Comment #3

Ambient water quality was taken from the Waterloo WPCP (p.3) and it is unclear as to why this data is being used to represent ambient water quality. Ambient water quality is that of the receiver. Nitrate data was assumed from a PWQMN station, for a 3-year period, collected 30 years ago and unacceptable. Similarly, given the historic issue of ammonia levels in the discharge, use of ambient (28 km. upstream?) data for effluent calculations is unacceptable.

XCG Comment #3

This was a typographic error on XCG's behalf. The ambient water quality data for the St. Jacob's review in the 2007 WWMP was taken from the previous study by Gore & Storrie (March 1995) - Waterloo Wastewater Treatment Master Plan - not the Waterloo WWTP. This error will be corrected in the final TM.

MOE Comment #4

The low flow in the Conestogo (Glen Allan) was assumed to be 2.1 m^3/s (p.4) because it is the GRCA target outflow. For the period 1960-1988, the lowest actual minimum flow below the dam was 0.048 m^3/s on December 1, 1969 and highest minimum flow in any year during that period is only 2.90 m^3/s (May, 1985). There are historical WSC stations at Conestogo (02GA013) and St. Jacobs (02GA006) which are better located; however, the data record for these is poor unless GRCA has restarted them.

XCG Comment #4

No comment required on the flow assessment used in the 2007 WWMP. XCG has addressed these flow considerations further in Section 3.2 of the draft TM.

MOE Comment #5

It is indicated that the concentration of phosphorus in the Conestogo River is 0.12 (mg/L presumably) from a "previous study". The previous study needs to be identified along with the dataset used to determine this concentration (same comment for the other parameters in table 3). If in fact the 0.12 mg/L is a valid ambient (background) concentration, that value is the one to which Policy 2 applies. Table 5 indicates that, for TP at least, Scenario 2 would not meet this policy, while Scenario 4 might.

Without seeing the origin of these numbers, it is not possible to make a more definitive statement. There is also an issue of what constitutes Scenario 4 and whether or not a Ministry Review Engineer would concur with the projected discharge levels identified in Table 5.

XCG Comment #5

As noted in Comment #4, there was a typo in referring to the Gore & Storrie Waterloo Wastewater Treatment Master Plan (1995). This is the "previous study" referred to in the 2007 report. The actual data from the G&S 1995 report was not provided to XCG for review purposes. As noted previously, we recognize that a more detailed assimilative capacity study will be needed as part of a Schedule C Class Environmental Assessment if any of the subject WWTPs are to be expanded. This study will update the historic information and provide proposed effluent limits for the expanded works for review and comment by MOE.

MOE Comment #6

The draft memo indicates a "mixing zone analysis" was done but no details are provided as to how it was done. The 2007 WWMP indicates that CORMIX is only being run on the large plants. If a mathematical model was used on the St. Jacobs WWTP it should be identified along with the input data (in appendix) and identification of the assumptions made including those relating to geomorphology, curves and channel braiding. There is a conclusion that the mixing zone (concentration higher than the PWQO) was contained within 25% of the channel width. The mixing zone is not solely associated with PWQO but to a point (PCM) where complete cross-channel mixing occurs (and the "plume" cannot be differentiated). There is also a question of how this statement can be made when Phosphorus exceeds the PWQO throughout the entire area upstream and downstream of St. Jacobs. It must also be noted that the mixing zone is only applicable to conservative substances. Biologically active contaminants, particularly oxygen-demanding substances and ammonia require a far-field determination of impact (to the sag point) if it occurs between St. Jacobs and the confluence with the Grand.

XCG Comment #6

In the 2007 WWMP, the following statement is found in Appendix C6: "*For the smaller treatment plants, mass balances were completed for un-ionized ammonia, nitrate and total phosphorus, where sufficient background data was available. A 25% mixing zone (75% zone of passage) was applied to the receiving streams for these smaller WWTPs, including the Nith River, Canagagigue Creek and Conestogo River. The selection of a 25% mixing zone was based on previous assimilative capacity studies done for individual plants upgrades or expansions.*"
There was no other documentation on how these mixing zones were "applied".

MOE Comment #7

In the updated water quality analysis, it is indicated that the Region is currently conducting a detailed monitoring program. We would appreciate receiving more information on the program.

XCG Comment #7

A copy of the memorandum outlining the sample locations and parameters tested has been attached to this response. The Region will provide the updated dataset at the conclusion of the sampling program.The sample points for both St. Jacobs and Elmira will be integrated into the Region's ongoing water quality program which is administered by LGL. For this program a downstream far location has been added for each plant for consistency with sampling of other Regional wastewater plants. A map provided by LGL shows the location of the downstream far locations for both plants.

MOE Comment #8

Flow projections for the Nith at St. Jacobs have been area-yield projected from Glen Allan. Normally this is an acceptable methodology in a naturally flowing watershed or between similar watersheds; however, the Glen Allan station is one concession downstream of the Conestogo Reservoir and overwhelmingly dominated by releases from the dam control structure rather than area yield. The Ministry attempted to determine what relationship existed between Glen Allan and St. Jacobs in the late 1970's by monitoring both locations and at that time, it appeared there was no simple ratio of flows between the stations, probably reflecting the combination of relatively steady reservoir release from the upper Conestogo with precipitation runoff from the area between St. Jacobs and Glen Allan.

XCG Comment #8

XCG did not include a table illustrating the period of record for the flow stations of interest. This table will be included in the final TM. As discussed in Section 3.2.2 of the XCG report, the flow station in St. Jacobs (GRCA/WSC) and the flow station at Glen Allan were reviewed for low flow determination for the Conestogo River at St. Jacobs. It is acknowledged that the Glen Allan station is a significant distance upstream and these flows reflect the controlled discharge from the Glen Allan dam. As noted by the MOE reviewer, an area pro-rated relationship or other mathematical relationship between flows at Glen Allan and St. Jacobs could not be derived from earlier work. XCG also assessed the low flows at the stations in St. Jacobs both the early WSC gauge data as well as the GRCA data. The WSC dataset was limited in period of record and was quite dated. The GRCA St. Jacobs data was substantially longer however, the data had not been adjusted for ice effects in the winter season. A comparison of the area pro-rated Glen Allan 7Q20 flows and the St. Jacobs 7Q20 flows from the data set are listed in columns 3 and 4 in Table 25. The pro-rated Glen Allan flows were only used for the winter statistic as they provided a smaller flow (more conservative) and the higher St. Jacobs measured flow did not account for ice conditions. The statistics from the closer St. Jacobs station were used for the spring, summer and fall flow estimate. There is no other available flow data for this site.

MOE Comment #9

It is unclear why TP at Glen Allan is highest in the winter unless it is associated with the reservoir acting as a sink in the spring and summer before releasing the pool in the

fall and allowing sparsely regulated flow-thru until spring fill-up. These P-levels once-again may not be reflective of concentrations at St. Jacobs.

XCG Comment #9

A review of the historic data indicated that the highest TP concentrations at Glen Allan typically occurred in the winter season. The field data collected in 2010/2011 will provide a better indication of the water quality directly upstream of the St. Jacobs outfall compared to the PWQMN station data (28 km upstream).

MOE Comment #10

The use of 75th percentile (75°) concentrations is normally accepted by the Ministry for environmental purposes; however, this applies only to contaminants. The Ministry does not use percentile assessment of Dissolved Oxygen levels. Similarly, for calculated concentrations (such as un-ionized ammonia (UIA)) the 75° applies only to the calculated UIA dataset, not to individual temperature, pH or total ammonia nitrogen (TAN) concentrations or combination thereof. Similarly, UIA concentration is to be calculated using the pH and temperature measured at the time of collecting the TAN sample and not using average or monthly values.

XCG Comment #10

XCG will apply the above mentioned approach for ambient UIA calculations in the final TM.

MOE Comment #11

It should be noted that in the 1986 impact assessment of this discharge based on Ministry field work around the outfall, it was felt that the critical contaminant was ammonia due to elevated pH in the Conestogo River. That may be related to the higher dissociation of TAN to UIA during the summer in the Conestogo (table 13) compared to the seasonal pattern in Canagagigue Creek (Table 12).

XCG Comment #11

No comment required.

MOE Comment #12

Equally, the dataset for BOD_5 used to calculate Table 17 are dated and ended 11 years prior to the initial issuance of the Certificate of Approval. Use of this data to extrapolate conditions in 2011 or into the future are highly suspect and would have to be thoroughly vetted to demonstrate that they are still applicable.

XCG Comment #12

As noted above, the field data collected in 2010/2011 will provide a better indication of the water quality directly upstream of the St. Jacobs outfall compared to the PWQMN station data (28 km upstream).

MOE Comment #13

Nitrate is not currently a regulated parameter in most Certificates of Approval. It may appear where a discharger is a specific high source of Nitrates, particularly if Ontario adopts the CWQG limit of 2.93 mg/L as nitrogen. In a practical sense, when that is

done and a Policy 1/Policy 2 determination is made of a receiver, the issue of nitrate sources will likely be viewed holistically to identify major sources. Should a discharger be identified under the Policy 1/ 2 determination, the Ministry could be looking toward denitrification at the next upgrade. It may pay to analyze the effluent for nitrate to see if it could be an issue during this assessment. As for the NAESI IPS number, even Ag Canada is not promoting it because it is not an enforceable number.

XCG Comment #13

XCG will remove the reference to the IPS as an enforceable number or benchmark. As noted in the report, if the CWQG limit is adopted in Ontario, the receiving streams would both be designated as Policy 2 receivers. For the purposes of addressing the MOE comment, XCG will review the effluent nitrate data and conduct a mass balance assessment for nitrate loadings.

MOE Comment #14

Since the Upper Conestogo River (above Drayton) has a pattern of running dry for prolonged periods in the summer, GRCA's target flows of 2.1 m3/s or the inflow to the reservoir whichever is lower, means the 2.1 m3/s is unreliable as a "guaranteed flow" for assimilation and the traditional 7Q20 determination on the in-situ data set should be used. Obtaining an accurate flow regime at St. Jacobs may be a problem. The historical period of record and only active WSC station on the Conestogo is at Glen Allan, too far upstream (28 km.) to use directly and difficult to extrapolate to St. Jacobs because of the influence of the Conestogo dam. A station needs to be established (or re-established) at St. Jacobs or Conestogo so that a dataset can be created which can then be related to the flow record at Glen Allan and a representative 7Q20 flow determined. In Table 25, the 4th column presents 7Q20 flows for "Conestogo River at St. Jacobs". We are only aware of one station at St. Jacobs (WSC station 02GA006) which operated between August 1913 and August 1916 but that data is insufficient to generate a traditional 7Q20 assessment.

XCG Comment #14

As noted in our response to Comment #8, there is more recent data for the station at St. Jacobs but XCG did not include the period of record information in the report. We will include additional information on the period of record for the closer St. Jacobs flow station.

MOE Comment #15

XCG suggests that the flow dataset be truncated due to "a sharp shift in flows due to changing regulation policies". This is insufficient information to support data elimination. The memo needs to explain exactly what changed and why this establishes a new status quo for flows before data can be eliminated. Even if truncated, the lowest 7Q20 flow identified in column 2 of table 25 (0.706 m^3/s) appears wrong since Figure 2 (immediately below) shows a minimum 7-day low flow value ~0.6 m^3/s in 1998 (which would likely be the 7Q20 value).

XCG Comment #15

XCG will contact the GRCA for additional detail regarding the changes in regulation. The 7Q20 statistic is sensitive to all data that is used in its calculation. The figure is rightly referenced at approximately 0.6 m^3/s; it should be noted that this figure shows the annual lowest flow and that an annual 7Q20 flow was not estimated. The value mentioned occurred in the fall (October - December) all other values were at least 1.5 times greater than the 0.6 m^3/s value, this explains why the 7Q20 value is greater than 0.6 m^3/s in the fall.

MOE Comment #16

In section 4 (p.19), reference is made to data calculated in TM2 and TM7. In order to be accepted, this data needs to be made available for our review.

XCG Comment #16

The referenced Technical Memoranda will be included as appendices in the final Master Plan Report.

MOE Conclusion Comment #1

The current exercise, a Discharge Impact Calculation rather than an Assimilative Capacity Study, provides information on what parameters would likely be issues either already existent in the Conestogo River or potentially to become so if additional contaminant is added to the system. In order to proceed to effluent numbers, those calculated in this exercise would have to be substantiated by field work in the River at the outfall. At this time a number of the proposed effluent numbers are based on projections which may or may not be valid.

XCG Conclusion Comment #1

The field data collected in 2010/2011 will provide a better indication of the water quality directly upstream of the St. Jacobs outfall compared to the PWQMN station data (28 km upstream).

MOE Conclusion Comment #2

The effluent limits for BOD_5 and Suspended Solids are within acceptable bounds and are being met by current plant performance. These can be carried over in a plant expansion.

XCG Conclusion Comment #2

No comment required.

MOE Conclusion Comment #3

Of particular concern is the assumption that water quality data from Glen Allan can represent water quality at the point of impingement of the WPCP discharge. The "ambient" values thus obtained are critical to the establishment of limits for PWQO parameters (N, P, O), if the extrapolation is erroneous, any determinations calculated based on them could also be erroneous and may affect the scenario options available at this location. Only if monitoring of the effluent and the river at St. Jacobs verify the

projections used in this technical memorandum, should the proposed effluent limits be considered.

XCG Conclusion Comment #3

The field data collected in 2010/2011 will provide a better indication of the water quality directly upstream of the St. Jacobs outfall compared to the PWQMN station data (28 km upstream).

MOE Conclusion Comment #4

Similarly, any summary conclusions made should be supported by the relevant data in an appendix with source, location and timeframe identified.

XCG Conclusion Comment #4

This information will be included in the final TM.

MOE Conclusion Comment #5

During a previous expansion, the Ministry operated PWQMN station 16018407802 (Conestogo River at King Street, St. Jacobs) between 1975 and 1978. That station needs to be restarted (as the ambient (upstream) station), if expansion of the St. Jacobs WPCP is seriously being considered. Similarly appropriate downstream and mixing zone stations need data collections begun. Our practice is to heavily weigh the past 5 years of water quality (and effluent) data in our assessment of what should be authorized in moving forward to expansion of an existing or construction of a new facility. If existing water quality stations or datasets are to be used for this purpose, it must be definitively shown that they are accurate for any extrapolation (eg. That the Glen Allan water quality is the same as that in the Conestogo at the King St. bridge or that a mathematical relationship can be proven to create that dataset).

XCG Conclusion Comment #5

See XCG Comments #7, 9, 12, 14 and XCG Conclusion Comments #1, 3, 4.

MOE Conclusion Comment #6

If the Region is planning on a detailed monitoring of the lower Conestogo River, any stations in the St. Jacobs area should be identified to the Ministry and agreement obtained if they are to be used in a proposal for expanding the St. Jacobs plant (location, frequency and parameters).

XCG Conclusion Comment #6

See XCG Comment #7 for details of the monitoring program.

MOE Conclusion Comment #7

A more detailed methodology needs to be developed to generate receiver flows at St. Jacobs. As indicated previously, a straight area yield extrapolation from the WSC gauging site at Glen Allan does not seem to be accurate and some mathematical relationship (equation) may be necessary to generate sufficient record for determination of the requisite 7Q20 flows needed for the development of effluent concentrations. Existing flow records for St. Jacobs and Conestogo do not appear to be of sufficient duration to generate 7Q20 flows.

XCG Conclusion Comment #7

A detailed review of the operation of the Glen Allan dam, including the PTTW, and an attempt to develop a relationship between the Glen Allan and St. Jacobs datasets would be a component of a full assimilative capacity study as part of a Schedule C Class EA if expansion of the St. Jacobs WWTP is identified as the preferred solution in the Master Plan.

MOE Conclusion Comment #8

Any truncation of datasets used must be statistically justified and should only exclude data from earlier years. There must be scientifically sound justification for truncating recent data and statistically valid argument for identifying "outliers".

XCG Conclusion Comment #8

Data truncation was only completed on datasets that exhibited a statistically significant trend. The process was to systematically remove one year at a time from the beginning of the record and re-evaluate for a trend. This process was conducted until no statistically significant trend was identified; this truncated dataset was then used estimate the 75th percentiles. The datasets were not censored for outliers. This description of the statistical assessment will be included in the final TM.

MOE Conclusion Comment #9

The validity of the dataset and analysis for dissolved oxygen is questionable. This supports the suggestion that some term of continuous monitoring of at least DO is warranted just upstream of the St. Jacobs outfall.

XCG Conclusion Comment #9

It is expected that if the expansion is to go through a Class EA assessment, a more detailed look at dissolved oxygen in the receiving stream will be included. It is expected that as part of the assessment aquatic and benthic assessments and detailed DO modelling will be required to determine downstream impacts as well.

MOE Conclusion Comment #10

A specific assessment of bacterial contamination impact is unnecessary: 100/200 cfu/100 ml E. coli are standard criteria in every WPCP approval; similarly, any new C of A is likely to require an effluent pH range of 6.5 – 8.5 as a standard condition.

XCG Conclusion Comment #10

No comment required.

XCG

20th XCG

EXCELLENCE IN ENVIRONMENTAL CONSULTING SERVICES

Date: December 2, 2010 **XCG File No.: 3-035-51-01**

To: Pam Law (Region of Waterloo)

cc: Stephen Nutt (XCG)

From: Janet Noyes (XCG)

Re: St. Jacobs and Elmira WWTP Monitoring Program

1. INTRODUCTION

As laid out in the St. Jacobs - Elmira Wastewater Treatment Master Plan Technical Proposal/Detailed Workplan (XCG & HMM, 2010), there is a requirement to develop and execute a water quality monitoring program as part of the Master Plan. Information collected under the program is to be used to develop a database for future use by the Region. The collected data will be useful for future projects wherein data are required to define ambient water quality conditions and a source of information for mixing zone analysis. It should be noted that this data is not intended to be used in the concurrent assimilative capacity analysis.

The following memorandum provides details on the proposed sample locations and the sampling methodology. Sampling protocol was set up to closely reflect the Surface Water Quality Monitoring Program - Standard Operating Procedures (SOP) developed by LGL Ltd. (October 2010).

2. SAMPLING LOCATIONS

On November 8. 2010, representatives from the Region of Waterloo, XCG and LGL field staff conducted field reconnaissance in the vicinity of the St. Jacobs and Elmira wastewater treatment plants (WWTPs). The goal of this field work was to select locations that would provide representative water quality data for future assimilative capacity analysis. The representative data to be collected at each location is described below:

Upstream of the St. Jacobs WWTP on the Conestogo River (STATION ID: ST JACOBS US): this location is to be used to define stream water quality conditions upstream of the St. Jacobs WWTP discharge.

XCG Consultants Ltd.
6 Cataraqui Street
Woolen Mill
West Wing, Suite 105
Kingston, Ontario
K7K 1Z7
Tel: (613) 542-5888
Fax: (613) 542-0844
E-mail:
kingston@xcg.com

Downstream of the St. Jacobs WWTP on the Conestogo River (STATION ID: ST JACOBS DS NEAR): this location is to be used to formulate a dataset of water quality conditions within the St. Jacobs WWTP effluent mixing zone.

Upstream of the Elmira WWTP on Canagagigue Creek (STATION ID: ELMIRA US): this location is to be used to define stream water quality conditions upstream of the Elmira WWTP discharge.

Downstream of the Elmira WWTP on Canagagigue Creek (STATION ID: ELMIRA DS NEAR): this location is to be used to formulate a dataset of water quality conditions within the Elmira WWTP effluent mixing zone.

Several candidate locations were examined for each sampling point. The final locations were agreed to by both XCG and LGL staff (the approximate UTM co-ordinates for the proposed sample locations are summarized in Table 1).

Table 1 Approximate co-ordinates of proposed sampling stations.

STATION ID	Zone	Easting	Northing
ST JACOBS US	17 T	536091	4821015
ST JACOBS DS NEAR	17 T	536578	4820497
ELMIRA US	17 T	536360	4826615
ELMIRA DS NEAR	17 T	536368	4826564
Notes: Detailed description of STATION ID provided below			

Another goal of the sampling program was to make it consistent with the "Surface Water Quality Monitoring Program for the Grand and Nith Rivers Standard Operating Procedures" (LGL Limited, 2010). Table 2 has been populated with the required station information; the reader is referred to the aforementioned document for clarification.

Table 2 Water quality station details.

STATION ID	Location	Seasonal Notes	Sample Type	Sample Collection
ST JACOBS US	From bridge on King St., upstream side.	If frozen in winter do not sample.	Composite	Bridge
ST JACOBS DS NEAR	Access via walking trail from community centre.	If frozen in winter do not sample.	Discrete	Reaching pole
ELMIRA US	Access via access road from Elmira WWTP	If frozen in winter do not sample.	Composite	Wading
ELMIRA DS NEAR	Access via access road from Elmira WWTP	If frozen in winter do not sample. Not sampled if stream flows are unsafe.	Discrete	Reaching Pole

Composite samples will be collected as described in the LGL SOP: a stainless steel bucket is used to collect three discrete samples across the width of the river and are

mixed in another stainless steel bucket. The composite sample will be collected from the mixed bucket.

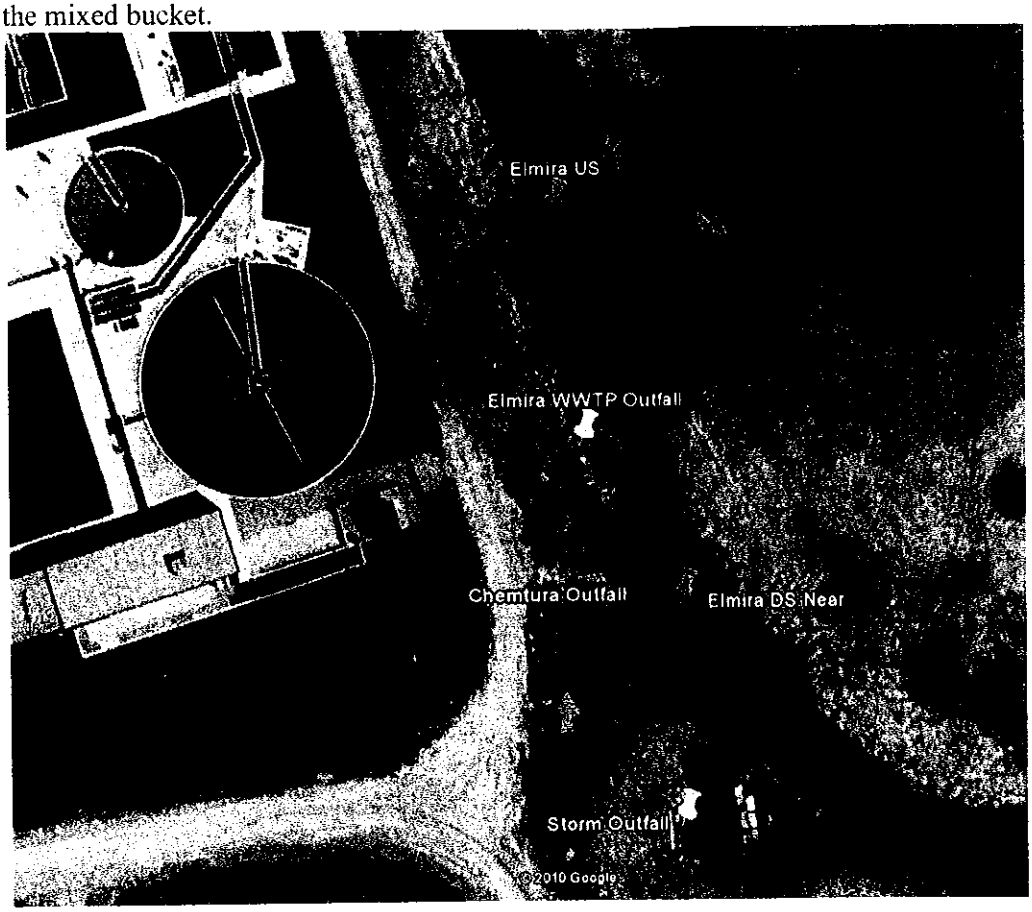


Figure 1 Sampling Locations for Elmira WWTP

Of note, the Elmira DS Near Station is located directly upstream of the Chemtura Outfall.



Figure 2 Sampling Locations for St. Jacobs WWTP

3. WATER QUALITY PARAMETERS OF INTEREST

The sampling program that will be used for the assimilative capacity study for the Master Plan is administered by the Grand River Conservation Authority (GRCA) as part of the Provincial Water Quality Monitoring Network (PWQMN). The sampling program described in this memorandum will be used to refine future assimilative capacity investigations and the parameter list required for assimilative capacity analysis is shorter than the required parameter list for the PWQMN samples. Required in-stream parameters for assimilative capacity analysis are summarized in Table 3 while parameters measured through stream sampling and submissions to a certified laboratory are summarized in Table 4. There are a few parameters in addition to those required specifically for the assimilative capacity assessment but these had been added to the parameter list to be consistent with the LGL SOP and the parameters requested by the Region.

Table 3 Required In-Stream Sampling Parameters

Parameter	PWQMN Code	Rationale
Field temperature	FWTEMP	Necessary to determine un-ionized ammonia.
Field pH	FWPH	Necessary to determine un-ionized ammonia.
Dissolved Oxygen	DO	Necessary for defining Policy conditions of receiver.
Conductivity	CONDAM	For consistency with other Region of Waterloo stations.

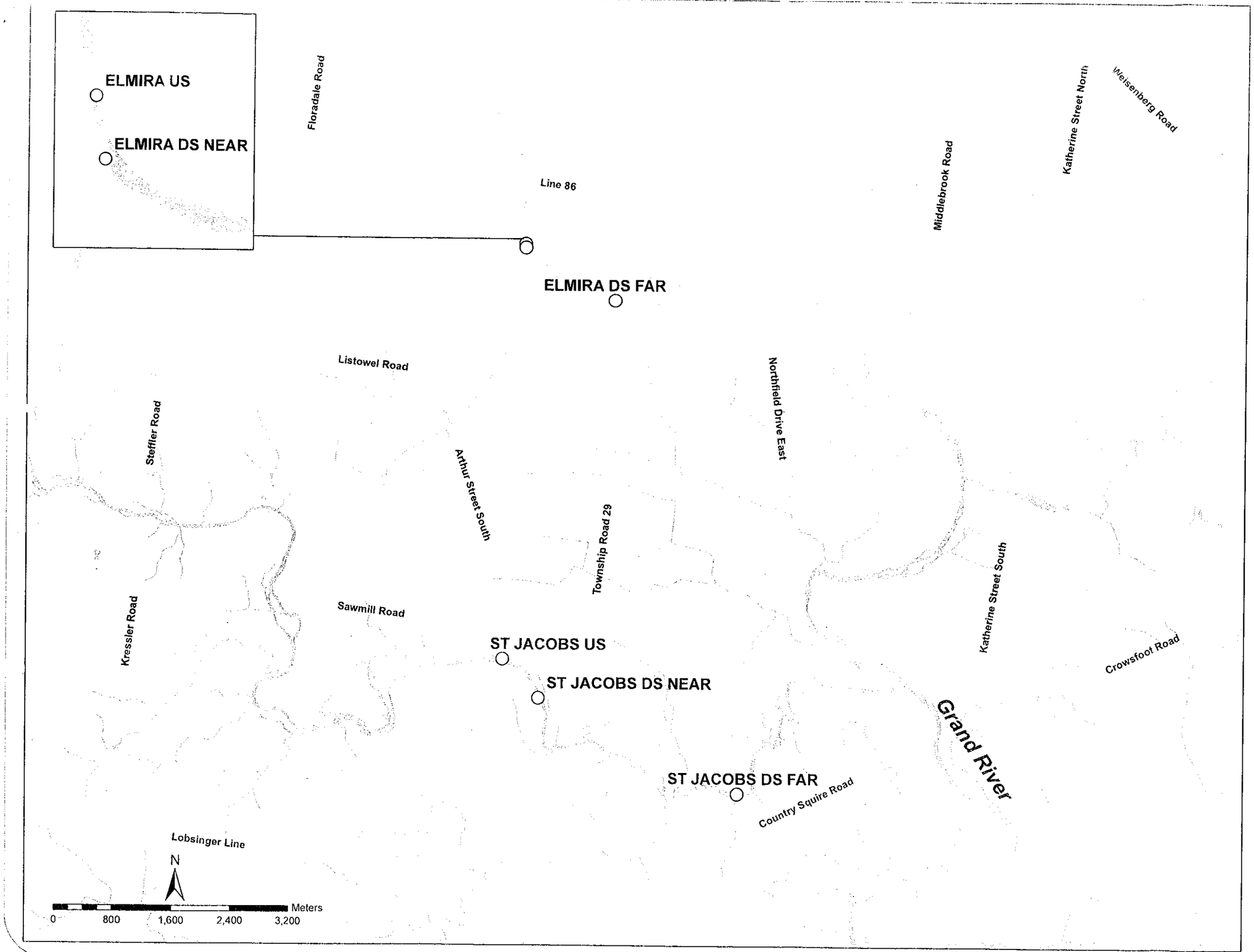
Table 4 Required Laboratory Sampling Parameters

Parameter	PWQMN Code	Rationale
5-day Biological oxygen demand	BOD5	Necessary for defining ambient conditions.
Total suspended solids	TSS	Necessary for defining ambient conditions.
Total phosphorus	PPUT	Necessary for defining Policy conditions of receiver.
Total ammonia	NNHTUR	Necessary to determine un-ionized ammonia.
E.coli	EC	Necessary for defining Policy conditions of receiver.
Nitrate	NN03UR	Currently not necessary. Likely to have a PWQO in the near future.
Nitrite	NNO2UR	For consistency with other Region of Waterloo stations.
Total Kjeldahl Nitrogen	NNTKUR	For consistency with other Region of Waterloo stations.
Chloride	CLIDUR	For consistency with other Region of Waterloo stations.
Orthophosphate	PPO4FR	For consistency with other Region of Waterloo stations.

Samples will be collected following the Standard Operating Procedures with the exception that an equivalent to the YSI 600QS sonde will be used.

4. CLOSING

The presented brief monitoring program will provide a database for future assimilative capacity analysis information. Further, the program will easily integrate within the existing monitoring program being executed by the Region of Waterloo.



LEGEND

- Sampling Stations
- Roads
- Watercourses
- Waterbodies

Grand & Nith Rivers Surface Water Quality Monitoring Program

Elmira and St Jacobs Stations

LGL LIMITED
environmental research associates

Project	TA4812	Figure	
Date	December, 2011	Prepared By:	KC
Scale	1:50,000	Verified By:	LKR

Ministry of the Environment
West Central Region

119 King Street West
12th Floor
Hamilton, Ontario L8P 4Y7
Tel.: 905 521-7640
Fax: 905 521-7820

Ministère de l'Environnement

119 rue King ouest
12e étage
Hamilton (Ontario) L8P 4Y7
Tél. : 905 521-7640
Téléc. : 905 521-7820

January 9, 2012

Ms Pam Law
Transportation and Environmental Services
Region of Waterloo
150 Frederick Street
Kitchener, Ontario
N2G 4J3

Dear Ms Law:

Re: St. Jacobs – Elmira Wastewater Treatment Master Plan
Draft Technical Memorandum #3 – Determination of Effluent Requirements for the Elmira and St. Jacobs WWTPs

Following receipt of your December 21st correspondence, we have reviewed the following document(s) which comprised that correspondence in terms of potential surface water concerns related to an expansion/upgrade of the St. Jacobs Water Pollution Control Plant:

- *Response to MOE Comments re: St. Jacobs- Elmira WWT MP*, XCG Consultants Ltd. December 8, 2011; and the

- *St. Jacobs and Elmira WWTP Monitoring Program*, XCG Consultants Ltd. December 2, 2011

The contents of the December 8, 2012 response relate only to our comments on the St. Jacobs WPCP. The December 2, 2012 memo discusses monitoring at both St. Jacobs and Elmira.

Comments on the Response Document

Except where noted below, XCG's responses are acceptable or the Ministry acknowledges that data is being collected to address the comment, as applicable.

For comment #3, the second portion is still applicable; however, this may also be addressed in the additional data collection and analysis still to come.

For comment #6, this approach has been taken in the past where in-plume data is absent; however, it is a reverse determination: the effluent does not disperse to background within 25% of the width but instead, limits the dispersion to having only 25% of the receiver width available (boundary condition) which in turn is used to back calculate the maximum concentration which would mix in this ¼ stream. The actual "mixing zone" is difficult to determine without site-specific information relating to cross-section and flow.

In comments #7 and #9, the use of the 2010-11 monitoring program data is unclear (see next section). Although the samples collected and analyzed are likely appropriate for water quality information, in stream work would also be required to collect the advective and dispersive hydrodynamics needed for the full ACS model. Further cross-sectional chemistry will likely have to be done to clarify the mixing and show that the single or 3-part composite samples are representative of their cross-section and how far they can be extrapolated. Once the critical season is determined, more frequent sampling may be required for a period of time for the ACS.

For comment #8, a current station at St. Jacobs would be preferable to trying to extrapolate data from Glen Allan (on its own).

For comments #4 and #15, $_7Q_{20}$ is a statistical determination and will vary with the duration of the database. If the flows are available for 20 years or less, the $_7Q_{20}$ will have to be the lowest 7-day period on record (e.g. $_7Q_{14}$ if available). When the database expands past the 20 year timeframe, the value of the $_7Q_{20}$ determination changes and may not be the lowest 7-day period in the past 20 years but rather, a statistically varied determination based on the entire period of record.

For conclusion comment #8, there must be some limit to the truncation. If dealing with a trending dataset, you could be reduced to the last year's data before the trending pattern disappears. Any trend may also be reflective of in-year patterns or changes to sampling regimes (e.g. TSS in spring v. the other 3 seasons, or a planned enhanced sampling program during the summer season in some years.)

Comments on the Monitoring Program

In the introduction, the statement is made that "It should be noted that this data (the discussed monitoring program) is not intended to be used in the concurrent assimilative capacity analysis. In Section 4, the reverse statement is made "The presented brief monitoring program will provide a database for future assimilative capacity analysis information." Could you respond to this discrepancy?

Two of the sampling locations in the Conestogo River appear to coincide with PWQMN stations (active & inactive). Conestogo River at King Street, St. Jacob (16-018-4078-02) was operated between 1975-1978 (43.541143º, -80.553316º) and it may be beneficial to compare the current & former databases. Similarly, the far D/S station appears to coincide with active PWQMN Station 16-018-4029-02, Conestogo River at Waterloo St. Reg.Rd.22, southwest of Conestogo (43.524852º, -80.514399º) and these datasets should be compatible.

In the sampling plan, indications were given that the field sampled parameters would be done by sonde. Given that D.O. is a critical parameter, the sonde should be lowered at the three cross-section locations and the results averaged, rather than use the sonde on the bucket sample. This may in fact be the intent, and this comment is made as it is not explicit in the memo.

Due to the technical nature of these comments, it would be more expeditious for responses or requests for clarification/discussion be made directly to Paul Odom either at (905)521-7674 or e-mail to paul.odom@ontario.ca. I have taken the liberty of providing copies of this letter directly to XCG via email.

Sincerely,

Original signed by

Barbara Slattery
EA/Planning Coordinator

cc. Steven Nutt, Janet Noyes, XCG (via email only)

Region of Waterloo

TRANSPORTATION AND
ENVIRONMENTAL SERVICES
Water Services

150 Frederick Street
Kitchener ON Canada N2G 4J3
Telephone: (519) 575-4426
Fax: (519) 575-4452
www.region.waterloo.on.ca

March 1, 2012
File: E12-40/8294-60

Ministry of the Environment
West Central Region
119 King Street West, 12th Floor
Hamilton, Ontario L8P 4Y7

Attention: Mr. Paul Odom,
Surface Water Group Leader

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Draft Technical Memorandum #3 – Determination of Effluent Requirements
for the Elmira and St. Jacobs WWTPs

Dear Mr. Odom:

Thank you for providing comments and ongoing communication regarding the St. Jacobs – Elmira Wastewater Treatment Master Plan.

XCG has prepared the attached responses to MOE's latest comments as detailed in a letter dated 9 January 2012. It has been verified that any comments or methodology recommendations related to ongoing monitoring are being addressed as part of the Region's monitoring program which is being administered by LGL. Any comments regarding future Assimilative Capacity Studies will be retained and integrated into any future studies. Comments relating to the works completed as part of the scope of the ongoing Master Plan will be reflected in an updated Technical Memorandum to be included as part of the Master Plan.

If you have any further comments or questions regarding these responses, please feel free to contact the undersigned. Meanwhile, thank you again for your comments. The Region will keep you informed as the Master Plan proceeds to conclusion in 2012.

Yours very truly,

Ms. Pam Law, P.Eng.
Project Engineer
Water Services,
Region of Waterloo

cc: Stephen Nutt/Janet Noyes, XCG Consultants Ltd.
Barbara Slattery, MOE

XCG CONSULTANTS LTD.
T 613 542 5888 F 613 542 0844 | kingston@xcg.com
6 Cataraqui Street, Woolen Mill, West Wing, Suite 105, Kingston, Ontario, Canada K7K 1Z7

Date: February 29, 2012 **XCG File No.: 1-035-51-01**

To: Pam Law (RoW)

cc: Stephen Nutt (XCG)

From: Janet Noyes (XCG)

Re: Response to MOE Comments re: St. Jacobs - Elmira WWT MP

XCG has reviewed the comments provided by Mr. Paul Odom of the Ministry of Environment (MOE), dated January 9, 2012. The MOE comments are in regards to four specific documents:

- XCG (2010); St. Jacobs and Elmira WWTP Monitoring Program, December 2, 2010.
- XCG (2011a); TM#3 – Determination of Effluent requirements for the Elmira and St. Jacobs Wastewater Treatment Plants, September 12, 2011.
- MOE (2011); St. Jacobs – Elmira Wastewater Treatment Master Plan Technical Review of Draft Technical Memorandum #3, October 31, 2011.
- XCG (2011b); Response to MOE Comments re: St. Jacobs – Elmira WWT MP, December 8, 2011.

To address the MOE's comments, XCG has reproduced the individual chain of comments to provide context and provided an appropriate response.

XCG acknowledges that the most recent MOE comments relate only to the St. Jacobs WPCP.

MOE Comments on Response Document (XCG 2011b)

MOE Comment #1

Except where noted below, XCG's responses are acceptable or the Ministry acknowledges that data is being collected to address the comment, as applicable.

XCG Comment #1

Acknowledged.

MOE Comment #2

For comment #3, the second portion is still applicable; however, this may also be addressed in the additional data collection and analysis still to come.

XCG Comment #2

The second portion of the referred to Comment #3: *"..., given the historic issue of ammonia level in the discharge, use of ambient (28 km. upstream?) data for effluent calculations is unacceptable.*"

As noted the closest upstream data available at the time of the assessment was 28 km away. As acknowledged by the MOE, the recent data collected will provide a better representation of ambient water quality for use in a detailed assimilative capacity assessment to be completed at a later date.

MOE Comment #3

For comment #6, this approach has been taken in the past where in-plume data is absent; however, it is a reverse determination: the effluent does not disperse to background within 25% of the width but instead, limits the dispersion to having only 25% of the receiver width available (boundary condition) which in turn is used to back calculate the maximum concentration which would mix in this ¼ stream. The actual "mixing zone" is difficult to determine without site-specific information relating to cross-section and flow.

XCG Comment #3

Acknowledged. This comment addressed previous work done by others. A preliminary mixing zone analysis was completed as part of XCG's assessment. It used cross-section data obtained from the GRCA and low flow values calculated from flow stations kept by GRCA and Water Survey of Canada. The mixing zone analysis will be further refined during the future ACS.

MOE Comment #4

In comments #7 and #9, the use of the 2010-11 monitoring program data is unclear (see next section). Although the samples collected and analyzed are likely appropriate for water quality information, in stream work would also be required to collect the advective and dispersive hydrodynamics needed for the full ACS model. Further cross-sectional chemistry will likely have to be done to clarify the mixing and show that the single or 3-part composite samples are representative of their cross-section and how far they can be extrapolated. Once the critical season is determined, more frequent sampling may be required for a period of time for the ACS.

XCG Comment #4

The 2010-2011 monitoring program data was not used in XCG's assessment of in-stream water quality, effluent limits or mixing zones; XCG used the existing best available data for the analysis. It is acknowledged that additional water quality parameter monitoring will be required for a higher detail ACS, which will be addressed following the Master Plan recommendations. The intent of the monitoring program was to begin to collect background water quality data in the Conestogo and Canagagigue streams in a similar method to the ongoing monitoring program now being conducted by LGL for the Region of Waterloo. The intent was to use the 2010-

2011 water quality data in support of a future ACS. In stream work and cross-sectional chemistry are included in LGL's continuing monitoring program.

MOE Comment #5

For comment #8, a current station at St. Jacobs would be preferable to trying to extrapolate data from Glen Allan (on its own).

XCG Comment #5

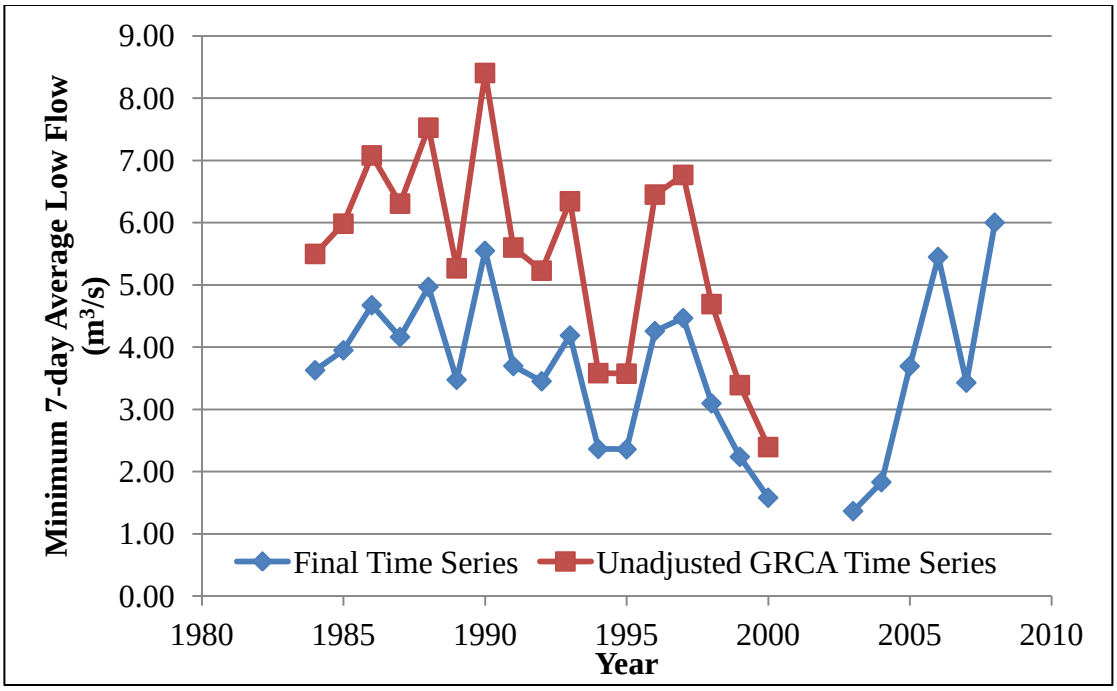
As noted in TM#3 (XCG 2011a), there was a Water Survey of Canada (WSC) station located in St. Jacobs on the Conestogo River that was monitored between 1913 and 1916. This data was not used in the 7Q20 analysis. GRCA resumed monitoring flows at St. Jacobs in the same location beginning in 1973 to 2002, at which time the WSC resumed operation of the station.

Discussions with GRCA indicated that the current streamflow regulation policies have been in effect since 1984. Accordingly, XCG truncated the Conestogo flow dataset prior to 1984 for the seasonal 7Q20 analysis, which provided over 20 years of data.

As also noted by GRCA, the flow measurements at St. Jacobs were not corrected for ice conditions during the winter season during the period in which the GRCA was monitoring flows, which may result in poor winter flow estimates. Ice effects in the winter season have been accounted for in the more recent WCS dataset ranging from 2002 to 2010.

To generate an alternate estimate of the winter 7Q20 low flow XCG conducted a comparative statistical analysis between the GRCA data and the recent WSC data. The assumption is that the no adjustment for ice affects would result in higher stream flow values; as such a comparison of the means (GRCA vs new WSC) using a one-tailed Student t-test was completed. The first step was to check for normality; this was completed by a simple probability plot. It was found that the data was normally distributed. The second step was to test for a significant difference (at a 95% confidence level) in the sample variances using the F-test; no statistically significant difference in the variances was found. The final step was to test for a statistically significant difference (at a 95% confidence level) of the means; a statistically significant difference between the means was found (i.e. the GRCA mean was higher than new WSC mean).

To generate a new adjusted time series it was necessary to calculate an adjustment factor to convert the GRCA down to the new WSC data mean. This factor was calculated as the (mean of the new WSC) / (mean of the GRCA); the final value was 0.66; the adjusted time series is shown in the figure below. The resultant 7Q20 winter low flow was 1.37 m^3/s.



MOE Comment #6

For comments #4 and #15, $_7Q_{20}$ is a statistical determination and will vary with the duration of the database. If the flows are available for 20 years or less, the $_7Q_{20}$ will have to be the lowest 7-day period on record (e.g. $_7Q_{14}$ if available). When the database expands past the 20 year timeframe, the value of the $_7Q_{20}$ determination changes and may not be the lowest 7-day period in the past 20 years but rather, a statistically varied determination based on the entire period of record.

XCG Comment #6

Comment #4 referred to previous work done by other consultants. XCG is cognisant of the various implications in statistical analysis of flow data and constraints imposed by truncated data.

In XCG's update of TM#3, will provide a table describing the period of record for flow data and re-iterate the reasoning for the truncation of the data (1984 to account for the existing streamflow regulation policy). Of note, the truncated flow dataset provided over 20 years of flow data; these data were used for the standard statistical determination of the 7Q20 flow. Determination of the seasonal statistics will be updated as per Comment #5.

MOE Comment #7

For conclusion comment #8, there must be some limit to the truncation. If dealing with a trending dataset, you could be reduced to the last year's data before the trending pattern disappears. Any trend may also be reflective of in-year patterns or changes to

sampling regimes (e.g. TSS in spring v. the other 3 seasons, or a planned enhanced sampling program during the summer season in some years.)

XCG Comment #7

Truncation of WQ data: XCG reviewed data from each water quality parameter separately and reviewed the datasets for statistically significant trends. If no trends were identified the entire dataset was applied; if a trend was identified it was truncated by removing the oldest data so that a non-trending dataset could be developed. The shortest period of record applied in the case of St. Jacobs was 15 years (1995 to 2010). In all cases, any data truncations were noted in the Data Summary Tables.

Truncation of flow data: As noted previously, XCG truncated the flow data from the Conestogo River measured at St. Jacobs prior to 1984, which corresponds with the implementation of GRCA's current streamflow regulation policy.

MOE Comments on Monitoring Program (XCG 2010)

MOE Comment #8

In the introduction, the statement is made that "It should be noted that this data (the discussed monitoring program) is not intended to be used in the concurrent assimilative capacity analysis. In Section 4, the reverse statement is made "The presented brief monitoring program will provide a database for future assimilative capacity analysis information." Could you respond to this discrepancy?

XCG Comment #8

This statement is not a discrepancy as it is acknowledged that a "full" assimilative capacity study may be required in the future, if the preferred option from the Master Plan is to move forward with a plant expansion. At that time, the data being collected from the 2010-2011 monitoring program and the subsequent data being collect by LGL, will be used. The 2010-2011 monitoring data was not used for the current XCG report (XCG 2011a).

MOE Comment #9

Two of the sampling locations in the Conestogo River appear to coincide with PWQMN stations (active & inactive). Conestogo River at King Street, St. Jacob (16-018-4078-02) was operated between 1975-1978 (43.541143º, -80.553316º) and it may be beneficial to compare the current & former databases. Similarly, the far D/S station appears to coincide with active PWQMN Station 16-018-4029-02, Conestogo River at Waterloo St. Reg.Rd.22, southwest of Conestogo (43.524852º, -80.514399º) and these datasets should be compatible.

XCG Comment #9

A comparison of the historical database to the data collected in the XCG 2010-2011 monitoring program may be undertaken as part of a future study, it was not within the scope of this project. A comparison of the 1970's data upstream St. Jacobs WWTP may not correlate well with the more recent data as there have been historic trends noted with a number of different parameters.

The sampling station noted in LGL's figure as St. Jacobs DS Far, was not included as part of the XCG monitoring program and thus there is no 2010-2011 data for comparison with the PWQMN station. However, the DS Far stations may be included in the follow-up sampling being conducted by LGL and that data may be available for future comparative purposes.

MOE Comment #10

In the sampling plan, indications were given that the field sampled parameters would be done by sonde. Given that D.O. is a critical parameter, the sonde should be lowered at the three cross-section locations and the results averaged, rather than use the sonde on the bucket sample. This may in fact be the intent, and this comment is made as it is not explicit in the memo.

XCG Comment #10

The procedures for conducting the DO sampling (and all other sampling protocols) were further described in LGL's Standard Operating Procedures, as referenced in XCG's Monitoring Plan. LGL's protocol for DO includes in-stream measurement at left bank, right bank and mid-bank.

APPENDIX E
REVIEW OF I/I REDUCTION PROGRAMS

XCG File No.: 3-035-51-01
December 24, 2012

ST. JACOBS-ELMIRA WASTEWATER TREATMENT MASTER PLAN
REVIEW OF INFILTRATION AND INFLOW REDUCTION PROGRAMS

Prepared for:

REGION OF WATERLOO
150 Frederick Street, 7th Floor
Kitchener, Ontario
N2G 4J3

Prepared by:

XCG CONSULTANTS LTD.
300-2620 Bristol Circle
Oakville, Ontario
L6H 6Z7

In association with:

HATCH MOTT MACDONALD
200-5420 North Service Road
Burlington, Ontario
L7L 6C7

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APPENDICES

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1. INTRODUCTION

The Region of Waterloo has recently initiated a new Wastewater Treatment Master Plan (WWTMP) for the communities of St. Jacobs and Elmira to develop a long term strategy for providing wastewater servicing to the two communities and satisfy the requirements of Phases 1 and 2 of the Municipal Class Environmental Assessment (EA) process. The St. Jacobs-Elmira WWTMP will review wastewater treatment conditions for the two communities since the implementation of the recommendations of the 1997 Elmira and St. Jacobs Wastewater Treatment Class EA Study (Region of Waterloo, 1997) and completion of the 2007 Region-wide Wastewater Treatment Master Plan Study (EarthTech, 2007), and recommend wastewater servicing requirements to meet expected growth in the two communities for the next 30 years.

The Region wide WWTMP recommended short and long term actions for the Elmira WWTP and for the St. Jacobs WWTP. At the Elmira WWTP, the WWTMP recommended a short term optimization program to address process issues. The Region is currently proceeding with detailed design of upgrades to the Elmira WWTP including construction of additional sewage equalization storage tanks (to temporarily store excess wet weather flow) and upgrades to dewatering, aeration influent distribution, and RAS pumping. At the St. Jacobs WWTP, the WWTMP short term recommendations included implementation of an optimization program to address process issues and implementation of the Region's Biosolids Master Plan. In the long term, the WWTMP recommended capacity upgrades at both facilities (to 10 MLD at Elmira WWTP and 2.5 MLD at the St. Jacobs WWTP). The Region-wide WWTMP also recommended completion of a separate master plan for the Elmira and St. Jacobs WWTPs where options for wastewater servicing of both communities could be considered together. This study also provides an opportunity to consider the feasibility of incorporating flows from the Heidelberg WWTP into an overall solution.

1.1 Objectives of Project

The overall scope of work for this project includes:

- Collection and review of relevant past studies and collection of the latest information from ongoing studies;
- Collection of relevant data;
- Update of wastewater forecasts to the year 2041;
- Review of applicable regulations and policies concerning wastewater treatment plant discharge and river quality;
- Re-examination of the assimilative capacity (mass balance analysis) of the Canagagigue Creek and Conestogo River for current and future flows;

- Identification of the existing operating status for each WWTP and examination of opportunities and constraints;
- Examination of strategies for future wastewater treatment, at existing locations and/or elsewhere;
- Examination of historical inflow and infiltration (I/I) data and works completed to date;
- Preparation of a strategy for future management of I/I within each collection system; and
- Preparation of a Final Report.

The culmination of the project will be the completion of a new Wastewater Treatment Master Plan for the communities of St. Jacobs and Elmira, fulfilling the requirements of Phases 1 and 2 of the Municipal Class Environmental Assessment (EA) process.

This Technical Memorandum presents a review of inflow and infiltration (I/I) programs within the communities of St. Jacobs and Elmira. Specifically, this Technical Memorandum contains the following:

1. A summary of the recommendations from the 1997 ESR and 1996 I/I studies;
2. Discussion on the results of meetings held with Township of Woolwich staff (and their consultants) to collect background information and discuss their I/I investigation and reduction programs (past, present and future);
3. A summary of the I/I programs and works completed by the Township, and the upgrades completed by the Region at the two WWTPs to address I/I;
4. A review current levels of I/I within each collection system and comments on the effectiveness of improvements made to date;
5. A review of the impact of I/I on current WWTP operations and potential future impacts with the construction of new equalization storage tanks at the Elmira WWTP; and
6. Identification of other opportunities or constraints within the collection systems.

2. EXISTING COLLECTION SYSTEMS

The communities of St. Jacobs and Elmira are situated within the Township of Woolwich, one of four townships that together with three cities comprise the Regional Municipality of Waterloo. The wastewater systems in both communities are operated as a 2-tier system, with the Township responsible for wastewater collections and general pumping, and the Region responsible for wastewater treatment, discharge and biosolids management. The communities of St. Jacobs and Elmira each have their own separate wastewater collection and treatment facilities. The Region owns both WWTPs, and the facilities are operated by the Ontario Clean Water Agency (OCWA) under contract with the Region.

2.1 St. Jacobs Wastewater Collection System

Figure 2.1 shows the layout and extent of the St. Jacobs wastewater collection system including the location of the St. Jacobs WWTP.

The St. Jacobs wastewater collection system and treatment plant were originally constructed in 1971. The St. Jacobs wastewater collection system comprises approximately 10 km of sanitary sewers ranging in size from 200 mm to 450 mm in diameter, with the majority of pipes being 200 mm and 300 mm in diameter. The sewer system includes approximately 122 manholes.

2.2 Elmira Wastewater Collection System

Figure 2.2 shows the layout and extent of the Elmira wastewater collection system including the location of the Elmira WWTP.

The Elmira wastewater collection system comprises approximately 33 km of sanitary sewers ranging in size from 100 mm to 525 mm diameter, with the majority of pipes being 250 mm and smaller in diameter. The sewer system includes approximately 530 manholes.

The older, North Elmira sewer system (now 75+ years old) is also serviced by a cellar drain system, including common manholes in which the sanitary and cellar drain sewers are separated by a bulkhead. Water from weeping tiles and downspouts have their own collection system (cellar drain system), independent of the sanitary sewers, so water from these systems does not flow to the WWTP during average flow conditions. The common manholes between the cellar drain and sanitary sewer systems provides an opportunity for cellar drain flows to enter the sanitary sewer system as inflow if the manholes surcharge for any reason (e.g. during wet weather).

Many of the homes in the South Elmira sewer system, which were built prior to 1980, had foundation drains connected to the sanitary sewer. The area also has storm sewers which are too shallow to allow foundation drain connections. This provides an opportunity for entry of excessive I/I into the sewer system during both dry and wet weather.

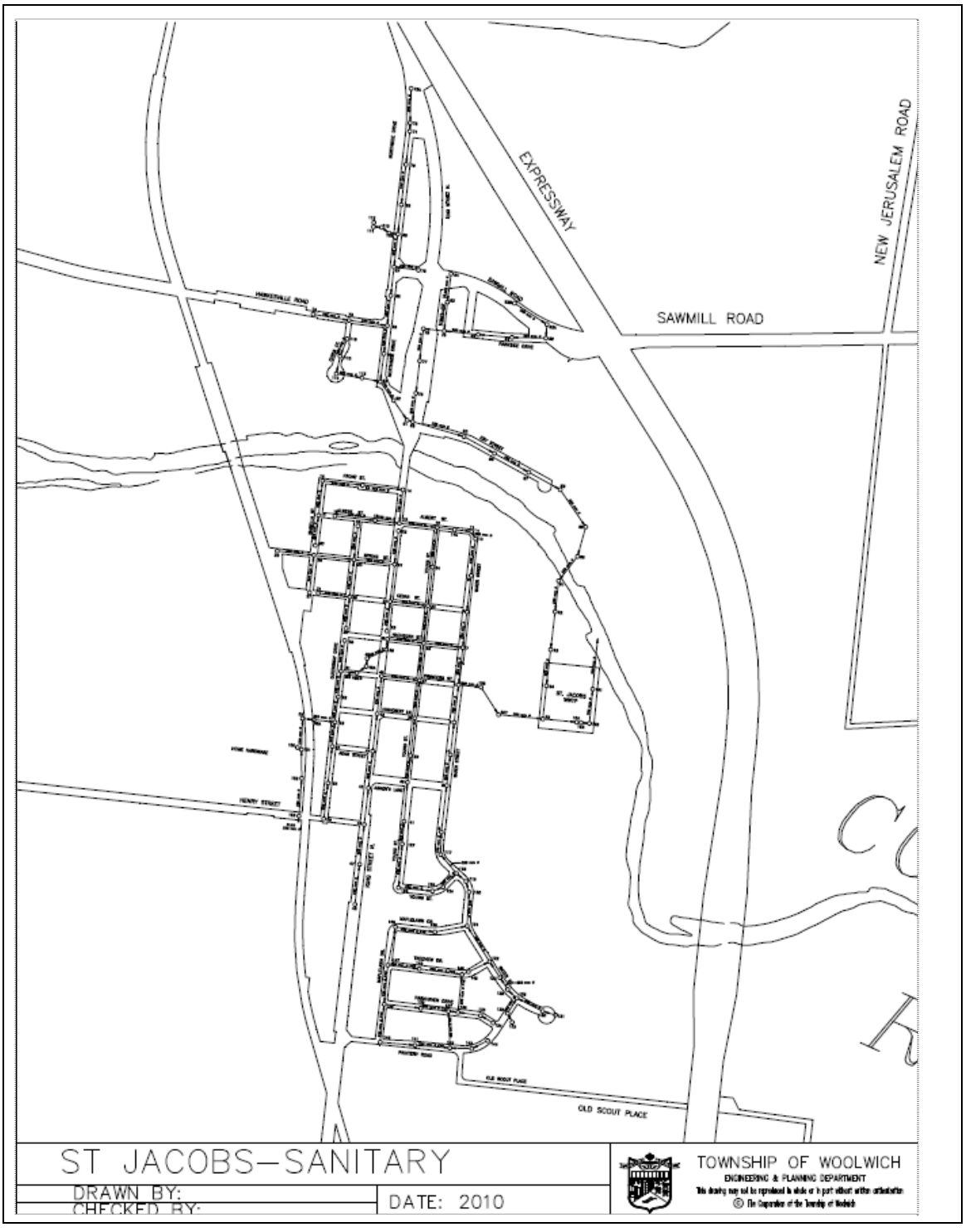


Figure 2.1 St. Jacobs Wastewater Collection System

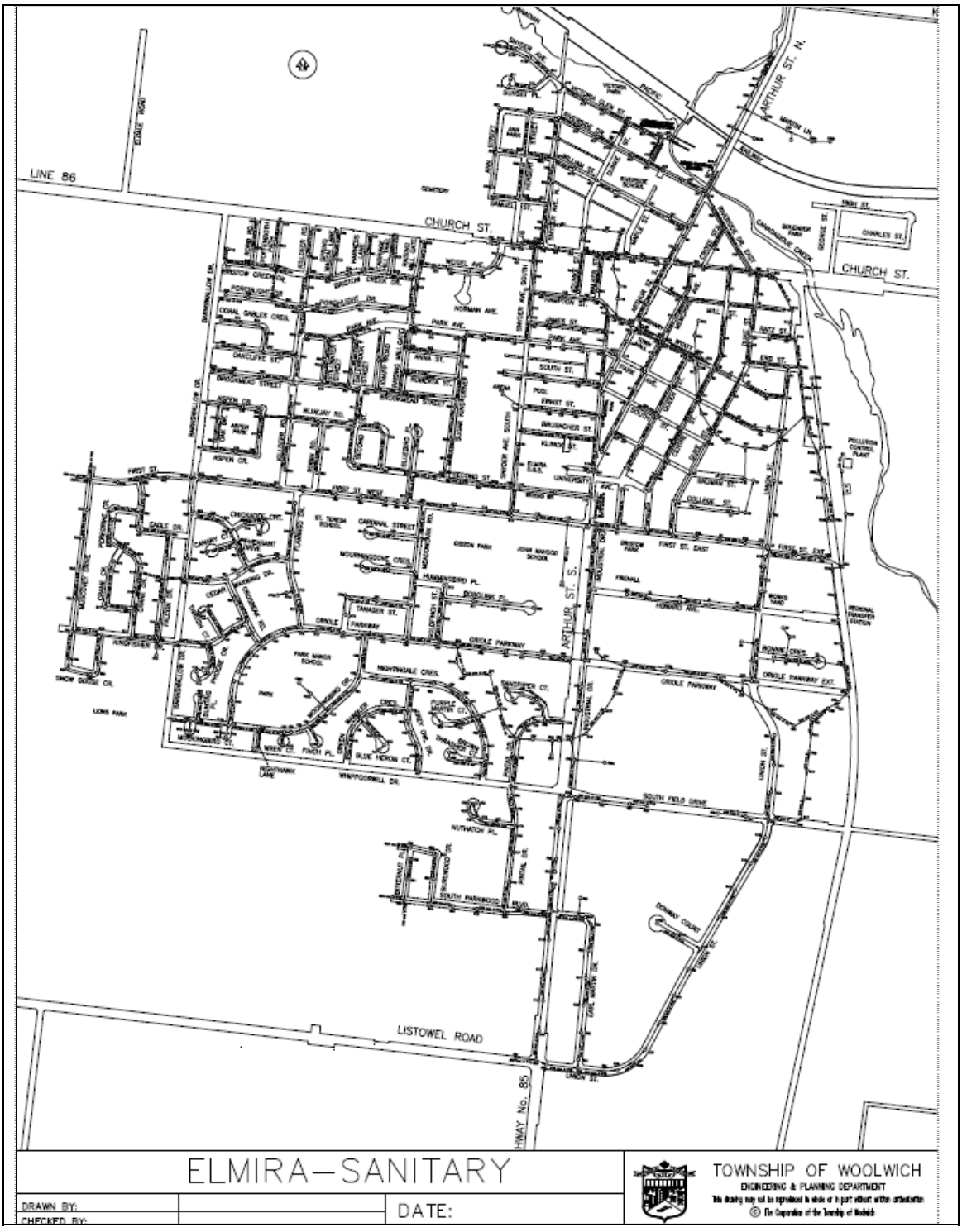


Figure 2.2 Elmira Wastewater Collection System

3. REVIEW OF PREVIOUS STUDIES

The Region of Waterloo has completed a number of previous engineering studies that have investigated and identified current and future wastewater treatment needs in the communities of St. Jacobs and Elmira. These studies have also included an investigation of the impact of I/I within the contributing collection systems. The Township of Woolwich has also been implementing their own detailed programs to identify and reduce I/I within their collection systems. The most significant previous studies related to St. Jacobs and Elmira included the following:

1. Elmira Sanitary Sewer Infiltration/Inflow Study - Pilot Project (March 1997)
2. Elmira and St. Jacobs Infiltration and Inflow Review (May 1997)
3. Elmira and St. Jacobs Wastewater Treatment Project ESR (October 1997)
4. Regional Wastewater Treatment Master Plan (2007)

A summary of the key findings and recommendations of each of these studies is presented below in chronological order below.

3.1 Elmira Sanitary Sewer I/I Inflow Study - Pilot Project (March 1997)

In the early 1990's, growth in Elmira was limited by the lack of wastewater treatment capacity and capacity constraints within the existing collection system. Significant extraneous I/I was found to be entering the sewer system, taking up capacity and resulting in bypassing of untreated sewage to the Canagagigue Creek. In 1995, the Township of Woolwich and the Region of Waterloo initiated the Elmira Sanitary Sewer Infiltration/Inflow Study to better identify the deficiencies within the system and potential sources of the I/I (Paragon, 1997).

Extensive flow monitoring undertaken in both the north and south sanitary collection systems confirmed that significant dry and wet weather I/I was occurring within the system. The combined sanitary/cellar drain system in North Elmira appeared to be in relatively good condition and was generally considered to be providing a valuable function in separating the clean cellar drain water from the domestic wastewater. The lack of an existing outlet from the cellar drain system in Area 1 (at the time) resulted in extraneous I/I entering the sanitary sewer system. This was rectified during the study.

The flow monitoring revealed significant I/I was entering the south portion of the collection system during both dry and wet weather. A review of background information and discussions with builders active in the Elmira area prior to 1980 confirmed that there were a significant number of potential direct connections to the sanitary sewer system.

To better understand the potential benefit/effectiveness of a source control program (to remove direct inflows), a pilot project was suggested and undertaken within a priority area located generally north of First Street and west of Bluebird Place. The goals of the pilot project were to better establish the implementation costs, determine

the degree of I/I reduction that could be achieved, and identify any other issues that could affect implementation of such a program on a system-wide basis. The pilot project was focused on foundation drains connected directly to the sanitary sewer system.

Three different approaches were identified and evaluated for reducing I/I from these private direct connections, including the following:

1. **Gravity Foundation Drain to Deep Storm Sewer System** - Construction of a new deep storm sewer system within roadways together with new storm laterals to interconnect with existing foundation drains and/or sumps. System-wide, this would require construction of 2 new storm pumping stations within the south Elmira system to permit discharge to the adjacent watercourse.
2. **Sump Pump/Connection to Existing Storm Sewer System** - Construction of new internal sumps, sump pumps and associated plumbing/electrical work, new storm connections, new common discharge header to intercept individual storm connections and interconnect with existing storm sewer system, and disconnection of existing foundation drains and/or internal sump pumps from existing sanitary service lateral and interconnection with internal and/or external sumps.
3. **New Sanitary Sewer System** - Construction of a new sanitary sewer system (third pipe) within the roadway together with new sanitary service laterals to interconnect with the existing internal plumbing at each home. The existing sanitary sewer system and laterals would be maintained to intercept and convey foundation drainage/groundwater to new storm pumping stations. System-wide, this would require construction of 2 new storm pumping stations within the south Elmira system to permit discharge to the adjacent watercourse.

Based upon the pilot project flow data and other 1994 in-sewer flow monitoring, the study indicated that average dry weather flow could be reduced by 348-1000 m^3/d (based on pilot project results) or 702 m^3/d (based on theoretical calculations) and peak wet weather flow could be reduced by 77-157 L/s (based on pilot project results) or 137 L/s (based on theoretical calculations).

Estimated capital and operating costs for the 3 alternatives were developed, which indicated that the estimated reduction in average dry weather could potentially result in an annual savings in wastewater treatment costs of $48,000 to $140,000.

A comparative evaluation of the 3 alternatives was completed considering their potential for I/I reduction, estimated costs, ease of implementation, ability to phase improvements, impact on private property/owners, and ability to address other related problems. Based on this evaluation, Alternative 3 - New Sanitary Sewer System - was recommended as the preferred solution because it would:

- Eliminate the need to enter individual homes to retrofit existing plumbing systems thereby minimizing the impact on private property/owners. It was noted that minimal impacts on private property resulting from construction of new

sanitary sewer laterals could be mitigated by proper landscaping and good communications.

- Provide a gravity outlet for the foundation drains and/or water table that did not rely on the use of individual sump pumps, which the public may have perceived negatively due to maintenance and overall security issues.
- Provide the highest I/I reduction of the 3 alternatives as it would generally provide a new (tighter) sewer with no known connections other than the internal plumbing of each home. Only a moderate infiltration allowance would be provided for under this alternative.
- Replace those sections of deficient pipe identified in the Elmira Sanitary Sewer Infiltration Study that would need to replaced in any case as part of the capital works plan.
- Would result in partial construction of the roadways, which when combined with other capital budgets/projects, could provide cost-effective opportunity for reconstruction of roads/watermains in South Elmira.

3.2 Elmira and St. Jacobs Infiltration and Inflow Review (May 1997)

Following completion of the draft Wastewater Treatment Master Plan ESR in 1997, the Region commenced a project to investigate the potential for reducing I/I in both the St. Jacobs and Elmira collection systems (Dillon, 1997). This study, in conjunction with the Elmira Sanitary Sewer I/I Pilot Project Study, resulted in the reassessment of the preferred alternatives for future wastewater servicing in the two communities, as recommended by the 1997 ESR, and formed the basis for the 10-year I/I capital reduction program that commenced in 1998. Implementation of this program was done by the Township of Woolwich as part of a joint cost sharing agreement with the Region of Waterloo.

The report stated that the strategic and design alternative that provided the best solution to the stated problem was the individual expansion of the existing Elmira and St. Jacobs WWTPs, combined with a well developed I/I control program. The report indicated that this alternative would provide development capacity once the necessary physical and biological treatment upgrades were completed at the two plants, and would ensure a higher quality effluent would be produced, resulting in significantly lower loadings to the receiving streams during average, and in particular, peak wastewater flow conditions.

The report noted that although it appeared that the implementation of I/I control measures in the St. Jacobs collection system could eliminate the need for expansion of the St. Jacobs WWTP, it could take several years before adequate plant capacity was recovered (from I/I reduction measures) to allow the development limitations (in place at the time) to be lifted. The report noted relatively minor additions would be required at the St. Jacobs WWTP to achieve the necessary additional capacity.

The report recommended the same physical upgrades at the treatments plants that had been included in previous reports, and noted that actual expansion/upgrade costs

would depend upon detailed condition audits and hydraulic surveys to be undertaken during pre-design. Recommended biological upgrades at the plants included enhanced precipitation, additional secondary clarification, and tertiary filtration.

Sewage equalization storage was recommended at both WWTPs to accommodate the existing flows from a 1 in 2 year storm event without I/I controls. It was noted that these equalization storage tanks could attenuate peak flows from large events following the successful implementation of I/I controls.

Implementation of I/I controls were envisaged for both the north and south Elmira and a large majority of the St. Jacobs wastewater collection systems. Table 3.1 identifies the required I/I reductions within the respective systems to ensure long-term availability of development capacity and the stability of the biological treatment process to adhere to the more stringent effluent criteria associated with the WWTP upgrades.

Table 3.1 Targeted Reductions in I/I for Preferred Strategy

WWTP	I/I Average per Capita1 (Lpcd)			I/I Peak Flow Rate[2] (L/s)			Peak Factor[3]
	Existing[1]	Target [4]	% Reduction	Existing[1]	Target [4]	% Reduction	
Elmira	250	150	40	335	205	39	6
St. Jacobs	400	200	50	1035	39	62	6

Notes:
1. Average per capita sewage generation rate is 300 Lpcd in Elmira and 315 Lpcd in St. Jacobs.
2. Average dry weather instantaneous sewage flow rate is 25 L/s in Elmira and 5 L/s in St. Jacobs
3. Peak Factor is calculated as 'targeted peak I/I plus dry weather sewage' divided by 'average I/I plus dry weather sewage'. This represents the peak factor before equalization.
4. Anticipated I/I reductions to be realized over a 7 to 10 year period depending on capital program and success rate. Target I/I per capita peak flow rates are 2400 Lpcd for Elmira and 2600 Lpcd for St. Jacobs.

The report noted that the I/I control program for South Elmira would likely employ a new third pipe to collect and convey sanitary sewage either to the proposed First Street Trunk Sewer or the existing South Pumping Station, and the existing sanitary sewers would be used as a deep storm sewer system requiring discharge to surface waters either through new storm pumping stations or relief to local creeks or ditches in the area. A detailed evaluation of the remediation options was undertaken by the Township and Paragon Engineering as part of the Pilot Project initiated in 1996 and completed in 1997.

The report noted that the I/I control program for the north area of Elmira would likely include replacement of the First Street East and Uniroyal Trunk Sewers, repairs to the remaining bulkheads in the combined manholes of the cellar drain system, installation of additional flap gates and possibly more effective methods to prevent high creek levels from entering or backing up the cellar drain system and ultimately separation of combined manholes, if required. The report noted that further definition of likely sources of I/I was required in North Elmira.

The report noted that the I/I control program for St. Jacobs would include either replacement or relining of sanitary sewers with replacement of service laterals, with a similar reduction in I/I expected for similar expenditure. It was noted that

replacement would likely have a higher likelihood of success, particularly in dealing with foundation drain or cistern overflows. However, it was noted that lining of the sanitary sewers would be less disruptive. The report suggested that the decision would depend on the relative contribution of foundation drain flows and cistern overflows to the overall I/I flows. The report noted that previous studies and reports had not been able to distinguish the different sources of I/I in St. Jacobs, and suggested that further source identification was required. Finally, the report identified that the Township had undertaken additional flow monitoring in St. Jacobs, and suggested that review of this data during pre-design could identify specific areas of concern that should be addressed as a priority.

3.3 Elmira and St. Jacobs Wastewater Treatment Project - ESR (Oct 1997)

This project was carried out as a Schedule 'C' Class Environmental Assessment and examined alternatives for providing adequate wastewater treatment capacity for the communities of Elmira and St. Jacobs to the year 2021. The Draft ESR completed in 1996 recommended the following measures:

- Upgrade the Elmira WWTP to improve water quality and maintain existing flow limit, with the WWTP treating flows from all current and future development north of First Street;
- Construct a new WWTP near St. Jacobs, with this WWTP treating all St. Jacobs flows and existing flows from South Elmira;
- Construct new pump stations in St. Jacobs and Elmira to convey flows to the new St. Jacobs WWTP;
- Continue inflow and infiltration (I/I) reduction initiatives and Regional Water Efficiency Program.

Upon completion of the draft ESR in 1996, it was identified that further details would be required to support the proposed recommendations. Additional data was collected and investigations were completed, and this information was used to reassess the previous recommendations. The result was a revised preferred servicing solution comprising the following measures, as presented in Final ESR (Region of Waterloo, 1997):

- Upgrade the Elmira WWTP at the existing site to service the whole Elmira settlement area:
- Upgrade and expand the St. Jacobs WWTP at the existing site to service the whole St. Jacobs settlement area;
- Provide some equalization storage capacity at both WWTPs to minimize the impact of I/I on plant operation;
- Implement significant I/I reduction programs in both communities; and
- Continue Regional Water Efficiency Program.

Upgrades and expansions of the two WWTPs were completed in 2000 and included the following components:

Elmira WWTP

- New influent pumping station
- New equalization storage tank
- New headworks facility
- Modification of existing aeration basins 5 & 6 to create 5-cell basins to provide enhanced peak flow operation and biological nutrient removal
- New secondary clarifier
- New RAS/WAS pumping station
- New UV disinfection facility
- Modification of existing primary sludge holding tank

St. Jacobs WWTP

- New headworks facility
- New secondary clarifiers
- New tertiary filtration facility
- New UV disinfection facility

3.4 Regional Wastewater Treatment Master Plan (2007)

The Region completed an update of its Regional Wastewater Treatment Master Plan in 2007 (EarthTech, 2007), which included wastewater flow projections accounting for the Province of Ontario's Places to Grow Act (2005). As part of this study, mass balance analyses were conducted for the Region's smaller WWTPs (including St. Jacobs and Elmira) and their respective receiving water bodies, for both current and future flow conditions. Key findings of these analyses were as follows:

Elmira WWTP

- Current Status: Ambient conditions for the Canagagigue Creek (receiving water body for the Elmira WWTP) were determined to be MOE Policy 1 for unionized ammonia and MOE Policy 2 for phosphorus.
- Future Flows: It was estimated that the Elmira WWTP has sufficient capacity to service the community to 2031. The report identified that additional capacity might be realized through optimization of the existing primary clarifiers, and that advanced treatment technologies may be required for future expansions in order maintain current effluent loadings to the Canagagigue Creek.
- Opportunities: The Elmira WWTP has experienced high organic loading causing stress to the treatment process. If these high loads continue, it may be necessary

to undertake process optimization in the short term. It was recommended that the Region and Township should continue to address I/I issues and consider potential diversion of excess flows as these extra flows limit plant capacity and impact the treatment efficiency of the plant.

St. Jacobs WWTP

- Current Status: Ambient conditions for Conestogo Creek (receiving water body for the St. Jacobs WWTP) were determined to be MOE Policy 1 for unionized ammonia and MOE Policy 2 for phosphorus.
- Future Flows: It was estimated that the capacity of the St. Jacobs WWTP would be realized by 2016.
- Opportunities: Optimization at the St. Jacobs WWTP should be completed to address system deficiencies, including cold temperature operation. It was recommended that the Region and Township should continue to address I/I issues to reduce excess flows as these extra flows limit plant capacity and impact the treatment efficiency of the plant.

3.5 Annual Water and Wastewater Monitoring Report (2010)

The Region's Annual Water and Wastewater Monitoring Report for 2010 identified the following capacities and flows at the St. Jacobs and Elmira WWTPs:

Elmira WWTP

- Plant Capacity = 7,800 m^3/d.
- Average Daily Flow (for 2009) = 4,089 m^3/d.
- Adjusted Average Daily Flow = 4,613 m^3/d (based on last 5 years and 85% confidence correction).
- Flow Allocation Commitments not including Draft Approvals = 157 m^3/d.

St. Jacobs WWTP

- Plant Capacity = 1,450 m^3/d.
- Average Daily Flow (for 2009) = 976 m^3/d (2009 flows down 22% from previous year, so not necessarily representative of average flow).
- Adjusted Average Daily Flow = 1,220 m^3/d (based on last 5 years and 85% confidence correction).
- Flow Allocation Commitments not including Draft Approvals = 32 m^3/d.

3.6 Elmira WWTP Upgrades (In Progress)

In addition to the recommended expansion of the Elmira WWTP, the 1997 Class EA completed by the Region recommended the installation of several additional equalization tanks at the plant to provide storage of excess wet weather flows. Two of these tanks (#3 and #4) were constructed as part of the plant upgrades in 2000,

and combined with the previous existing tanks (# 1 and #2), provide a total of 3,894 m^3 of equalization storage. In 2009, the Region commenced a preliminary assessment of the need for still further equalization storage capacity at the plant, and this additional storage is currently in the design stage along with the following plan upgrades:

- New dewatering centrifuge
- New primary influent bypass weir to equalization tanks #1 and #2
- New aeration influent distribution control
- RAS pumping
- Miscellaneous instrumentation and control (I&C) systems

A more detailed discussion of the Elmira equalization storage tanks is provided in Section 6 of this Technical Memorandum.

4. TOWNSHIP OF WOOLWICH I/I REDUCTION ACTIVITIES

Members of our Project Team met with representatives the Region of Waterloo, Township of Woolwich, and Stantec (who have been assisting with the Township's I/I reduction programs in St. Jacobs and Elmira) at the Region's Headquarters on November 19, 2010. The purpose of the meeting was to exchange information regarding the Township's I/I Reduction Programs within the communities of St. Jacobs and Elmira. Meeting Minutes are included in Appendix A.

An overview of the Township's I/I reduction program from 1997 to present was given by the Township and then consultants. Some key highlights included the following:

- Manhole rehabilitation program is in progress (comprising 61 manholes).
- I/I issues from a new development area were identified and addressed by requiring the developer to repair the system prior to the Township assuming the new sewer infrastructure.
- CCTV inspections have identified some sewer laterals flowing continuously.
- Review of long term flow data collected in St. Jacobs indicates that high flows occur in the spring, and that flows can remain elevated for up to six months.

It was noted that the Region and the Township had previously entered into a cost sharing agreement as a result of the 1997 Regional Wastewater Master Plan, which ended in 2008. The following sections present more detailed information on the Township's efforts in both St. Jacobs and Elmira.

4.1 St. Jacobs I/I Reduction Program

A presentation was given on the efforts and progress achieved to date (from 2002 to 2010) on the Township's I/I reduction program in St. Jacobs, which led to further discussion about the program. A copy of the presentation is included in Appendix B of this Technical Memorandum.

Some key points of discussion included the following:

1. With respect to identification and investigation of I/I problems, the Township maintains a number of permanent and temporary flow monitoring sites in St. Jacobs to identify issues and determine the success of their ongoing I/I reduction program. They also maintain an annual flushing and CCTV sewer inspection program.
2. With respect to remedial works for I/I reduction, the Township's general approach/intent has been to fix I/I problems as they are identified. I/I reduction works completed in St. Jacobs include rehabilitation of some 61 manholes (still in progress).
3. The Township's inspection programs recently identified excessive I/I coming from a new subdivision development. This issue was addressed by requiring the

developer to repair the system prior to the Township assuming the new sewer infrastructure. The Township has also changed plumbing practices for clean out and sewer lateral construction to reduce the potential for I/I from new development areas.

4. With respect to I/I performance measurement, flow monitoring data collected at the St. Jacobs WWTP and at Manholes 87 and 108 has been compiled for the period from 1999 to 2007, and used to determine the performance of I/I repairs that have already been completed.

The Township has had an active program of I/I investigation and repair since 1989, and believe that the most cost effective repairs have already been completed. Despite this, groundwater infiltration continues to be an issue in St. Jacobs, and the Township has not found any significant specific sources.

The Township identified that their next steps in addressing I/I in St. Jacobs include the successful completion of the ongoing manhole rehabilitation program (61 manholes) and consideration of private side I/I sources. The Township is currently evaluating private side repair programs but has significant issues associated with liability. The Township is currently completing a cost effectiveness analysis for sump pump disconnection and lateral lining in St. Jacobs.

The following information was requested from the Township as input to the review of I/I in St. Jacobs:

- Copies of the powerpoint presentation given during the meeting.
- Any CAD drawings or drawing layers showing pipe diameter and slopes, location of manhole repairs, and flowing laterals.
- Daily flow data from 2004 to 2010 for St. Jacobs including any rainfall data. (WWTP and permanent metering sites).
- Technical Memorandum on the Third Pipe System Evaluation (when available).
- Results of forensic analysis completed in 2009.

4.2 Elmira I/I Reduction Program

A presentation was given on the efforts and progress achieved to date (from 2002 to 2010) on the Township's I/I reduction program in Elmira, which led to further discussion about the program. A copy of the presentation is included in Appendix C of this Technical Memorandum.

Some key points of discussion included the following:

1. With respect to I/I investigation and identification, the Township maintains a number of permanent and temporary flow monitoring sites in Elmira to identify issues and determine the success of their ongoing I/I reduction program. They have also conducted household surveys in the Birdland area and identified houses with sump pumps and gravity foundation drain connections. They also maintain an annual flushing and CCTV inspection program.

2. With respect to remedial works for I/I reduction, the Township's general approach/intent has been to fix I/I problems as they are identified. I/I reduction works completed in Elmira include implementation of a third pipe solution for the Birdland pilot area and reconstruction of ageing infrastructure (including replacement of existing lateral sewers to the property line).
3. With respect to I/I performance measurement, flow monitoring data collected at the Elmira WWTP and at Manhole 26A has been compiled for the period from 1999 to 2007, and used to determine the performance of I/I repairs that have already been completed.

In Elmira, the Township has focused on the Birdland area, where extensive work has been done to replace existing infrastructure found to be in poor condition, and on installation of a third pipe system to convey foundation drainage (outside the sanitary sewer system).

The Township recently considered the possible implementation of the third pipe system in Elmira. Based on analysis, the Township has concluded that the program would not be cost effective. Recent inspections have identified that significant leakage continues to occur through existing sanitary sewer laterals. The Township is now evaluating lining of laterals and other trenchless rehabilitation technologies.

It was noted that new equalization storage tanks are currently being constructed at the Elmira WWTP as part of the current upgrade project, to temporarily store excess wet weather flows attenuate peak flows into the plant. It was also noted by the Region that a small portion of the volume in the existing tanks is currently being used by Operation Staff to equalize sewage flows on a daily basis, and this has a potential impact on the expected operation and performance of the equalization tanks during wet weather, especially if the tanks cannot be emptied prior to larger storms.

The following information was requested from the Township as input to the review of I/I in Elmira:

- Any CAD drawings or drawing layers showing pipe diameter and slopes, location of infrastructure renewal projects, results of foundation drain assessment for Birdland area.
- Daily flow data from 2004 to 2010 for Elmira including any rainfall data.(WWTP and permanent metering site).
- TM on equalization storage sizing.
- TM on Third Pipe System Evaluation.

5. REVIEW OF I/I PROGRAMS

The following summarizes the I/I programs and remediation works completed in St. Jacobs and Elmira, and the upgrades completed by the Region at the two WWTPs to address I/I.

5.1 St. Jacobs I/I Study and Rehabilitation Program (2002 to 2010)

The community of St. Jacobs has historically experienced high I/I flows within its sanitary sewer system, and the Township of Woolwich has been investigating and correcting source of I/I in St. Jacobs since the mid 1990's. The following provides a summary of the I/I investigations and correction measures completed from 2002 to 2010, based on the information provided by the Township.

The St. Jacobs I/I Program has comprised three main components:

1. Rainfall and Sewer Flow Monitoring;
2. Detailed Field Investigations; and
3. I/I Rehabilitation Programs and Projects.

5.1.1 St. Jacobs Rainfall and Sewer Flow Monitoring

Rainfall and sewer flow monitoring was conducted at numerous locations within the St. Jacobs sanitary sewer system over a period of several years to identify and quantify sources of I/I in the sanitary sewer system. Figure 5.1 shows nine locations where sewer flow meters have been installed at one time or another to measure I/I within the St. Jacobs sanitary sewer system since 2002.

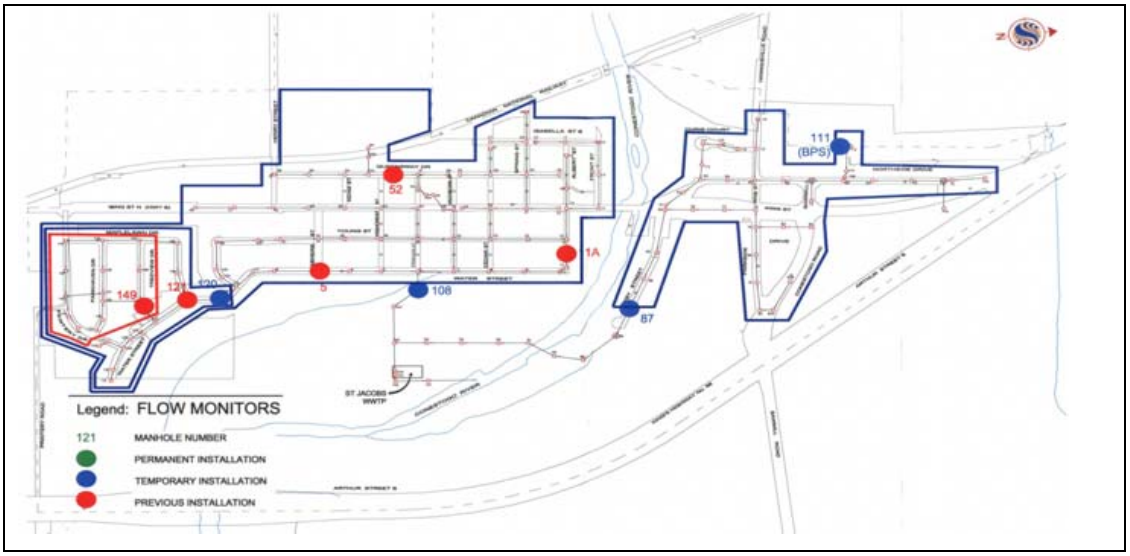


Figure 5.1 Sewer Flow Monitoring Locations in St. Jacobs (Stantec, 2010b)

Figures 5.2 to 5.4 compare the daily flows at the St. Jacobs WWTP to water demand (pumped data) for the years 2008, 2009 and 2010 respectively. The figures confirm the occurrence of excessive I/I in the St. Jacobs sanitary sewer system, indicated by:

- Sewage flows are always higher than water demand, even during drier periods;
- Sewage flows are highest in the spring and remain high for several months; and
- Sewage flows often exceed the capacity of the St. Jacobs WWTP (1,450 m^3/d).

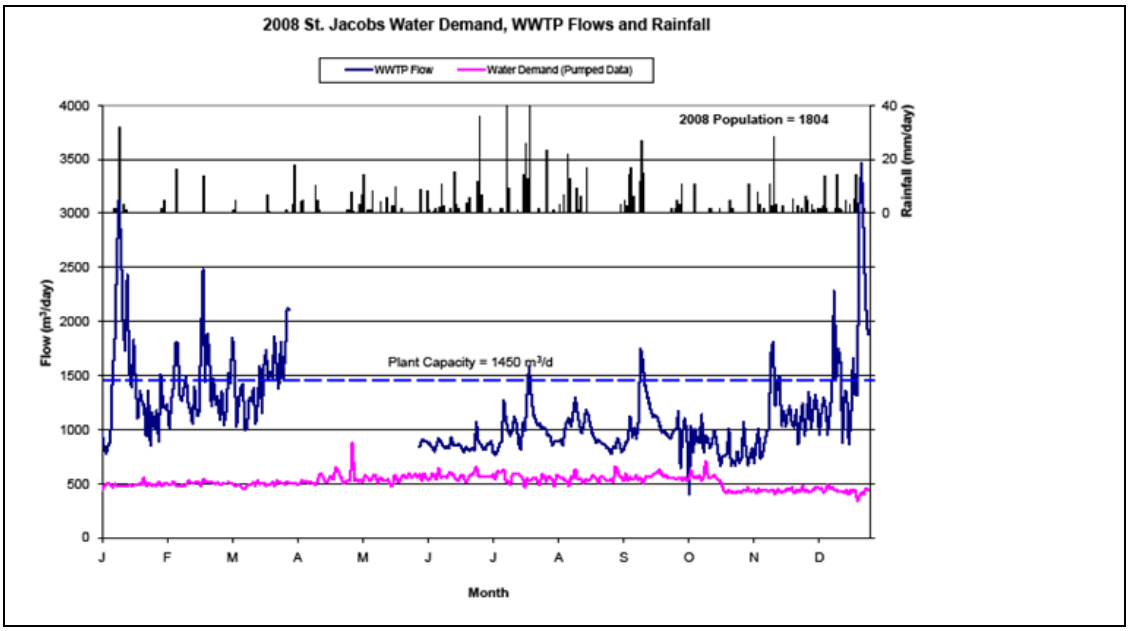


Figure 5.2 St. Jacobs WWTP Flows for 2008 (Stantec, 2010b)

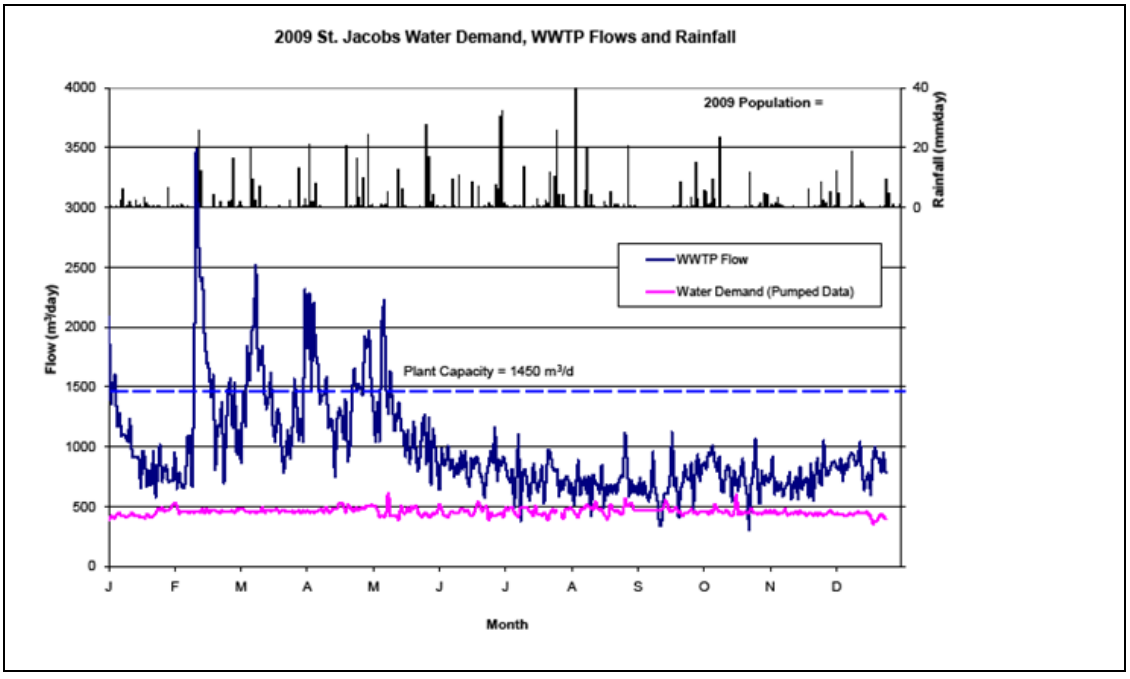


Figure 5.3 St. Jacobs WWTP Flows for 2009 (Stantec, 2010b)

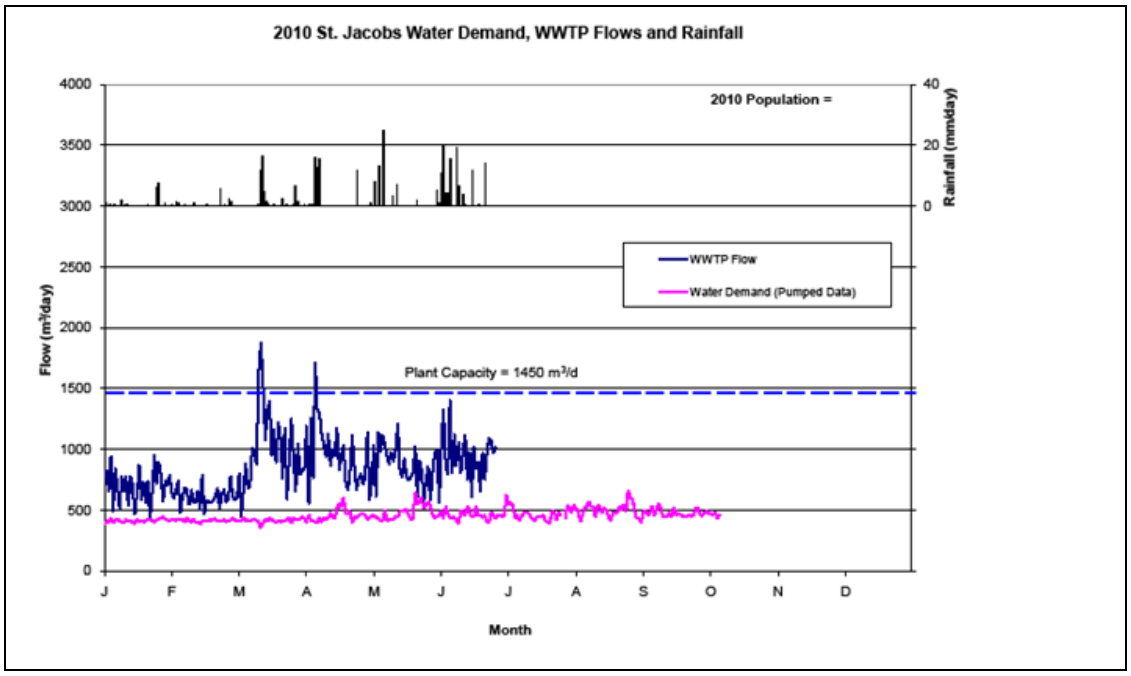


Figure 5.4 St. Jacobs WWTP Flows for 2010 (Stantec, 2010b)

5.1.2 St. Jacobs I/I Detailed Field Investigations

Detailed field investigations have included the following:

- CCTV inspections of sanitary sewers;
- Assessment of sewer laterals including identification of unaccounted-for laterals and prioritization of flowing laterals;
- Investigation of high priority sewer laterals;
- Exterior lot inspections;
- Fog testing;
- Manhole inspections; and
- Cistern Inspection program.

Figure 5.5 shows the priority ranking of deficient sewer laterals. The rankings are described as follows:

- Priority 1 - Major flow and/or major calcification observed.
- Priority 2 - Moderate flow and/or moderate calcification observed.
- Priority 3 – Minor flow and/or minor calcification observed.
- Unconnected lateral.

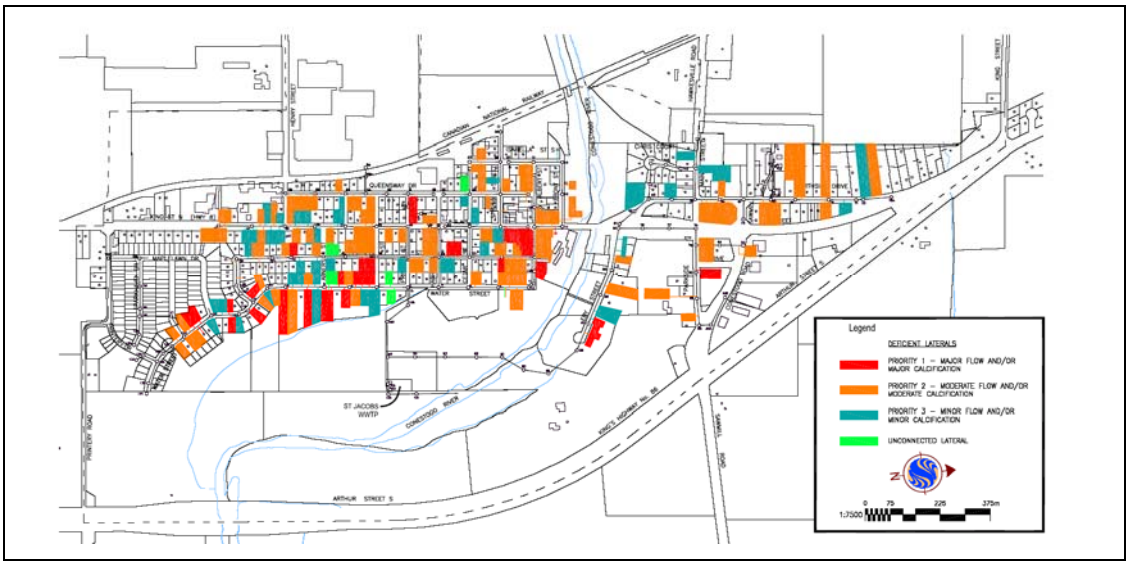


Figure 5.5 Prioritization of Sewer Laterals in St. Jacobs (Stantec, 2010b)

Household inspections of priority sewer laterals were conducted in Drainage Area 5 A total of 23 of 57 homes in the area were inspected and 17 lateral CCTV inspections were completed. Figure 5.6 shows the results of the sewer lateral inspections. The inspections identified some deficiencies and 2 flowing laterals, but no significant 'smoking gun'.



Figure 5.6 Results of Sewer Lateral Inspections in St. Jacobs (Stantec, 2010)

Exterior lot inspections were completed for all building in St. Jacobs. Many homes were observed to have roof leaders to ground, suggesting the need for smoke or fog testing to pinpoint sources of I/I into the sanitary sewer system. Smoke (fog) testing was conducted in 2005 and smoke was observed exiting the eavestroughs of 4 homes. One sanitary manhole was found to have a sump pump discharge.

A total of 137 manholes were inspected in 2005. The majority of deficiencies were found to occur at the adjustment rings between the manhole frame and chimney. In addition, cracks in manhole cones and corbels, cracks below invert, and generally deteriorated manhole structures were found.

To summarize, extensive multi-year investigations have uncovered numerous minor sources of I/I in the St. Jacobs sanitary sewer system, but no one (or more) major source of I/I has been identified. Minor sources of I/I include mainline sewer leaks, manhole leaks, minor cross connections (with the storm sewer system) and a few flowing sewer laterals. An Access database was prepared, which includes lot by lot information to organize the information.

5.1.3 St. Jacobs I/I Rehabilitation Program

Figure 5.7 summarizes geographically the results of the detailed I/I investigations conducted in St. Jacobs to date, including the specific location and priority of manholes and sewer deficiencies and their respective recommended remedial measures.

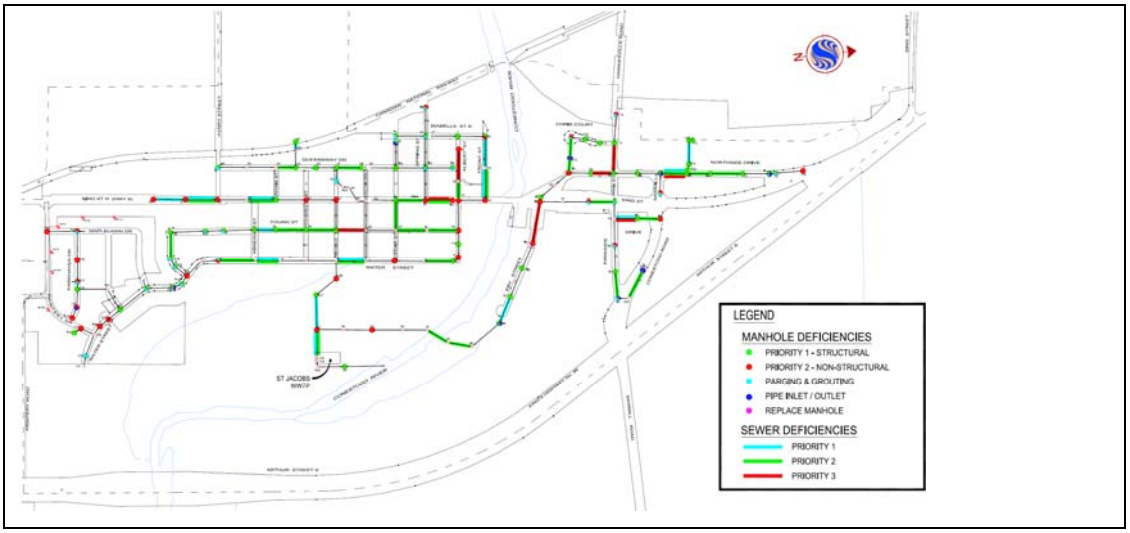


Figure 5.7 Results of Inspections in St. Jacobs (Stantec, 2010b)

As noted during the meeting with the Township, excessive I/I was recently discovered upstream of Manhole 121, coming from a new subdivision development. This was corrected and Township has put into place a system to prevent a similar occurrence in future. The Township now requires that any I/I issues within new developments are fixed prior to the Township assuming the sewer infrastructure.

Figures 5.8 and 5.9 presents a comparison of measured sanitary sewer flows (at Manhole 108) for the past 5 years (adjusted for population growth during this period), during March and April respectively. Although the annual rainfall volume varied significantly at times during this period, the general trend in sewage flow during drier periods does appear to confirm that the I/I program is achieving some success, but this is difficult to quantify given the variability of annual rainfall volumes.

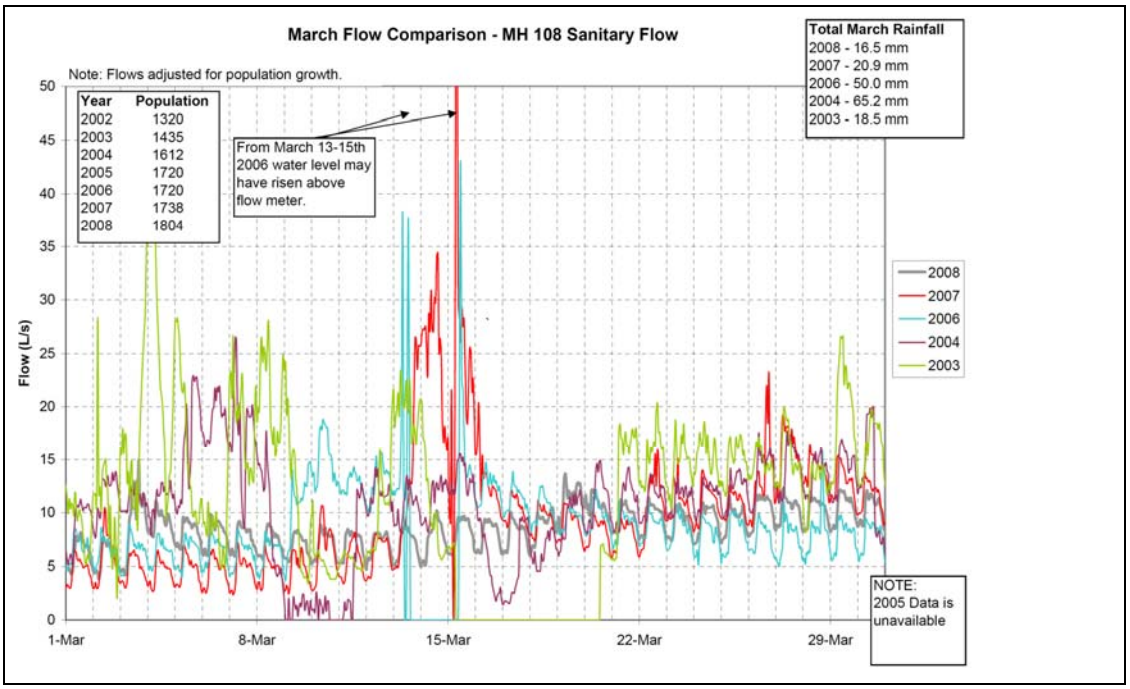


Figure 5.8 Preliminary I/I Rehab Results for Mar 2003-2008 (Stantec, 2010b)

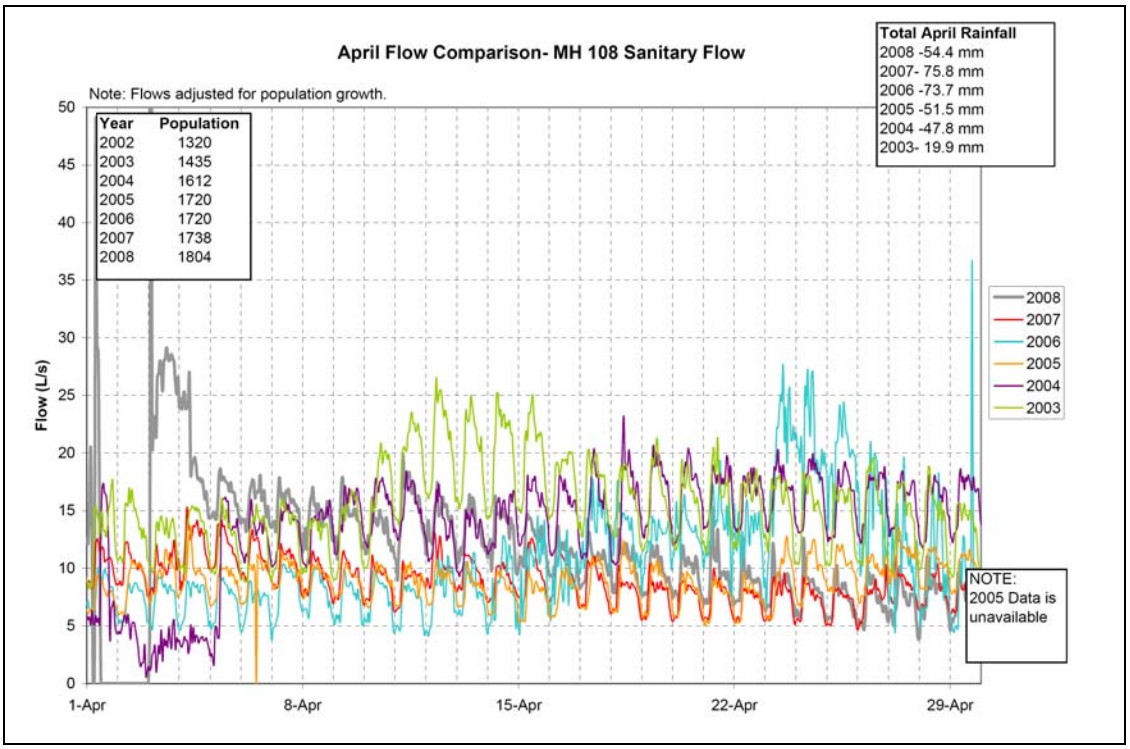


Figure 5.9 Preliminary I/I Rehab Results for Apr 2003-2008 (Stantec, 2010b)

Remaining sources of I/I include:

- Known gravity connections of foundation drains to sanitary sewers in St. Jacobs; and
- Known sewer lateral deficiencies identified by recent CCTV inspections of laterals on Water Street. CCTV inspections are planned for Young Street where deficient laterals are expected to be found.

The current public side I/I rehabilitation program has not reduced I/I to the extent the Township might had hoped. Private sewer lateral rehabilitation and/or foundation drain disconnection appears to be the only viable solution moving forward to reduce I/I in St. Jacobs, and therefore the Township plans to proceed with a new Sewer Lateral Rehabilitation Program, along with ongoing I/I correction.

Based on the information and analyses prepared by the Township, the Township has had some success in reducing I/I, however this success has been difficult to quantify.

To achieve quantifiable success, will require that the Township reprioritize and begin to address the many minor deficiencies identified in the private system as well as private system deficiencies.

The Township's ongoing manhole rehabilitation and sewer lateral relining program will be critical components of an ongoing program.

5.2 Elmira I/I Study and Reconstruction Program (1997 to 2010)

In the early 1990's, growth in the community of Elmira had been by insufficient wastewater treatment capacity and conveyance capacity constraints within the sanitary sewer system caused by significant extraneous I/I entering the sewer system. The Township of Woolwich has been investigating and correcting sources of I/I in Elmira since 1994. The following provides a summary of the I/I investigations and correction measures completed from 1997 to 2010, based on the information provided by the Township and their consultant.

The Elmira I/I Program has comprised three main components:

1. Rainfall and Sewer Flow Monitoring;
2. Detailed Field Investigations; and
3. I/I Rehabilitation Programs and Projects.

5.2.1 Elmira Rainfall and Sewer Flow Monitoring

Rainfall and sewer flow monitoring was conducted at numerous locations within the Elmira sanitary sewer system over a period of several years to identify and quantify sources of I/I in the sanitary sewer system. Figure 5.10 shows the locations of the eighteen locations where sewer flow meters have been installed at one time or another to measure I/I within the Elmira sanitary sewer system since 1997. Sanitary sewer system monitoring has been undertaken to establish a continuous record of dry and wet weather flows on a subwatershed basis; and to clearly identify the nature,

extent and location of extraneous flows in the system. Additional data, collected several years prior to the I/I study in suspect areas, was used to corroborate study results.

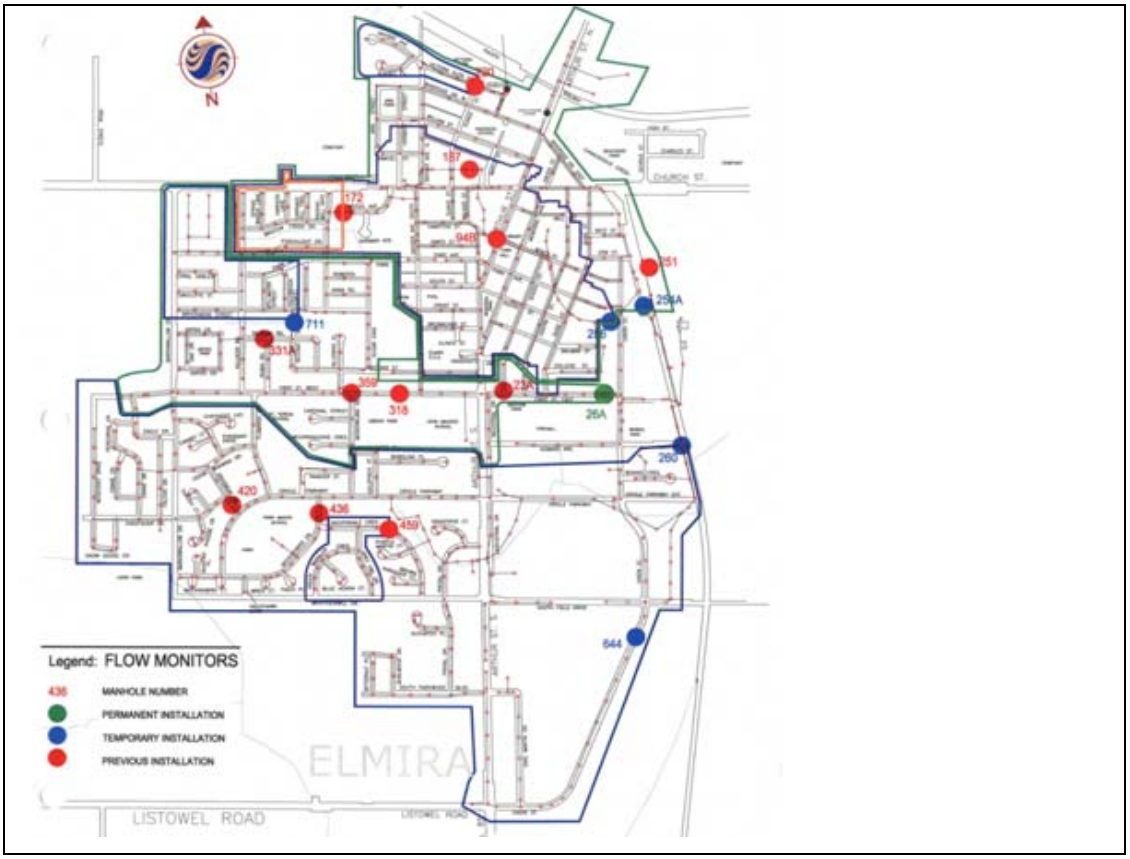


Figure 5.10 Elmira Sewer Flow Monitoring Locations (Stantec, 2010c)

Figure 5.11 compares average daily flows at the Elmira WWTP from 2002 to 2010 to the overall average annual flow for the same period and to the current rated capacity of the WWTP. The figure confirms the occurrence of excessive I/I in the Elmira sanitary sewer system, indicated by:

- Sewage flows are highest in the spring and remain high for several months (from February to June); and
- Sewage flows have often exceed the capacity of the Elmira WWTP (7,800 m^3/d).

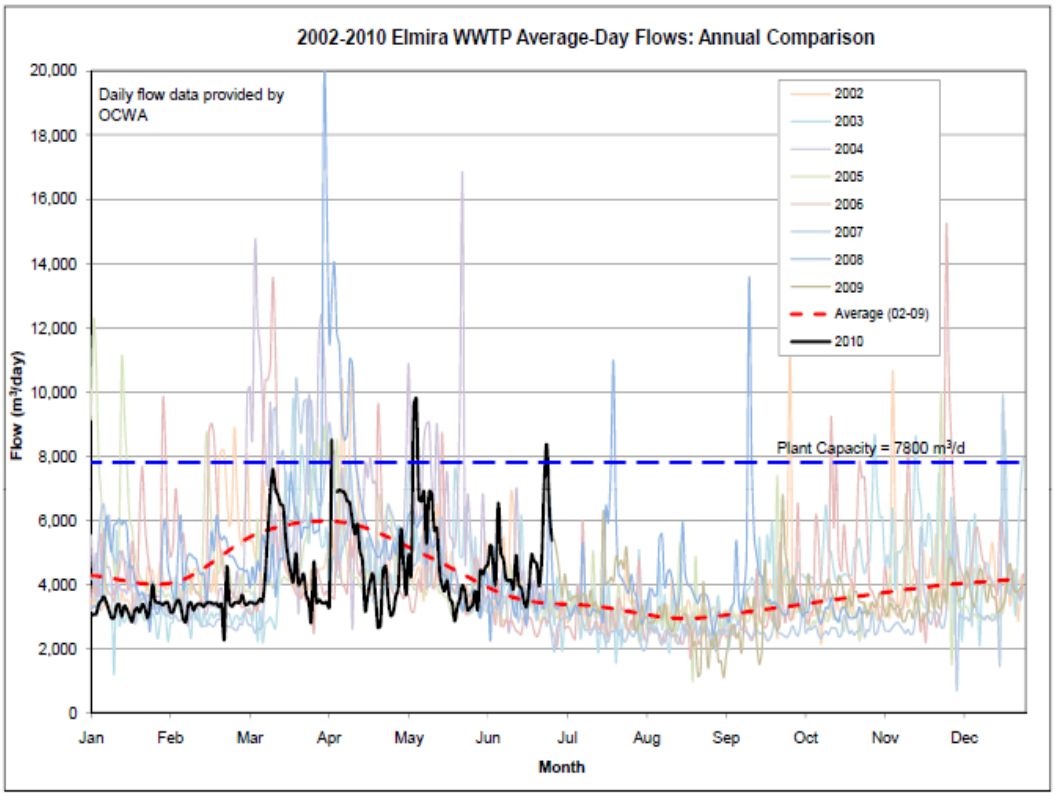


Figure 5.11 Elmira WWTP Flows for 2002-2010 (Stantec, 2010c)

Analysis of the flow monitoring data for dry weather conditions indicated that in the North system, the majority of dry weather I/I was entering the system downstream of Manhole 94B, which presently has no outlet for the existing cellar drain system. In the South system, significant dry weather infiltration was evident throughout the system, but particularly in Subcatchment 308.

Wet weather events occurring during the monitoring period generally had return periods of less than 2 years. Analysis of wet weather flows revealed significant extraneous flow to the sewer system. During the most significant wet weather event of the monitoring period, in April, 1994, average daily wet weather inflow approached 7,210 m^3/d, or 158% of the average day capacity of the Elmira WWTP at the time.

The instantaneous peak wet weather flow in the North system was found to be 2 to 2.5 times theoretical sewage flows; and in the South system they were found to be 3.5 to 6 times theoretical flows. These peak flows were deemed to be the cumulative effect of many direct connections to the sanitary sewer system.

5.2.2 Elmira I/I Detailed Field Investigations

Detailed field investigations included the following:

- Infrastructure condition surveys, including CCTV sewer inspections, manhole inspections and dye testing;

- Household private side system surveys; and
- Groundwater monitoring.

Household surveys of the sewer systems in both North and South Elmira were completed to identify the nature and extent of any improper connections. Prior to 1980, the Region and the Township had permitted direct connection of foundation drains to control high groundwater in South Elmira. The household surveys characterized improper connections as those with sumps discharging to the internal plumbing or where there were connections from an unknown location (from which a direct connection to the sanitary system was inferred).

Groundwater monitoring included a review of background geotechnical reports, as well as in-field monitoring. In-field monitoring confirmed that high groundwater conditions exist throughout the year and average groundwater levels are above the obvert of the sanitary sewer system, exacerbating I/I.

Conclusions drawn from the I/I study strongly suggested that the primary source of I/I in the Elmira sanitary sewer system was private side direct connections to the sanitary system, exacerbated by the high groundwater in the area. It was determined that a private side solution was required in order to significantly reduce I/I, and a pilot project was proposed, to establish the effectiveness of a private side source control program comparing different methods of achieving this.

The pilot project was developed with a view to quantifying the nature and magnitude of direct discharges into the sanitary sewer system from directly connected foundation drains/sump pumps, and to evaluate the cost effectiveness of disconnecting direct foundation drains. Seven homes within the problem area were selected from among those residents expressing interest in the program. Each home was retrofitted with a sump pump, flow meter and storm sewer connection to monitor discharge over an extended period of time. Three of the homes were also fitted with data loggers to establish time series information. Downstream flow monitoring was carried out over approximately six months. Sewer system monitoring was also continued during this period to provide comparative data to the pilot project. Results from the pilot project were extrapolated to establish potential reductions in dry and wet weather flows for each of the problem areas. Measured flows in each subcatchment were compared to theoretical flows, and the difference between the two, the potential reduction in flow, was compared to the pilot project results, for both dry and wet weather conditions. Table 5.1 summarizes the potential reductions indicated by the pilot project.

Table 5.1 Potential Dry and Wet Weather Flow Reduction (Stantec, 2002)

Area	Potential Reduction in Average DWF (m^3/d)		Potential Reduction in Peak Wet Weater Flow (L/s)[2]	
	Pilot Project	Theoretical	Pilot Project	Theoretical
308	97 - 278	140	23.0 – 46.9	40.9
377/420	83 – 238	165	24.9 – 50.9	46.0
436	58 – 167	162 [1]	13.5 – 27.7	25.3 [1]
461/Pintail	44 – 127	87	9.1 – 18.6	15.4
Oriole Pkwy.	66 – 190	148	6.1 – 12.7	9.0
Total	**348 – 1000**	**702** [1]	**76.6 – 156.8**	**136.6** [1]

Notes:
1. Includes an equivalent population for the school.
2. Based on July 7, 1994 wet weather event.

Based on the results presented in Table 5.1, final program targets were set at average per capita flow reductions of 100 Lpcd and 130 L/s peak flow reduction (based on the total Town population of 7,240).

Three different source control measures were identified and evaluated as a means of achieving the theoretical reductions developed during the pilot project, including installation of gravity foundation drains to a new deep storm sewer; a sump pump/connection to the existing storm sewer; and a new sanitary sewer. The new sanitary sewer option was selected as the preferred solution, and generally consisted of the construction of a new sanitary sewer system within the roadway together with new sanitary service laterals interconnected with the existing internal plumbing at each home. The total capital cost for implementation of the preferred solution was estimated to be $8.8 million.

5.2.3 Elmira I/I Rehabilitation Program

Following the pilot project, the Township of Woolwich, in cooperation with the Region of Waterloo, commenced installation of new sanitary sewers, on a phased basis, in the areas identified as having the worst I/I problems. Detailed evaluation of existing municipal services during the first phases of the project identified that the existing sanitary, storm and watermains were in poor condition. Accordingly, it was therefore decided to remove and reconstruct all municipal services, including the existing sanitary sewer, which was originally expected to function as the new I/I pipe. The new sanitary and I/I pipes were installed in the same trench, with common manholes (the I/I pipe runs through the manhole as a closed conduit).

Private side reconstruction was achieved through a combination of in-house retrofit conversion and exterior directional drilling. The existing in-house domestic wastewater system was connected to the new sanitary sewer, while the foundation drain discharge remained connected to the existing sanitary lateral which became the new I/I pipe. Directional drilling between the street and the house foundation

significantly reduced inconvenience to residents and project restoration costs. One hundred percent of the residents within the first four project phases volunteered to participate in the private side sewer reconstruction.

As of April 2002, four construction phases had been completed, representing construction of the outlet and one of the original five subcatchments in which severe I/I problems were identified. Approximately 280 homes were retrofitted out of a total of 930 homes. To track the impact of this I/I reduction program, permanent flow meters were installed on the I/I pipe and the sanitary sewermain at the downstream end. Results obtained with 17% of the program completed, showed an average day I/I reduction of 25 Lpcd (or 25% of the target) has been achieved.

For peak flows, a monthly peak flow reduction of 44 L/s (525 Lpcd) or 34% of the target flow reduction had been achieved. Figure 5.12 shows the measured amount of I/I flows removed for 1999 to 2001.

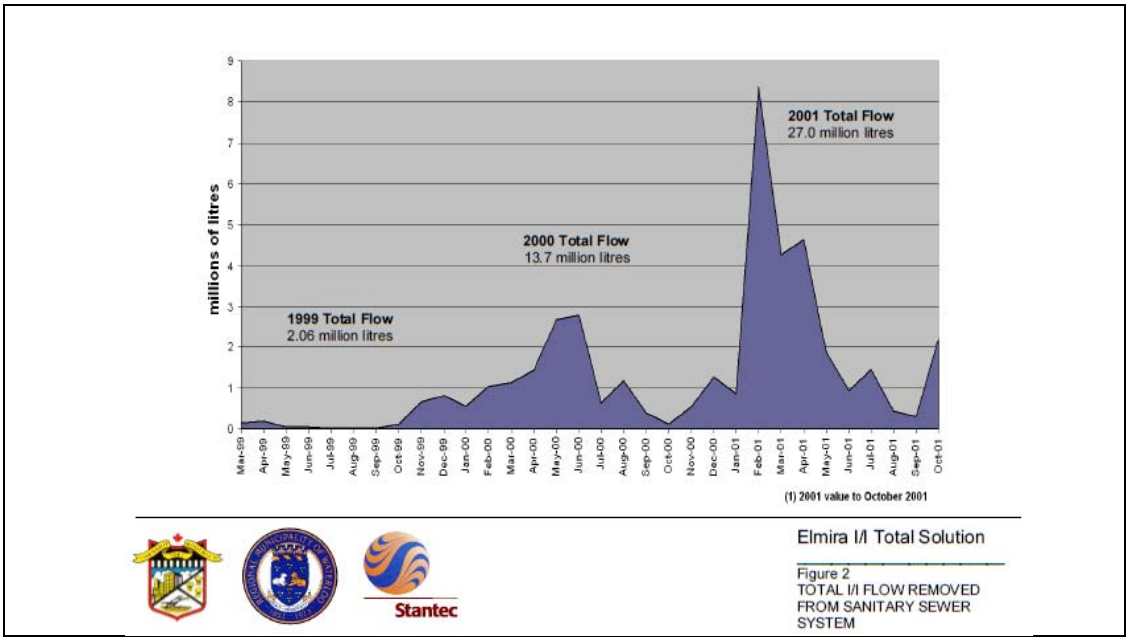


Figure 5.12 Total I/I Removed from Elmira Sewer System (Stantec, 2010c)

Plant flows showed a steady decline in average daily flows after the spring of 1999 when the first I/I pipes were commissioned, and Plant Operators advised that during the large storms of May 2001, no plant bypasses were necessary, representing significant improvement to the quality of flow to receiving waters.

In addition, overflows at the South Pumping Station were significantly reduced during wet weather conditions following implementation of the program. For example, during the three-year period from 1999 to 2001, overflows occurred seven times at an average duration of two hours each, compared to 34 overflow events at an average duration of seven hours in the preceding three years from 1996 to 1998.

Implementation of the third pipe solution has continued since completion of the works prior to 2002, with the last contract completed in 2008.

Other recent I/I reduction and collection system improvement projects include the following:

- I/I separation projects from 1998 to 2007;
- Ongoing I/I investigations and minor fixes;
- South Trunk Sewer construction, including decommissioning of South Elmira wastewater pumping station;
- Replacement of the Chemtura Trunk Sewer (suspected to be a source of I/I) with new Elmira North Trunk Sewer in 2007; and
- Riverside Drive reconstruction in 2007, including replacement of sewers in an older area of town with new infrastructure.

The potential cost-benefit of implementing the third pipe solution within the Birdland area of Elmira was recently evaluated. The Township intends to undertake watermain replacement in this area and questioned whether I/I reduction measures should be included/coordinated with the planned watermain works. Two alternatives for reducing or mitigating I/I from foundation drains in Birdland have been considered, including:

1. Third Pipe Reconstruction Program
2. Sump Pump Installation Program

Table 5.2 summarizes the expected reduction in I/I flows associated with construction of the Third Pipe Reconstruction Program for Drainage Area 465 (upstream of MH 465), including the disconnection of the foundation drains from 121 homes (based on actual third pipe I/I reductions observed previously in MH 26A and in MH 459). A comparison to the original program targets (established in 1995) is also provided.

Table 5.2 Expected I/I Reduction for Third Pipe Solution (Stantec, 2010a)

Third Pipe Solution Actual & Potential Flows	Average Day I/I m^3/d	% Complete	I/I Peak Flow Rate (L/s)	% Complete
Original Reduction Target (923 homes)	702	27	137	27
Achieved Reduction to Date (281 homes)	177	25	63	46
Potential from Area 465 (121 homes based on an Observed Flow in MH 26A	14	-	39	-
Observed Flow in MH 459	60	-	34	-
Potential Reductions from Area 465 to be used in Cost Benefit Analysis	30	-	34	-
Notes: Achieved reduction to date as measured in MH 26A, I/I pipe, 2006 average and highest observed peak.				

Costs for the proposed third pipe reconstruction of 121 homes in Area 465 were estimated using tendered prices from previous third pipe reconstruction contracts completed from 2004 and 2006. Mid (not low) tender prices were used, and were inflated to 2010 at 5% per year, and a 15% increase for oil process and salt contaminated soils were added. Using the highest unit price per home ($92,752), the estimated cost to implement the third pipe reconstruction for 121 homes in Area 465 is $11,222,991 in 2010 dollars. Estimated Third Pipe Reconstruction costs are presented in Table 5.3 and the estimated value should be considered a Class C estimate. For the purposes of the cost-benefit analysis, this estimated cost was rounded to $11 million.

Table 5.3 Estimated Third Pipe Reconstruction Costs (Stantec, 2010a)

Street	Mid Tender	Price Adjusted to 2010	Add 15% Oil/Soils Disposal Increase	No. of Homes	Construction Price per House	Engineering & Contingency (25%)	Total Price Per House
2006 Cardinal and Morningdove	$1,500,000	$1,823,259	$2,096,748	38	$55,178	$13,794	$68,972
2004 Meadowlark and Hummingbird	$1,300,000	$1,742,124	$2,003,443	27	$74,202	$18,550	$92,752
2001 First Street	$3,200,000	$4,964,250	$5,708,888	127	$44,952	$11,238	$56,190
Proposed Nightingale, Grey Owl, Green Warbler Courts			$11,222,991	121			

A Sump Pump Installation Program would comprise installation of a new sumps and sump pumps in homes that currently have foundation drains connected by gravity to the sanitary sewer within the roadway. This would require work on private property, construction of a new sanitary sewer lateral to an outlet, and construction of an outlet conveyance system, possibly the storm sewer system. It was noted that winter operation of such a system can be problematic.

In addition to these required works, there are significant legal issues associated with requiring residents to own and operate a sump pump where a gravity connection previously existed. For example, if a home were to flood due to a failed sump pump, the Township might be at risk. Although a similar system was recently installed in Fort Erie, Ontario, this is not a common practice in Ontario. Although the Township has undertaken work on private property in the past (third pipe solutions), they did not involve sump pumps installation; rather, they replaced one gravity connection with another.

Results of a sump pump pilot project undertaken in 2008, which included measurement of actual flows from sump pumps in South Birdland, were assumed to be representative of flows from gravity connections in the same area. These results

were used to estimate expected average day and expected peak I/I reductions from foundation drain disconnection in Birdland. The results of this analysis are presented in Table 5.4.

Table 5.4 Expected I/I Reduction from Sump Pump Install (Stantec, 2010a)

Sump Pump Installation Potential Flows	Average Day I/I (m^3/d)	I/I Peak Flow Rate (L/s)
Estimated Flows from Pilot Project (149 homes in MH 410 and 436) over 270 days	11	20
Estimated I/I Reduction to be used for calculation	5	20
Potential from Area 465 (121 homes) to be used in Cost Benefit Analysis	4	16
Notes: This is the total flow observed over the study period divided by the number of days but is not a true average as flows were often zero as seen on Figure 5.		

A Class D estimate of expected Sump Pump Installation costs for the 121 homes in Area 465 is presented in Table 5.5. For the purposes of the cost-benefit analysis, this estimated cost was rounded to $4.5 million.

Table 5.5 Estimated Sump Pump Installation Costs (Stantec, 2010a)

Description	Estimated Cost
Cost of Items based on 1,675m of sewer, new outlet, sump pumps, new pressure lines, in-home retrofit using 2006 tendered unit price (mid-tender).	$3,012,196
Inflate to 2010 (4 years @ 5%)	$3,661,343
Engineering & Contingency (25%)	$915,336
Total Class D Estimate	**$4,576,678**
Notes: Outlet not designed, carrier pipe not sized, specific site conditions not evaluated.	

Tables 5.6 and 5.7 compare the estimated unit costs of I/I reduction for the Third Pipe Reconstruction and Sump Pump Installation options.

Table 5.6 Costs per Unit I/I Reduction for Third Pipe Option (Stantec, 2010a)

Calculated Reduction for Third Pipe Solution in 121 homes	30 m^3/d	34 L/s
Construction Cost Estimate (2010 Dollars, rounded)	$11,000,000	$11,000,000
Costs per Unit Reduction (2010 Dollars, rounded)	$374,092/ m^3/d	$330,081/L/s

Table 5.7 Costs per Unit I/I Reduction for Sump Pump Option (Stantec, 2010a)

Description	Average Flow	Peak Flow
Calculated Reduction of I/I for Sump Pump Installation for 121 homes	4 m^3/d	16 L/s
Construction Cost Estimate (2010 Dollars, rounded)	$4,500,000	$4,500,000
Cost per Unit Reduction (2010 Dollars, rounded)	$1,100,000/ m^3/d	$290,000/L/s

As shown in Tables 5.6 and 5.7, the estimated costs to achieve average and peak I/I reduction per unit are very high for both options. Table 5.8 summarizes and compares the expected cost-benefit for the two potential I/I reduction options.

Table 5.8 Cost/Benefit Analysis for I/I Reduction (Stantec, 2010a)

Options	Cost for Average Day I/I Reduction ($/$m^3/d$)	Cost for Peak I/I Reduction ($/L/s)
Third Pipe Solution	$374,092	$330,081
Sump Pump Installation	$1,100,000	$290,000

Due to the very high costs of these alternatives, and significant legal issues, Stantec recommended that the Township not proceed with either the Third Pipe Reconstruction or Sump Pump Installation programs. Instead, it was recommended that the Township continue to find and implement public side or non-invasive private side (e.g. lateral re-lining) solutions to further reduce I/I in Elmira.

In the short term, the Township is ongoing recommended efforts to reduce I/I are expected to include:

- CCTV inspection of sanitary sewer laterals in Birdland and North Elmira;
- Sanitary sewer lateral re-lining program;
- Flow monitoring in new subdivision developments; and
- Spot repairs in sewers.

In the long term, the Township plans to continue to investigate alternative I/I reduction approaches to determine which of them offer the greatest cost-benefit; work with the Region regarding WWTP capacity; monitor sewer flows to quantify and identify sources of I/I; and to correct I/I problems as they are found.

Based on the information and analyses prepared by the Township, the Township short and long term plans are reasonable and will result in an incremental reduction in I/I over time.

6. ELMIRA EQUALIZATION STORAGE FACILITIES

The need for additional equalization storage at the Elmira WWTP was originally identified during the Class EA process completed in 1997 (Region of Waterloo, 1997). Equalization storage was to be provided together with an expanded plant capacity to address excessive wet weather flows in the Elmira sanitary sewer system. The preferred solution included the following components:

- Expansion of the WWTP to 7,800 m^3/d (its current capacity);
- Provision of additional equalization storage to augment existing equalization storage tanks #1 and #2 with total volume of 1,284 m^3;
- Implementation of aggressive I/I control program in Birdland; and
- Collection system repairs and replacement in North Elmira sewer system.

Equalization storage requirements have been based on the following assumptions:

- Storage would be provided for inflows above 2.5 times average dry weather flow; and
- Plant processes would be enhanced to accommodate flows up to and including 2.5 times average dry weather flow.

Assuming that no further improvements were made to the existing collection system, for an average dry weather flow of 7,800 m^3/d, it was determined that a total equalization storage volume of 9,025 m^3 would be required to control the volume of flow above 2.5 times average dry weather flow for the duration of the two-day historical storm event that was selected as the design event (i.e. storm of February 21-23, 1997).

However, concurrent with the design of the new Elmira WWTP and two new equalization storage tanks, an I/I reduction program was developed, the full implementation of which was expected to reduce peak flows to the WWTP by approximately 39%. This was estimated to have the potential to reduce the required volume of additional equalization storage at the Elmira WWTP to 570 m^3. It was therefore recommended that the additional storage be implemented in phases in parallel with proposed I/I reduction measures to allow time to properly assess the degree of I/I reduction actually achieved. It was anticipated that the volume of future storage tank phases would be revisited to account for actual future I/I reductions. In accordance with the phasing recommendations, one third of the proposed additional 7,731 m^3 (i.e. approx 2,600 m^3) of equalization storage was constructed as part of the 2000 WWTP upgrades as equalization tanks #3 and #4.

The original design included an allowance for two additional equalization storage tanks (#5 and #6, each with a volume of 2,600 m^3) to be built in the next phase. It was anticipated that the need to construct this storage volume would be revisited as the effectiveness of I/I reduction measures was better understood. With 17% of the

I/I reduction program complete, average day I/I reductions reached 25% of the target and monthly peak flow reductions reached 34% of the target.

As the Township elected not to proceed with the third pipe reconstruction program in the remaining portion of Elmira, the need for equalization storage volume in Elmira was identified.

The need for additional equalization also included a review of current plant operations. The review of current plant operations concluded that the facility is not currently able to treat flows up to 2.5 times average dry weather flow as was originally intended. Operational limitations/constraints associated with the plant and the existing equalization storage facilities were identified. These included:

- Difficulties in delivering secondary bypass flows to equalization tanks # 1 and # 2 due to the influent bypass side weir elevation. As a result of these difficulties, secondary bypass has not been diverted to equalization tanks # 1 and # 2 since 2000.
- When the equalization storage tank volume is exceeded, the tank overflow is disinfected with sodium hypochlorite and discharged to Canagagigue Creek.
- Operators have used equalization tanks # 3 and # 4 for flow balancing on a daily basis. As a result, it was identified that the full equalization storage volume would be available.

7. SUMMARY & CONCLUSIONS

The St. Jacobs and Elmira wastewater collection systems both experience significant I/I, which takes up valuable capacity within the conveyance systems and wastewater treatment plants. The 1997 Elmira and St. Jacobs Wastewater Treatment Class EA study set peak flow I/I reduction targets for the Elmira and St. Jacobs wastewater collections systems. These targets: a 205 L/s or 39% reduction for Elmira; and a 39 L/s or 62% reduction for St. Jacobs; were supposed to be achieved by 2008. Over the past 10 years, the Township of Woolwich has undertaken a number of I/I reconstruction and rehabilitation projects to achieve these targets, and has collected a significant amount of sewer flow data to, in part, assess the success of their efforts.

7.1 St. Jacobs I/I Reduction Program Summary

In St. Jacobs, long term sewer flow monitoring and comparison with corresponding WWTP and WTP flows (water demand) confirm the occurrence of excessive I/I in the sanitary sewer system, which is indicated by:

- Sewage flows are always higher than water demand, even during drier periods;
- Sewage flows are highest in the Spring and remain high for several months; and
- Sewage flows often exceed the capacity of the St. Jacobs WWTP (1,450 m^3/d).

Rainfall and sewer flow monitoring and field investigations (including CCTV sewer inspections, manhole inspections, cistern inspections, smoke testing, assessment of sewer laterals, and exterior lot inspection) conducted over a period of many years indicate that I/I is endemic throughout the collection system, and no single major source of I/I has been found to significantly reduce the overall volume of I/I entering the sewer system. The Township recently identified and removed excessive flow from a manhole coming from a new subdivision development. The Township has put into place policies and procedures to ensure that newly constructed infrastructure does not contribute to I/I. The Township now requires that all I/I deficiencies be repaired prior to the Township assuming the new sewer infrastructure. This program should be continued.

Recent sewer flow data appears to indicate that the Township's efforts to reduce I/I have achieved some success, mainly in the reduction of average dry weather flows, but success in reducing peak wet weather flows has been more difficult to quantify, mainly due to the increased annual rainfall volumes experienced in recent years.

Remaining sources of I/I in St. Jacobs include known gravity connections of foundation drains to sanitary sewers and known sewer lateral deficiencies identified by recent CCTV inspections of laterals on Water Street, and potentially more to be found by proposed CCTV inspection of laterals on Young Street. The plan is to address these with a sewer lateral relining program.

The current public side I/I rehabilitation program has not reduced I/I to the extent the Township might had hoped. Private sewer lateral rehabilitation and/or foundation drain disconnection appears to be the only viable solution moving forward to reduce I/I in St. Jacobs. The Township plans to proceed with a new Sewer Lateral Rehabilitation/Relining Program, along with ongoing I/I correction in St. Jacobs.

Based on the information and analyses prepared by the Township the Township has had some success in reducing I/I, however this success has been difficult to quantify. To achieve quantifiable success will require that the Township reprioritize and begin to address the many minor deficiencies in the public and private systems. The Township's on-going manhole rehabilitation and sewer later re-lining programs will be critical components of an on-going program.

7.2 Elmira I/I Reduction Program Summary

Historically, excessive I/I in Elmira has resulted in basement flooding and bypassing of untreated sewage to the receiving stream. In addition, in the early 1990's, growth had been restricted in Elmira due to wastewater treatment and collection system constraints. The Township has been investigating and correcting sources of I/I in Elmira since 1994.

Comparison of average daily flows at the Elmira WWTP to the overall average annual flows for the same period and to the current rated capacity of the WWTP confirm the occurrence of excessive I/I in the Elmira sanitary sewer system, which is indicated by:

- Sewage flows are highest in the spring and remain high for several months (from February to June); and
- Sewage flows often exceed the capacity of the Elmira WWTP (7,800 m^3/d).

Rainfall and sewer flow monitoring and field investigations (including CCTV sewer inspections, manhole inspections, dye testing, groundwater monitoring, household private side system surveys, and special I/I pilot projects) were conducted over a period of years to identify and quantify potential sources of I/I.

Household surveys of the sewer systems in both North and South Elmira were completed to identify the nature and extent of any improper connections. Prior to 1980, the Region and the Township had permitted direct connection of foundation drains to control the high groundwater table in South Elmira. The household surveys characterized improper connections as those with sumps discharging to the internal plumbing or where there were connections from an unknown location (from which a direct connection to the sanitary system was inferred).

Groundwater monitoring included a review of background geotechnical reports, as well as in-field monitoring. In-field monitoring confirmed that high groundwater conditions exist throughout the year and average groundwater levels are above the obvert of the sanitary sewer system.

Conclusions drawn from the I/I study strongly suggested that the primary source of I/I in the Elmira sanitary sewer system was private side direct connections to the sanitary system, exacerbated by the high groundwater in the area. It was determined that a private side solution was required in order to significantly reduce I/I. The Township initiated a pilot project involving private side source controls to evaluate the different methods of achieving target I/I reductions.

The pilot project was developed with a view to quantifying the nature and magnitude of direct discharges into the sanitary sewer system from directly connected foundation drains/sump pumps, and to evaluate the cost effectiveness of disconnecting direct foundation drains. The information gained was extrapolated and has been used to assess the cost effectiveness of similar solutions in different areas.

Following the pilot project, the Township, in cooperation with the Region of Waterloo, commenced installation of new sanitary sewers, on a phased basis, in the areas identified as having the worst I/I problems. One hundred percent of the residents within the first four project phases volunteered to participate in the private side sewer reconstruction. Approximately 280 homes were retrofitted out of a total of 930 homes. To track the impact of this I/I reduction program, permanent flow meters were installed on the I/I pipe and the sanitary sewermain at the downstream end. Results obtained with 17% of the program completed, showed an average day I/I reduction of 25 Lpcd (or 25% of the target) has been achieved. For peak flows, a monthly peak flow reduction of 44 L/s (525 Lpcd) or 34% of the target flow reduction was achieved. Plant flows showed a steady decline in average daily flows after the spring of 1999 when the first I/I pipes were commissioned, and Plant Operators advised that during the large storms of May 2001, no plant bypasses were required. In addition, overflows at the South Pumping Station were significantly reduced during wet weather conditions following implementation of the program. Implementation of the third pipe solution has continued since completion of the works prior to 2002, with the last contract completed in 2008.

Other recent I/I reduction and collection system improvement projects in Elmira have included the following:

- I/I separation projects from 1998 to 2007;
- Ongoing I/I investigations and minor fixes;
- South Trunk Sewer construction, including decommissioning of South Elmira wastewater pumping station;
- Replacement of the Chemtura Trunk Sewer (suspected to be a source of I/I) with new Elmira North Trunk Sewer in 2007; and
- Riverside Drive reconstruction in 2007, including replacement of sewers in older area of town with new infrastructure.

The potential cost-benefit of implementing the third pipe solution within the Birdland area of Elmira was recently evaluated. The Township intends to undertake

watermain replacement in this area and questioned whether I/I reduction measures should be included with the planned watermain works. Two alternatives for reducing or mitigating I/I from foundation drains in Birdland have been considered, including a Third Pipe Reconstruction Program or a Sump Pump Installation Program. Due to the very high costs of these alternatives ($330,000/L/s and $290,000/L/s of I/I removed respectively), and significant legal issues, it has been recommended that the Township not proceed with either the Third Pipe Reconstruction or Sump Pump Installation programs. Instead, it was recommended that the Township continue to find and implement public side or non-invasive private side (e.g. lateral re-lining) solutions to further reduce I/I in Elmira.

In the short term, ongoing efforts to reduce I/I in Elmira include the following:

- CCTV inspection of sanitary sewer laterals in Birdland and North Elmira;
- Sanitary sewer lateral re-lining program;
- Flow monitoring in new subdivision developments; and
- Spot repairs in sewers.

In the long term, the Township continues to investigate alternative I/I reduction approaches to determine which of them offer the greatest cost-benefit; work with the Region regarding WWTP capacity; monitor sewer flows to quantify and identify sources of I/I; and to correct I/I problems as they are found.

7.3 Elmira Equalization Storage Facilities Summary

The existing Elmira WWTP includes four equalization storage tanks (#1 to #4) that are used to temporarily store excess wet weather flows and attenuate flows into the plant. Two new storage tanks (#5 and #6) are currently being constructed as part of treatment process upgrades. Equalization storage requirements have been based on the assumption that storage would be provided for inflows above 2.5 times average dry weather flow and that plant processes would be enhanced to accommodate flows up to and including 2.5 times dry weather flow. Assuming no further improvements were made to the existing collection system, for a dry weather flow of 7,800 m^3/d, it has been determined previously that a total equalization storage volume of 9,025 m^3 would be required for the two-day historical storm event that has been selected as the design event (February 21-23, 1997).

It was recommended that the additional storage be implemented in phases (with multiple storage tanks) in parallel with proposed I/I reduction measures to allow time to properly assess the degree of I/I reduction actually achieved, and revise the volume of future storage tank phases to account for actual future I/I reductions. In accordance with the phasing recommendations, one third of the proposed additional 7,731 m^3 (i.e. approx 2,600 m^3) of equalization storage was constructed as part of the 2000 WWTP upgrades as equalization tanks #3 and #4.

The original design then allowed for two additional equalization storage tanks (#5 and #6, each with a volume of 2,600 m^3) to built in the next phase. As discussed

above, various I/I reduction measures have been recommended, and as they are implemented, it is expected that this required additional equalization storage volume can likely be reduced. The I/I reduction program in Elmira has been effective and targets have been met for the portion of the program that has already been implemented. Peak flow reductions, in particular, have been significant.

Recent analysis concluded that there was still a need for some additional equalization storage volume at the Elmira WWTP. A review of plant operations identified limitations at the existing facility that reduced the peak treatment capacity. These included equalization tank # 1 and # 2 primary influent weir and the use of the existing equalization storage tanks for daily flow balancing.

7.4 Conclusions

On the basis of review of existing information collected on the analysis, inspection and I/I reduction activities undertaken by the Township in the communities of St. Jacobs and Elmira since the completion of the 1997 Elmira and St. Jacobs Wastewater Treatment Project, the following conclusions are made:

- The Township has undertaken a comprehensive approach to identifying and quantifying I/I from drainage areas in St. Jacobs and Elmira and has systematically undertaken comprehensive inspection and assessment activities in order to identify sources.
- The Township has had an ongoing manhole rehabilitation program to address 61 manholes in St. Jacobs with identified deficiencies. At this time, no other specific deficiencies have been identified within the public infrastructure in St. Jacobs.
- With the public side rehabilitation work completed in St. Jacobs since 1997, the program has not reduced I/I to the extent expected. While flow data shows a generally downward trend in sanitary sewer flows, the benefit of the Township's I/I reduction efforts to date are difficult to quantify. To meet targets, the Township has recognized that I/I remedial works are required on private infrastructure and have identified foundation drain connection and deficient laterals as potential sources of I/I. The Township is currently proceeding to investigate and evaluate options for addressing deficiencies.
- A detailed cost effectiveness analysis should be completed for St. Jacobs to establish the costs of the third pipe or sump pump solution.
- Following the completion of the cost effectiveness analysis, the Township should continue to implement its manhole rehabilitation program and consider reprioritizing minor deficiencies on the public and private infrastructure to achieve quantifiable benefits of I/I reduction in St. Jacobs.
- The Township has completed extensive work in Elmira to address I/I including five subcatchments which were found to contribute the most excessive I/I. In each subcatchment, new sanitary sewers a new third pipe to convey foundation

drainage were installed. Post construction monitoring concluded that these works had achieved 34% of the target I/I reduction based on monthly peak flow and 25% of the target reduction based on average day I/I flow. Analysis of plant flow data confirmed these results. The last reconstruction contract was completed in 2008.

- The Township has completed several other projects to repair deficiencies in the public system including construction of the South Trunk Sewer and decommissioning of the South Elmira pumping station, replacement of the Chemtura Trunk Sewer with the new Elmira North Trunk Sewer, and reconstruction of Riverside Drive.
- In addition to the above, the Township has evaluated the cost benefit of implementing a third pipe solution for the Birdland area of Elmira as part of an watermain replacement project. The evaluation concluded that a third pipe project and a sump project were both found to be not cost effective. The cost to reduce peak I/I was estimated to be $290,000 / L/s for the sump pump solution and $330,000/ L/s/ for the third pipe solution. On the basis of the analysis, the Township has decided not to proceed with the third pipe or sump pump installations in the Birdland area.
- The Township's short term I/I reduction efforts in Elmira include continued CCTV inspection of sanitary sewer laterals, relining of deficient sanitary sewer laterals, flow monitoring in new subdivision areas, and spot repairs in sewers to address deficiencies. Long term, the Township intends to continue to evaluate the cost effectiveness of alternative approaches.
- The Region is currently proceeding with the construction of additional equalization storage at the Elmira WWTP.

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Stantec, 2010c. Elmira Inflow and Infiltration Study and Reconstruction Program, 1997 to 2010. Powerpoint presentation at I/I Meeting with Region and Waterloo and Township of Woolwich. November 2010.

APPENDIX A

MINUTES OF I/I MEETING WITH TOWNSHIP OF WOOLWICH

XCG File No.:3-035-51-01

Re:	St. Jacobs - Elmira Wastewater Treatment Master Plan I/I Information Exchange
Meeting Date:	November 19, 2010
Location:	Region of Waterloo Headquarters
Attendees:	Pam Law (PL) Waterloo Region Dan Kennaley (DK), Woolwich Twp. Rod Kruger (RK), Woolwich Twp. Christine Hill, XCG Mark Stirrup (MS), HMM Barbara Robinson (BR), Stantec
Notes By:	Christine Hill

Item	Action

1. Barbara Robinson (BR) gave an overview of the Township's I/I reduction program from 1997 to the present. She identified the following:
   - Manhole rehabilitation program is in progress (61 manholes).
   - Identified and addressed I/I issues from a new development area by requiring the developer to repair the system prior to assuming the infrastructure.
   - Identified laterals flowing through CCTV inspection.

   BR indicated that review of the long term flow data collected in St. Jacobs's shows high flows occur during the spring period and can last for up to six (6) months.
2. It was noted that the Region and Township had entered into a cost sharing agreement as a result of the 1997 Master Plan. The agreement ended in 2008. One of the outcomes of the current Master Plan Update may be the development of a new cost sharing agreement.

Item	Action

3. There was a detailed discussion on the Township's program to date for St. Jacobs as follows:

    1. Issues Identification/ Investigation - Township maintains permanent and temporary monitoring sites in St. Jacobs to identify issues and determine the success of their program and completes annual flushing and CCTV inspection program. The Township's intent has been to fix problems as they are identified.
    2. Works completed in St. Jacobs include rehabilitation of 61 manholes (still in progress) and addressing high I/I from new development through subdivision assumption process. Township has completed a number of minor repairs to mainline sewers.
    3. Performance measurement - flow monitoring data collected at St. Jacobs WWTP and at MHs 87 and 108 has been compiled for the period from 1999 to 2007 to determine the performance of the repairs completed.

    In addition to the above, the Township has changed plumbing practices for clean out and lateral construction to reduce the potential for I/I from new development areas.

    Rod Kruger (RK) indicated that the Township has had an active program of I/I investigation and repair since 1989. He noted that the most cost effective repairs have already been completed. Despite this, infiltration continues to be an issue and the Township has not found any significant sources.

4. The Township's next steps in addressing I/I in St. Jacobs were discussed as follows:

    - Successful completion of the ongoing manhole rehabilitation program.
    - Investigation of a sump pump program to address private property.

    Stantec is currently evaluating a sump pump program to address private property for the Township.

Item	Action

DK provided a report to Township of Woolwich Council that provided information on the Township's 2010 Work Program to address I/I in Elmira, St. Jacobs, and Breslau (Report E45-2010). The report recommended laterals to five lateral sewers on Water Street, modifications to a pump station, further investigation of a sump pump program, continuation of manhole repairs, smoke testing and continue flow monitoring as works to be completed in 2010. The report does not recommend a third pipe system for St. Jacobs.

The sump pump program and lateral lining program is currently being evaluated based on cost effectiveness. BR is currently working on the evaluation and a Technical Memorandum is expected to be completed in about two (2) week's time. The TM can be made available to the Region following Township review.

5. There was discussion on the potential connection of Heidelburg WWTP flows into the St. Jacobs system. BR noted that Stantec can provide flow data from any of the temporary or permanent meters in St. Jacobs to help evaluate potential connection points and conveyance routes within St. Jacob's.

6. There was detailed discussion on the Township's program to date for Elmira:

    1. Issues Identification/ Investigation - Township maintains permanent and temporary monitoring sites in Elmira to identify issues and determine the success of their program, has done household surveys in the Birdland area and identified houses with sump pumps and gravity foundation drain connections, and completes annual flushing and CCTV inspection program. The Township's intent has been to fix problems as they are identified.
    2. Works completed in Elmira have included a third pipe solution for the Birdland pilot area and reconstruction of ageing infrastructure (included replacement of existing lateral sewers to the property line).
    3. Performance measurement - flow monitoring data collected at Elmira WWTP and at MH 26A has been compiled for the period from 1999 to 2007 to determine the performance of the repairs completed.

Item	Action

In Elmira, the Township's focus has been on the Birdland area where extensive work has been done to replace existing infrastructure found to be in poor condition and on installation of a third pipe system to convey foundation drainage.

7. The Township's next steps in addressing I/I in Elmira were discussed.

   DK provided a report to Township of Woolwich Council that provided information on the Township's 2010 Work Program to address I/I in Elmira, St. Jacobs, and Breslau (Report E45-2010) The report recommended continued manhole repairs, comprehensive manhole inspection, investigation of a sump pump program, investigation of flow rates from new developments and continued flow monitoring as works to be completed in 2010. The report does not recommend a third pipe system for Elmira.

   Stantec has recently completed a draft evaluation of a sump pump program for Elmira. A report to Township of Woolwich Council is expected in 2011.

   Recent inspections have identified that significant leakage through existing laterals continues to occur. The Township is now evaluating lateral lining and trenchless rehabilitation technologies.

8. It was noted that equalization storage tanks are currently being constructed at the Elmira WWTP as part of the current upgrade project. It was also noted that a small portion of the volume in the existing tanks is currently used to equalize flows on a daily basis by Operations Staff, and this has a potential impact on expected operation and performance of equalization tanks during wet weather.

9. The following information was requested from the Township for use in the Review I/I Task for the St. Jacobs and Elmira Wastewater Treatment Master Plan for St. Jacobs: — Township

   - The Presentation given at the start of the meeting.
   - Any CAD drawings or drawing layers showing pipe diameter and slopes, location of manhole repairs, and flowing laterals.
   - Daily flow data from 2004 to 2010 for St. Jacobs including any rainfall data (WWTP and permanent metering sites).
   - TM on Third Pipe System Evaluation (when available).
   - Results of forensic analysis completed in 2009.

Item	Action

10. The following information was requested from the Township for use in the Review I/I Task for the St. Jacobs and Elmira Wastewater Treatment Master Plan for Elmira: — Township

    - Any CAD drawings or drawing layers showing pipe diameter and slopes, location of infrastructure renewal projects, results of foundation drain assessment for Birdland area.
    - Daily flow data from 2004 to 2010 for Elmira including any rainfall data (WWTP and permanent metering site).
    - TM on equalization storage sizing.
    - TM on Third Pipe System Evaluation.

Meeting minutes updated - December 17, 2010-12-17

Any errors, omissions, or discrepancies should be reported to Christine Hill.

APPENDIX B

ST. JACOBS I/I STUDY AND REHABILITATION PROGRAM PRESENTATION

ST. JACOBS
INFLOW AND INFILTRATION (I/I) STUDY AND REHABILITATION PROGRAM, 2002 TO 2010



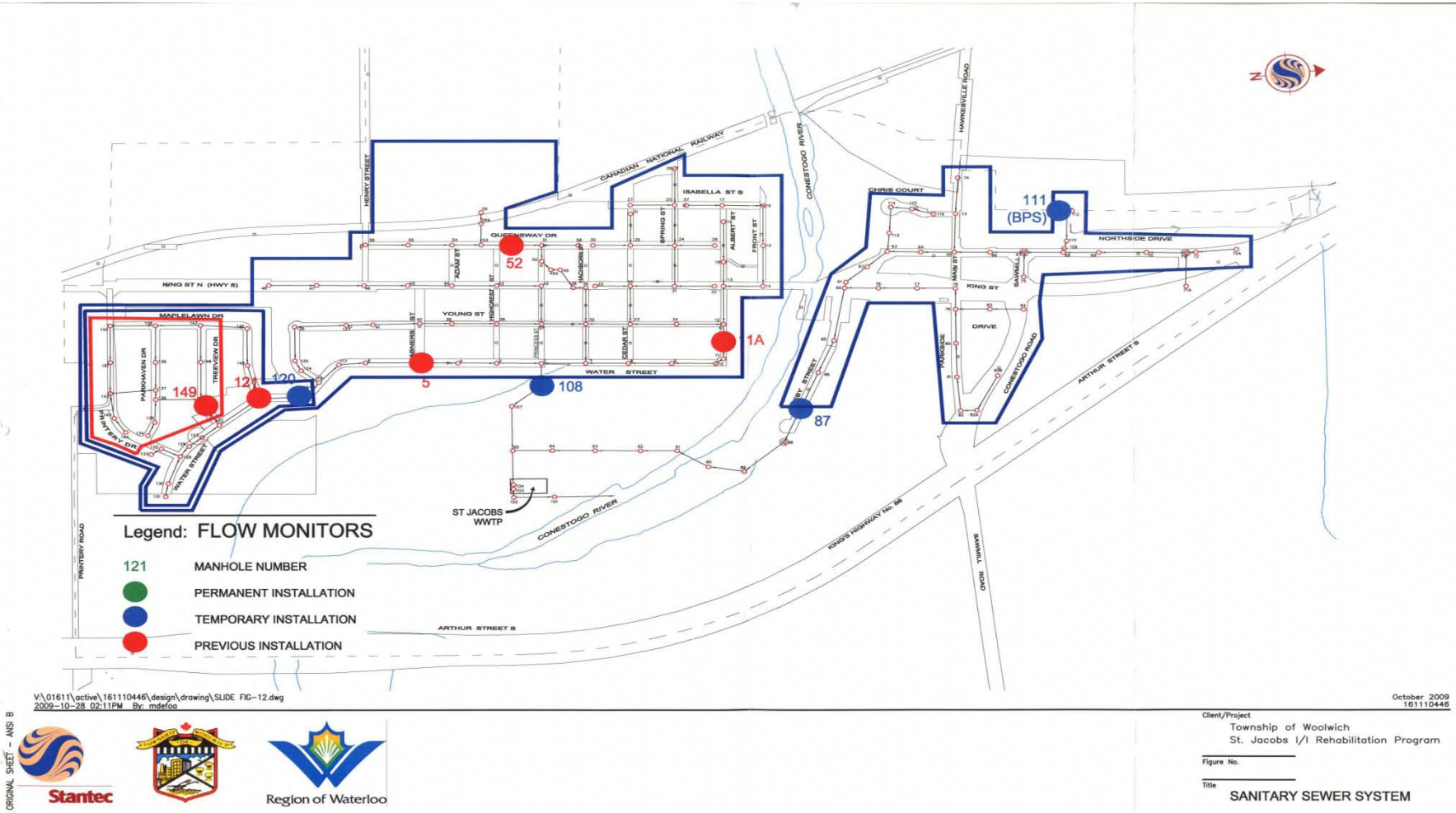
Presented by: B. Robinson, P.Eng.

Date: November 19, 2010

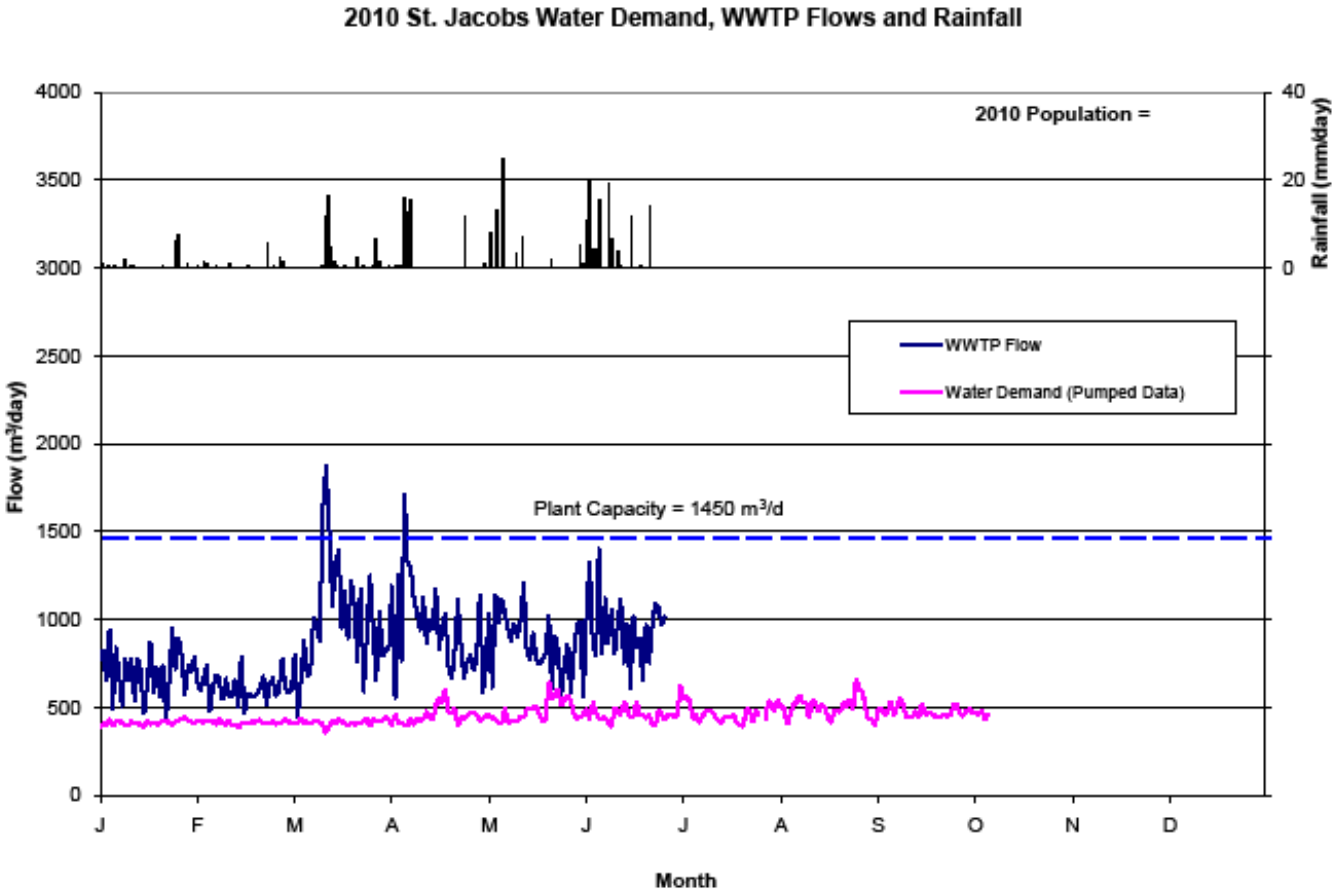
One Team. Infinite Solutions

Stantec

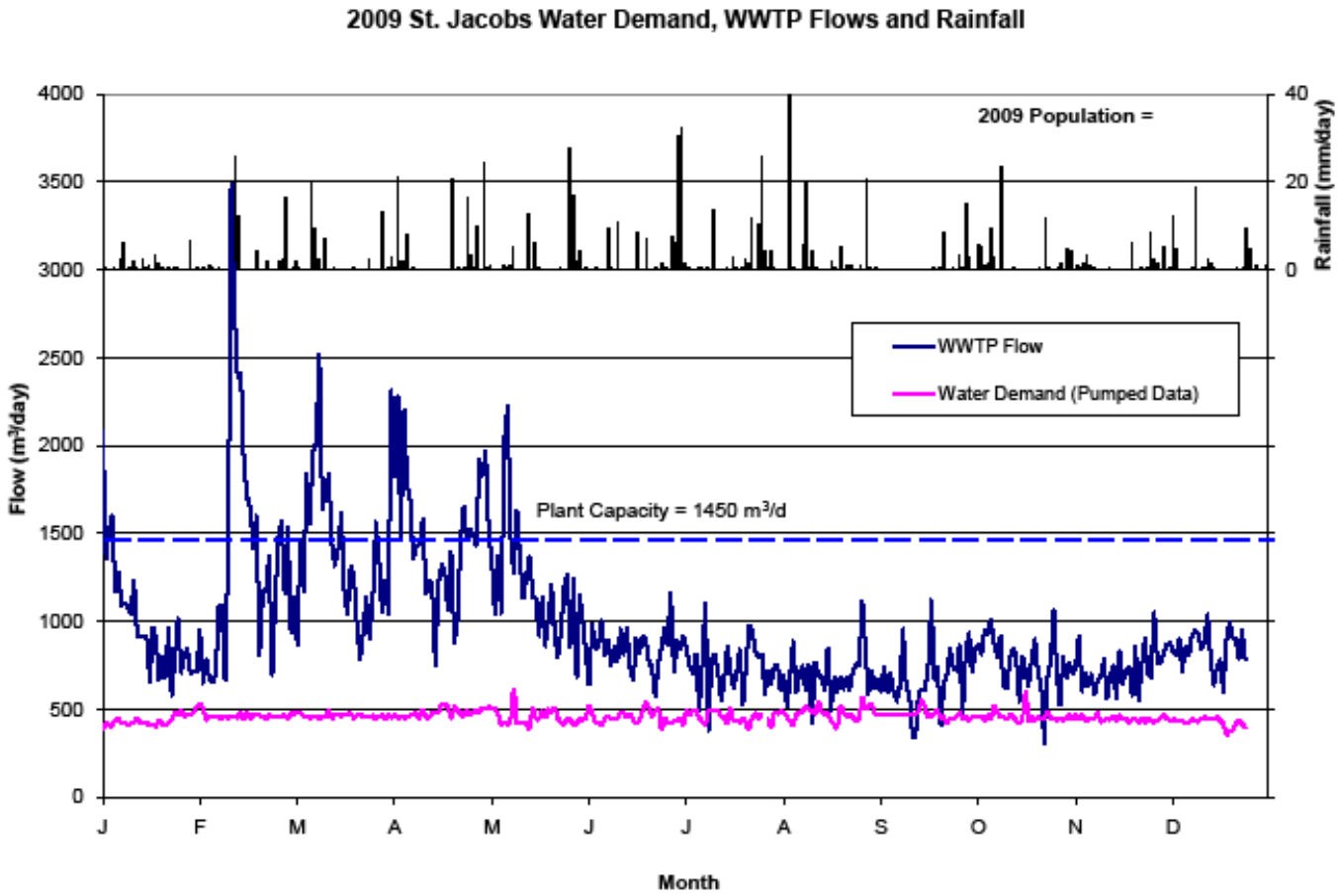
St. Jacobs Sanitary Sewers and Flow Monitors



WWTP and Water Demand



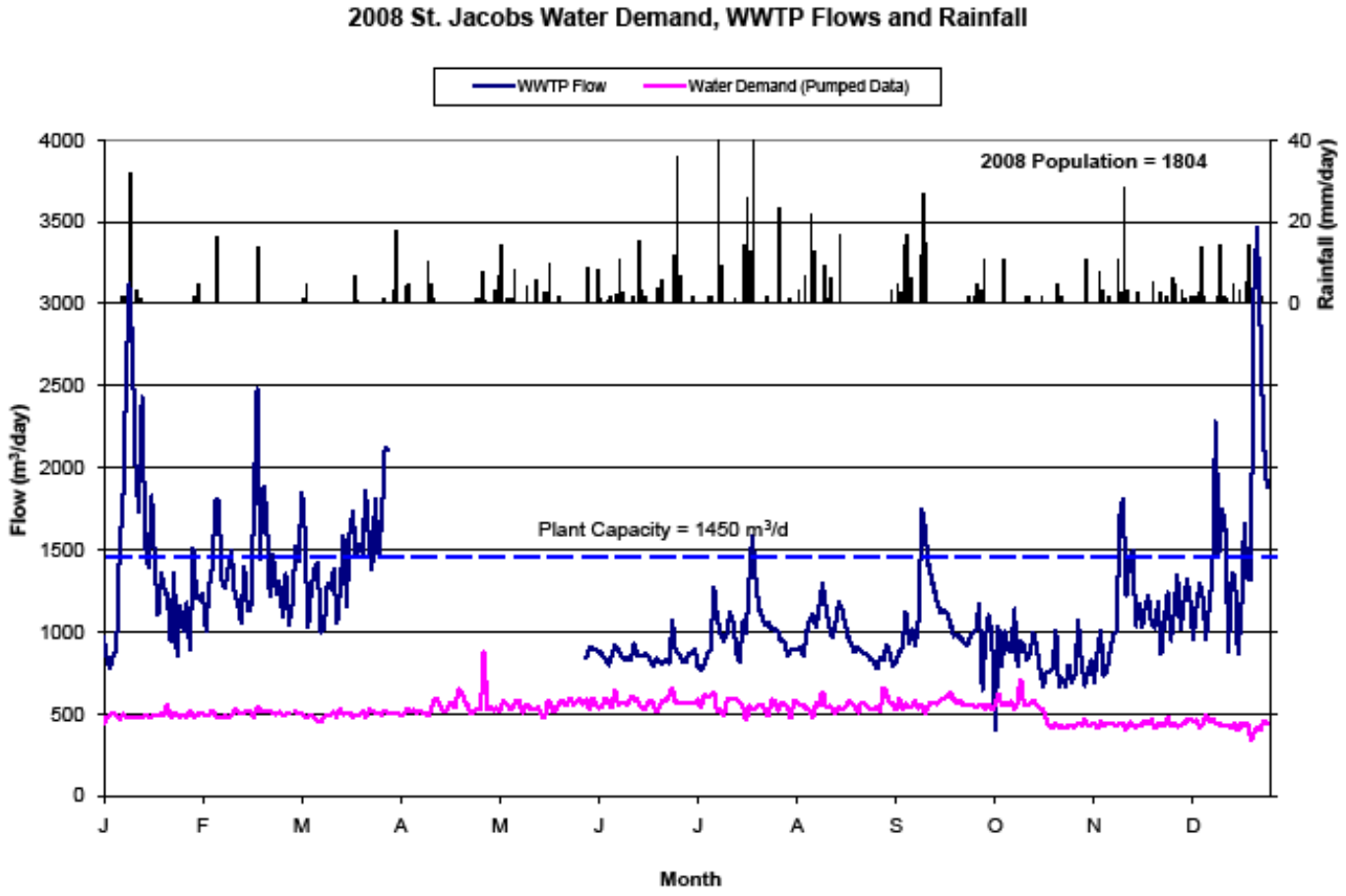
WWTP and Water Demand



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11/18/2010

WWTP and Water Demand



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11/18/2010

Summary of Work to Date

- Flow monitoring and detailed field investigations
  - CCTV Inspections
  - Assessment of laterals
    - Unaccounted-for laterals
    - Prioritization of flowing laterals
  - Investigation of high priority laterals
  - Exterior lot inspections
  - Fog testing
  - Manhole (MH) inspections
  - Cistern Inspection Program
- Three year rehabilitation program

Prioritization of Laterals

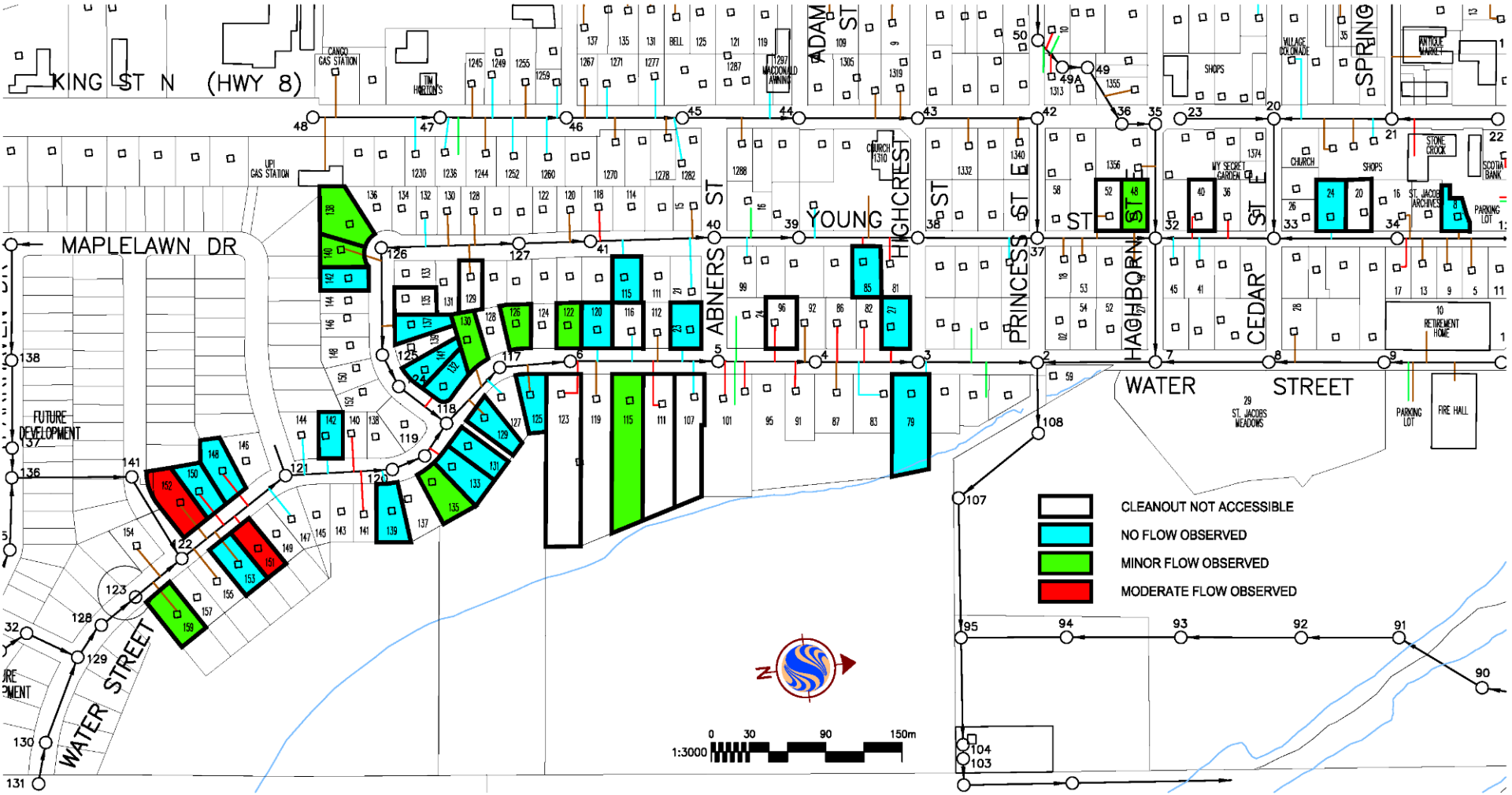


Lateral Inspections

Lateral Inspections Drainage Area 5	
Total Homes	57
Homes inspected	23
Laterals camera'd	17
Laterals flowing	2

- Staff undertook household drainage inspections of Priority laterals in Drainage Area 5 as a pilot area
- Results indicated some deficiencies but no smoking gun

Lateral Inspection Results



Exterior Lot Inspections

- Exterior lot inspections performed for all buildings in St. Jacobs
- Many homes have roof leaders to ground, which suggested the need for smoke testing

Smoke (Fog) Testing



- Smoke testing was undertaken in 2005
- Four homes were found to have smoke coming from the eavestroughs
- One sanitary MH was found to have a sump pump discharge

Manhole Inspections

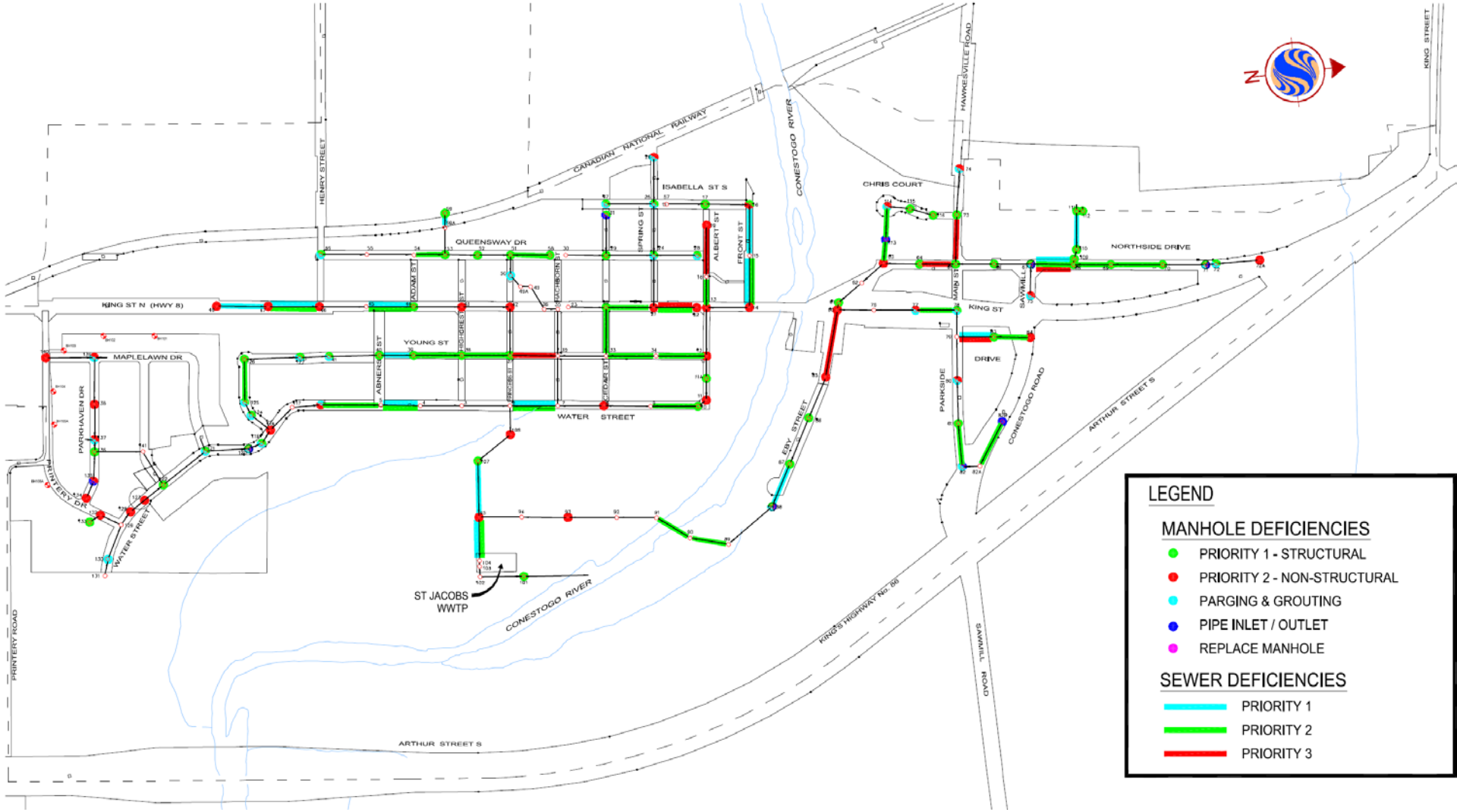


- 137 manholes were inspected in 2005
- The majority of deficiencies were found to be at the adjustment between frame and chimney
- In addition, cracks in cone & corbel, cracks below invert, and and deteriorated structures were found

Summary of Investigation Results

- Extensive, multi-year investigations have uncovered numerous minor sources of I/I in the St. Jacobs sewer system. No one major source has been identified.
- Minor sources include mainline sewer leaks, MH leaks, minor cross connections, and a few flowing laterals.
- An Access database is available with lot by lot information

Summary of Investigation Results



Rehabilitation Program

Phase	Rehabilitation Technology	No. of Repairs/ No. of MHs
Phase 1	Mainline Sewer Priority 1	19
Phase 2	Mainline Sewer Priority 2 and 3	58
Phase 3	MH Priority 1 Adjustments	72
	MH Priority 2 Adjustments	37
	MH Other Repairs	48
Optional Phase	Lateral Repairs	tbd

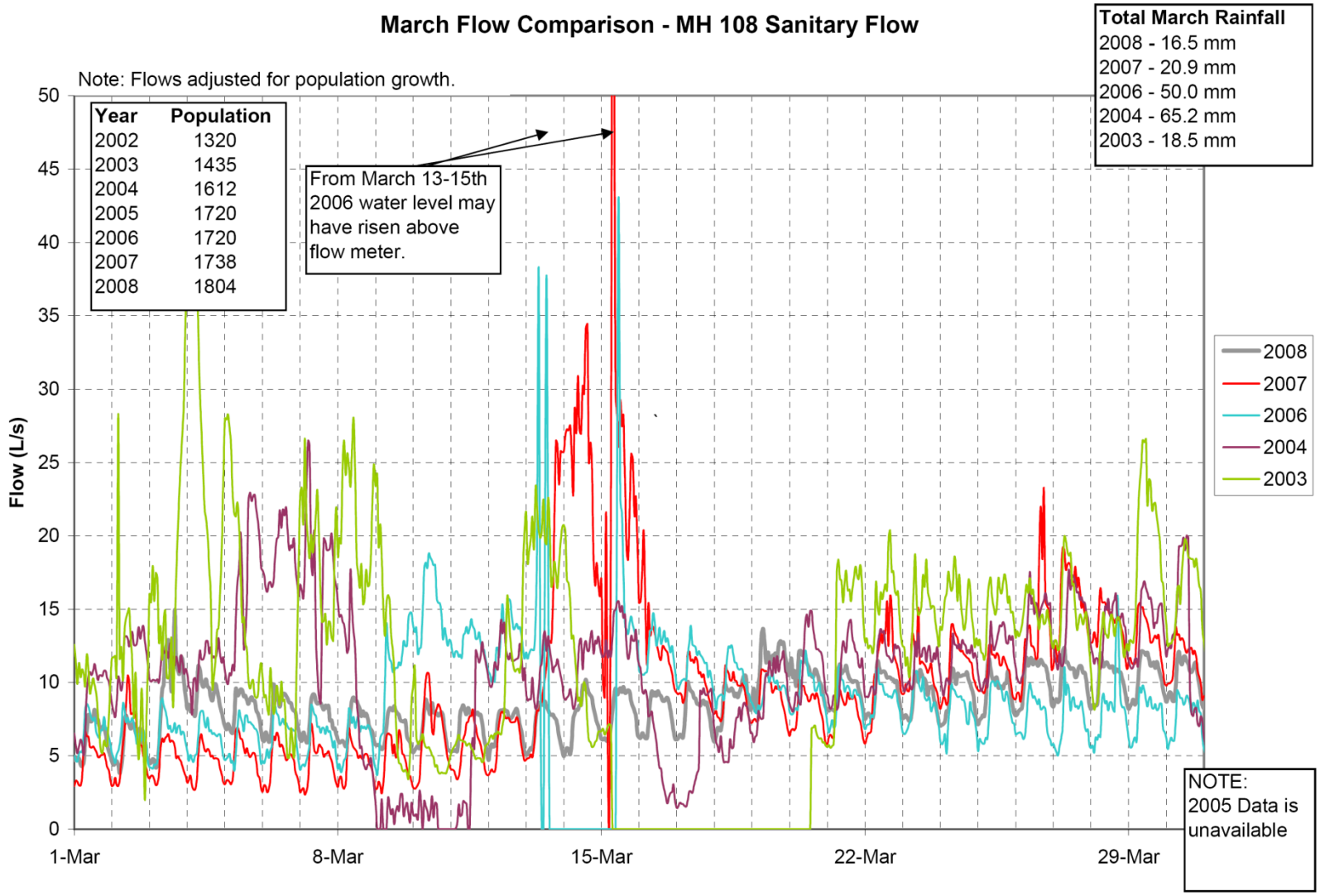


I/I in New Development

- I/I was discovered and corrected upstream of MH 121 in a new development
- See WEAO Paper 2010

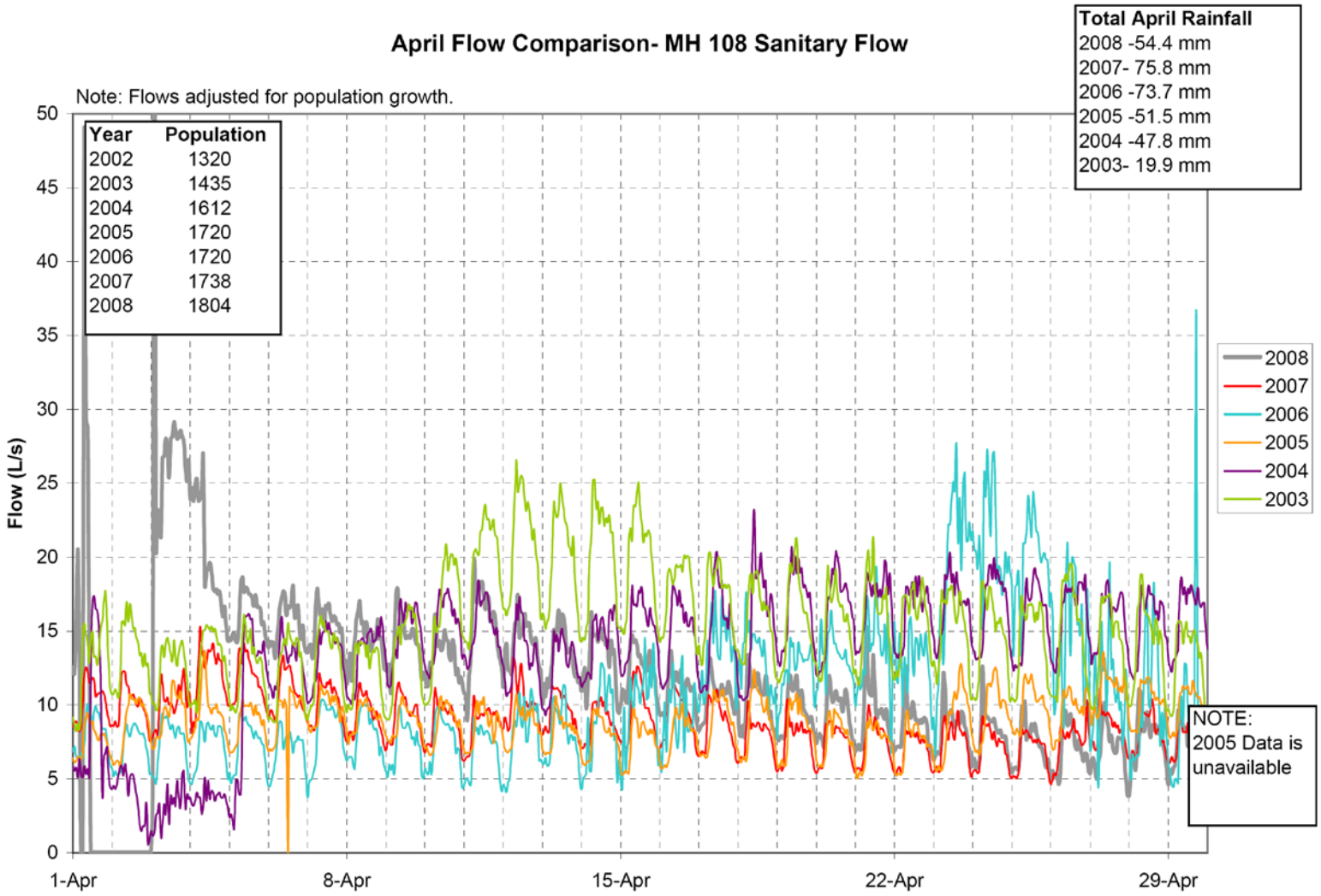
Preliminary Rehabilitation Results

March Flows, Past 5 years



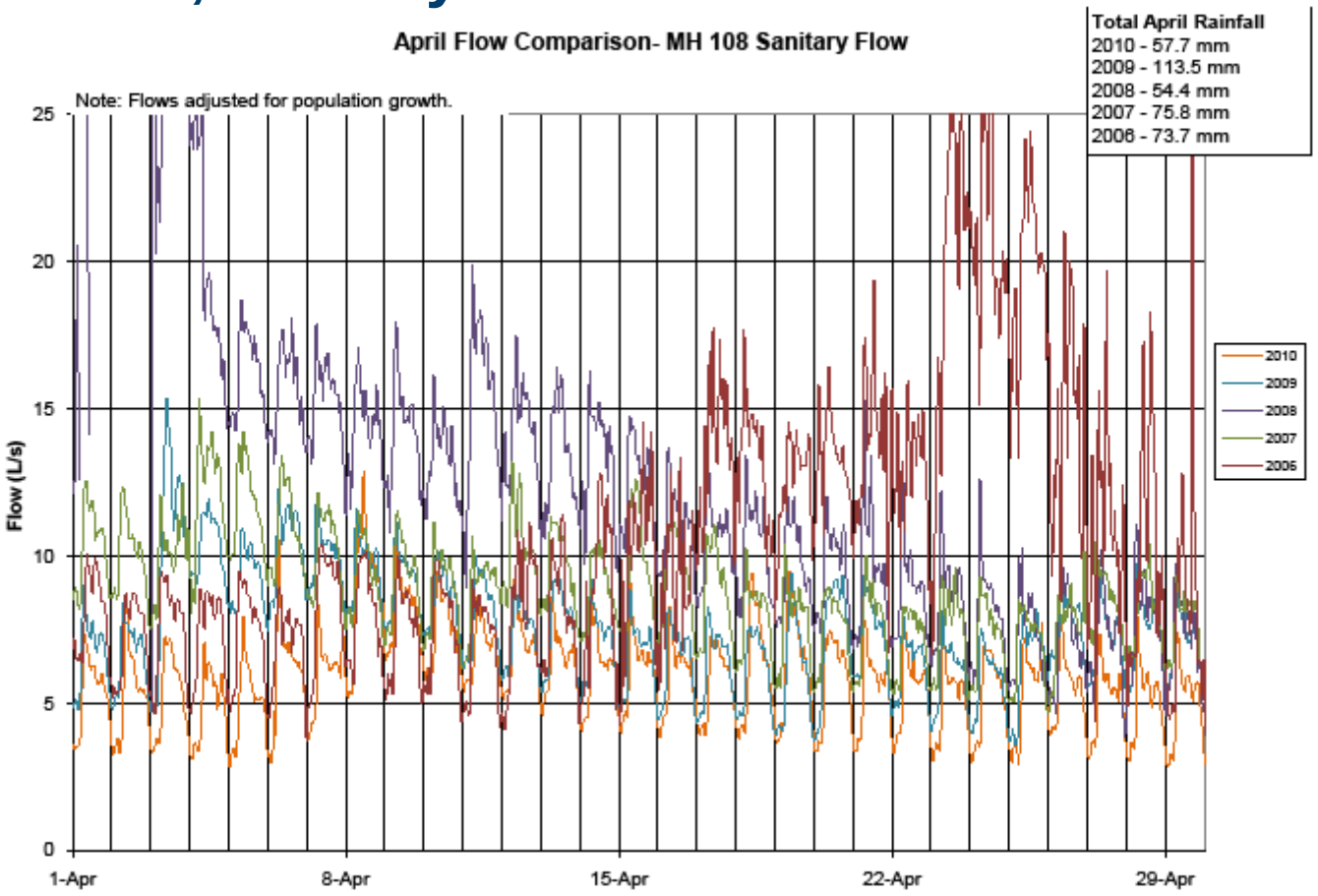
Preliminary Rehabilitation Results

April Flows, Past 5 years



Preliminary Rehabilitation Results

April Flows, Past 5 years



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11/18/2010

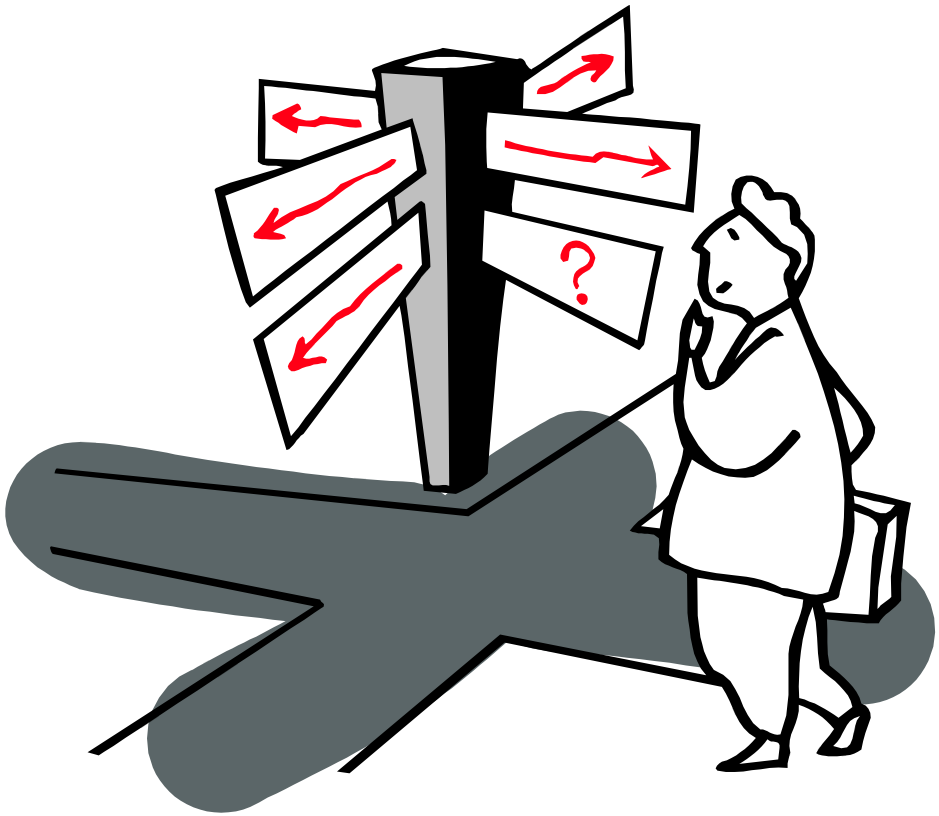
Remaining Sources of I/I

- There are known gravity connections of foundation drains to sanitary in St. Jacobs (see Access database)
- There are knows lateral deficiencies (recent lateral CCTV on Water Street and proposed lateral CCTV on Young Street)

Next Steps

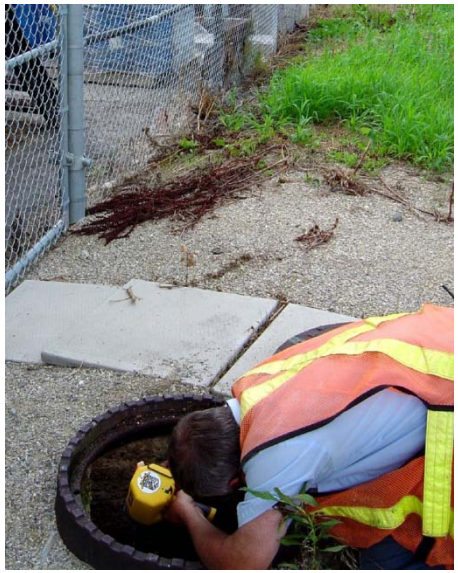
- Public Side Rehabilitation program has not reduced the I/I to the extent we had hoped
- Lateral Rehabilitation and/or Foundation Drain disconnections are the only viable solutions in St. Jacobs
- Lateral Rehabilitation program is being launched
- Ongoing I/I Correction

Questions?



APPENDIX C
ELMIRA I/I STUDY AND RECONSTRUCTION PROGRAM PRESENTATION

ELMIRA
INFLOW AND INFILTRATION (I&I) STUDY AND RECONSTRUCTION PROGRAM, 1997 TO 2010



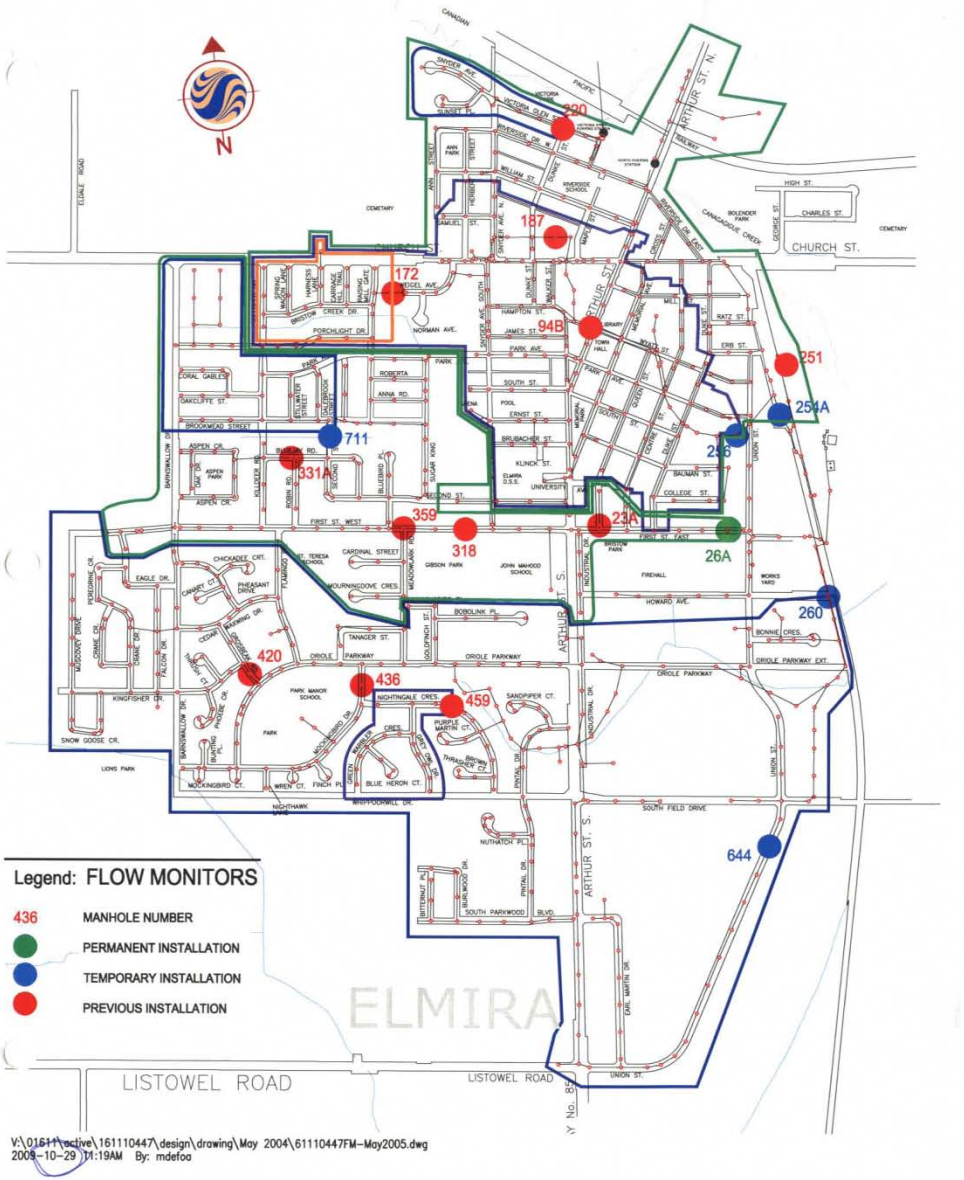
Presented By: B. Robinson, P.Eng.

Date: November 19, 2010

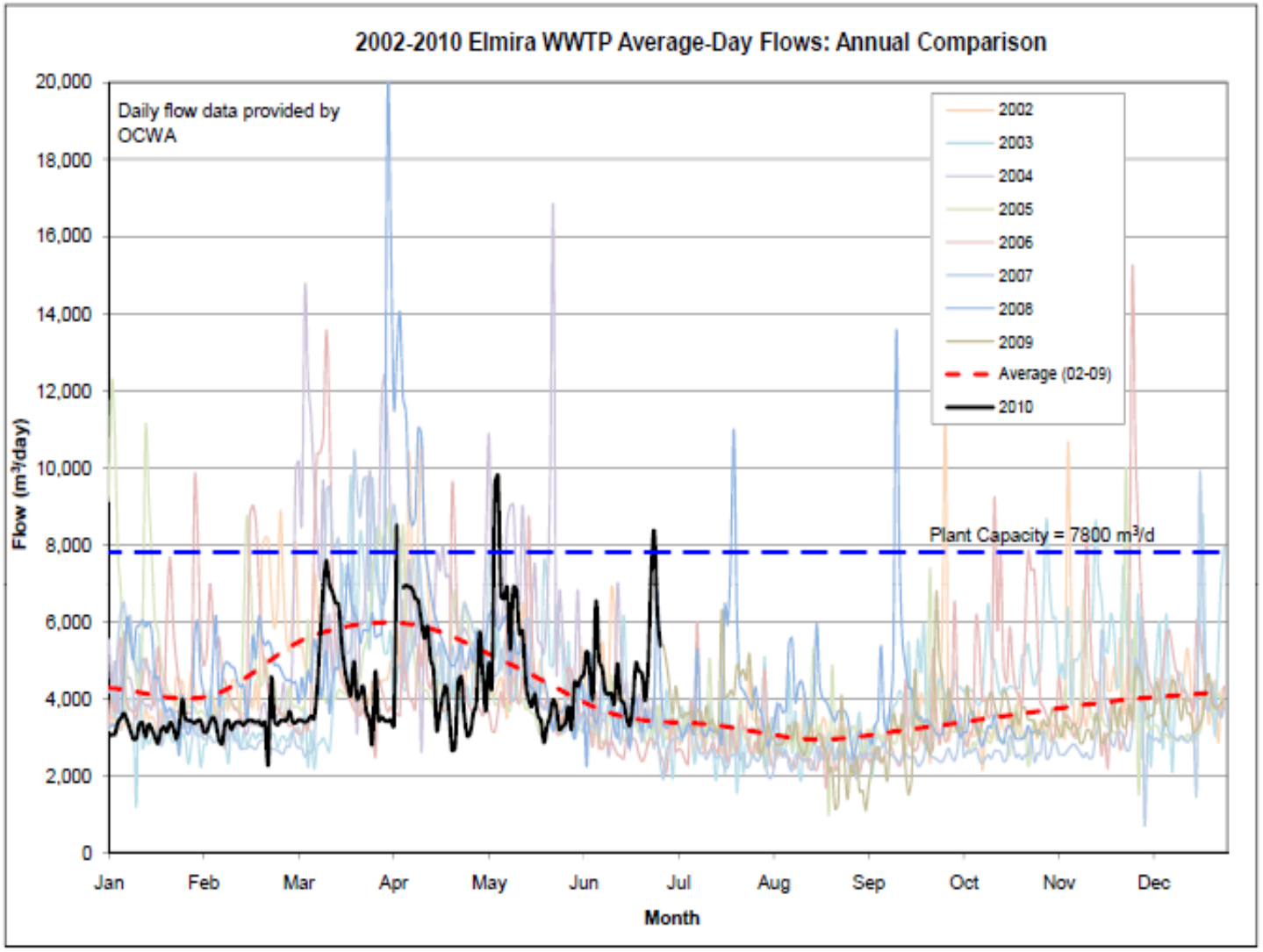
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Stantec

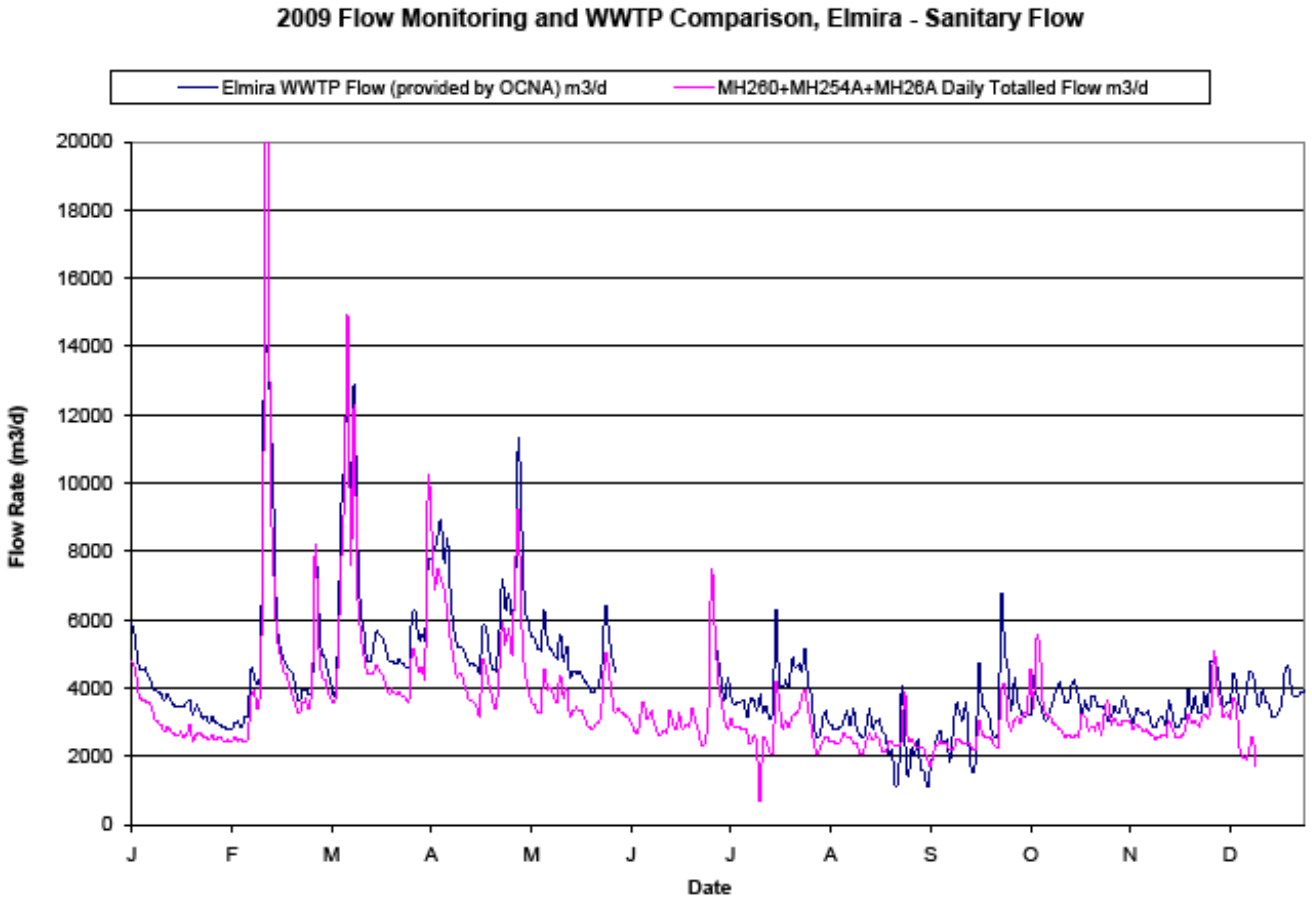
Elmira Sanitary Sewer System



Elmira WWTP Flows



2009 WWTP and Flow Monitoring



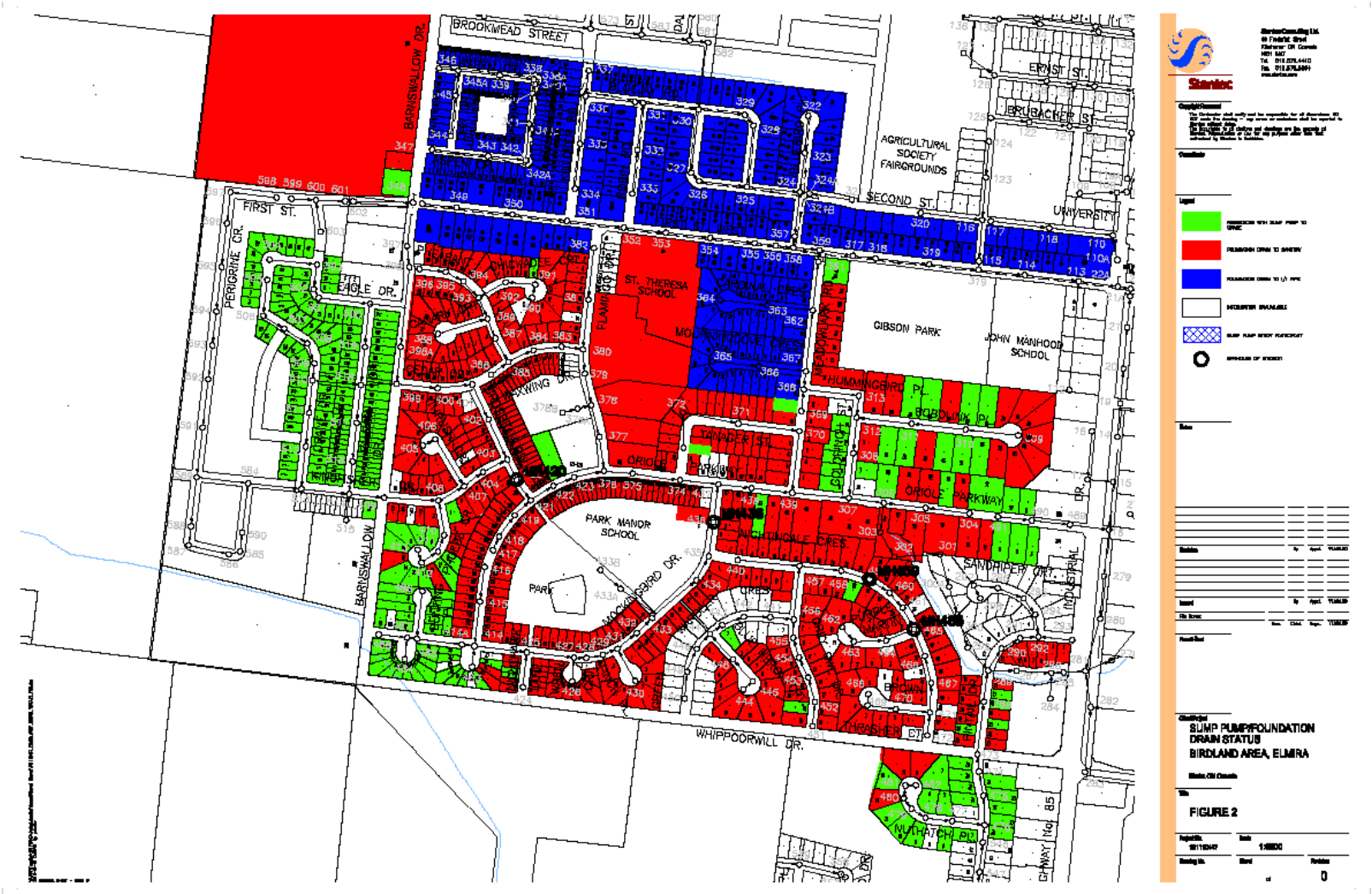
I/I Works to Date

- Township efforts have been focused in South Elmira
- The third pipe solution has been ongoing with the last contract completed in 2008
- Additional major I/I reconstruction works in Birdland were evaluated recently
- Ongoing I/I improvements have been undertaken since then

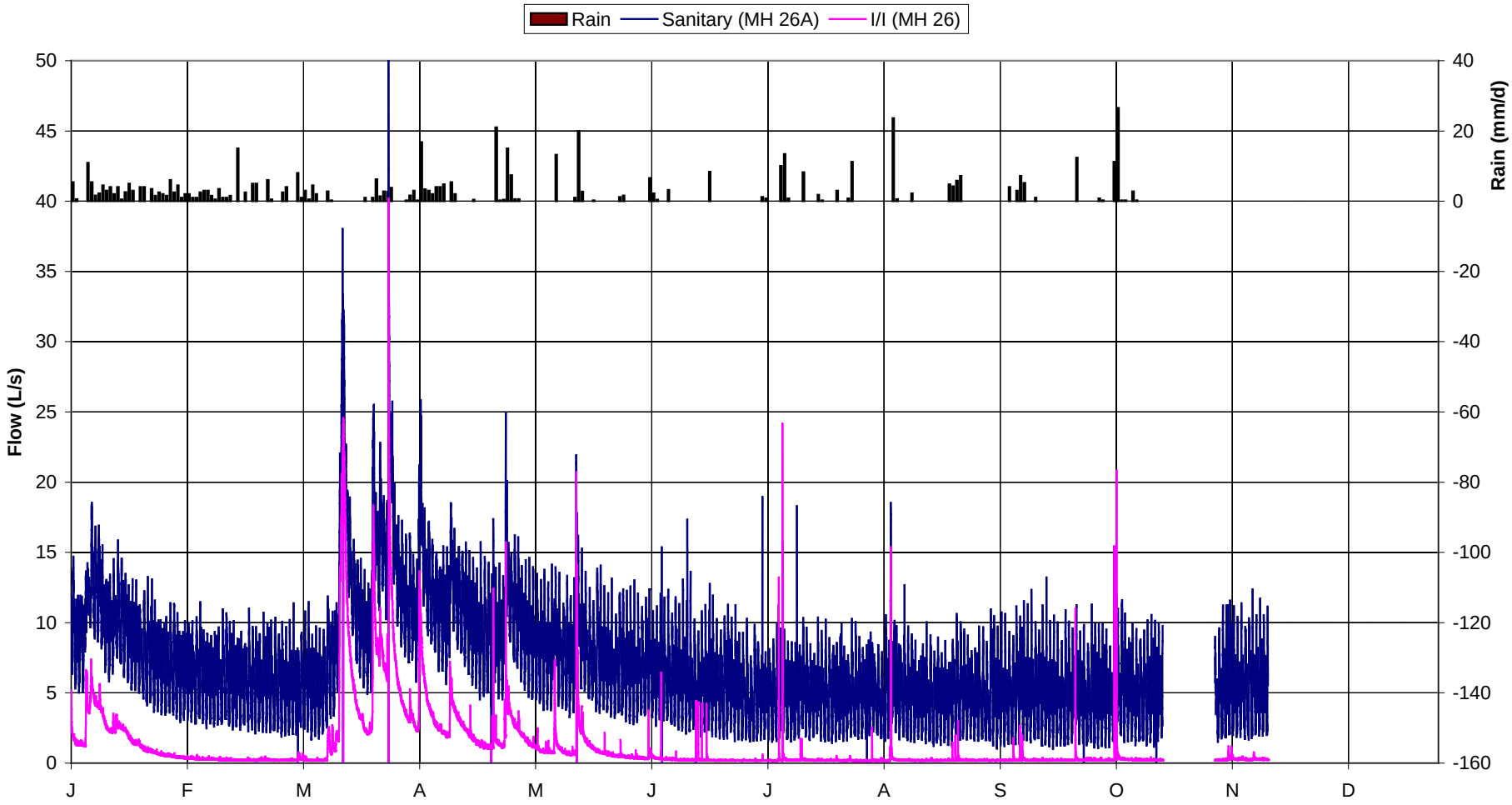
Collections Systems Improvements

- I/I Separation Reconstruction Project
- Ongoing I/I investigations and minor fixes
- Other Collections Systems Improvements
  - South Trunk sewer construction (including decommissioning of South WWPS)
  - North Trunk Sewer replacement
  - Riverside Drive reconstruction

Birdland Foundation Drains



Flow Monitoring at MH26A



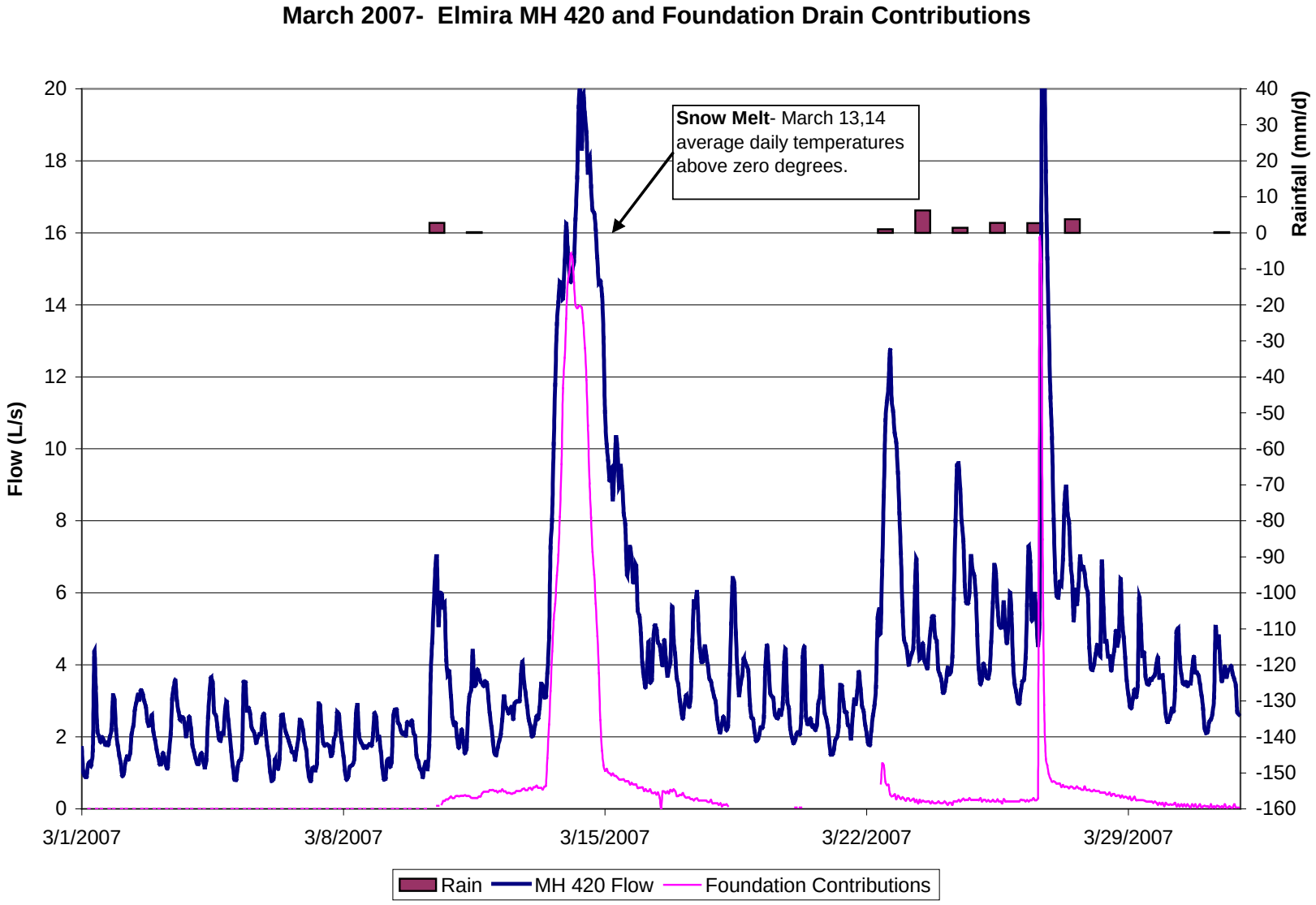
Estimation of Foundation Drain and Third Pipe Flows: Area 465

- Third Pipe flows are available in MH 26A
- Foundation Drain flows are available from a Sump Pump Pilot Project undertaken in 2007

Sump Pump Study Area



Pilot Project Results



Estimation of Foundation Drain and Third Pipe Flows: Area 465

	Average I/I Reduction (m3/d)	Peak I/I Reduction (L/s)
Foundation Drain Disconnection $4.5 million	4 m^3/d *($1,100,000/$m^3$/d)*	16 L/s *($290,000/L/s)*
Third Pipe Solution $11 million	30 m^3/d *($375,000/$m^3$/d)*	34 L/s *($330,000/L/s)*

- The Township has elected not to proceed with either of these solutions at this time

I/I Investigations Outside of Birdland

- Elmira shows high I/I response across the Town
- Cellar drain system in downtown Elmira: overflow is from sanitary to cellar and not the other way
- Public Side Pilot Project undertaken in 2009 (CCTV, MH inspections, Dye Testing)

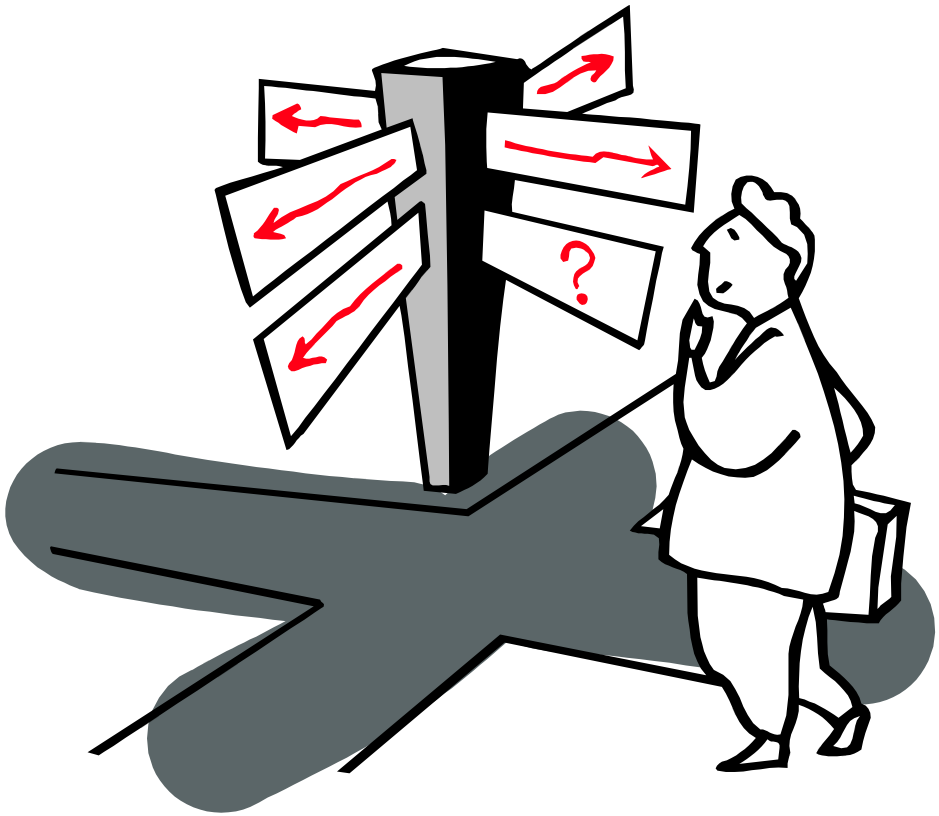
Next Steps (Short Term)

- Lateral CCTV inspections in Birdland and North Elmira
- Lateral relining program
- Ongoing New Subdivision flow monitoring
- Ongoing I/I spot repairs

Vision (from 2008)

- The Region of Waterloo (Region) committed capital dollars to reconstruction in Birdland to meet I/I targets
- What I/I improvements offer the most value for capital dollars spent?
- Continue to work with Region regarding WWTP capacity
- Ongoing flow monitoring and system corrections will continue

Questions?



APPENDIX F
CAPACITY AND NEEDS ASSESSMENT

XCG CONSULTANTS LTD.
T 905 829 8880 F 905 829 8890 | toronto@xcg.com
2620 Bristol Circle, Suite 300, Oakville, Ontario, Canada L6H 6Z7

XCG File No.: 3-035-51-01
November 22, 2012

FINAL
TECHNICAL MEMORANDUM NO. 6
ST. JACOBS - ELMIRA WASTEWATER TREATMENT MASTER PLAN
CAPACITY AND NEEDS ASSESSMENT

Prepared for:

REGION OF WATERLOO
150 Frederick Street, 7th Floor
Kitchener, Ontario
N2G 4J3

Attention: Pam Law, P.Eng.

Prepared by:

XCG CONSULTANTS LTD.
Suite 300, 2620 Bristol Circle
Oakville, Ontario
L6H 6Z7

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1. INTRODUCTION

The Region of Waterloo (Region) is undertaking a wastewater treatment master plan (WWTMP) for both the Elmira and St. Jacobs communities concurrently, ensuring that Phases 1 and 2 of the Municipal Class Environmental Assessment are satisfied. This WWTMP will review wastewater treatment conditions in these communities since the completion of the 1997 Class Environmental Assessment Study and the 2007 Region-wide WWTMP, and recommend a wastewater treatment strategy to meet growth in the communities for the next 30 years.

The 2007 Region-wide WWTMP (Earthtech, 2007) recommended the completion of a separate master plan for the Elmira Waste Water Treatment Plant (WWTP) and the St. Jacobs WWTP where options for servicing of both communities would be considered together. This study will provide an opportunity to consider wastewater treatment requirements for the communities of Elmira and St. Jacobs together and will also provide an opportunity to consider the feasibility of incorporating flows from the Heidelberg WWTP into an overall solution.

The Elmira WWTP provides tertiary treatment for wastewater generated in Elmira and has an average day Certificate of Approval (C of A) rated capacity of 7,800 m^3/d and a peak flow capacity of 19,500 m^3/d.

The St. Jacobs WWTP provides tertiary treatment for wastewater generated in St. Jacobs and has an average day C of A rated capacity of 1,450 m^3/d.

The Heidelberg WWTP provides tertiary treatment for wastewater generated in a small community of about 90 homes in the Village of Heidelberg (Heidelberg). The Heidelberg WWTP has an average day C of A rated capacity of 130 m^3/d and a peak flow capacity of 276 m^3/d.

1.1 Objectives

The objectives of this Technical Memorandum (TM) are:

- Review the historic performance of the St. Jacobs WWTP and Elmira WWTP;
- Establish the existing process capacity of the Elmira WWTP and the St. Jacobs WWTP; and
- Identify factors that limit the capacity of each WWTP that will need to be addressed at these WWTPs to achieve the required treatment capacity in 2031.

2. EXISTING ELMIRA WWTP

The Elmira WWTP is a Class III, Biological Nutrient Removal (BNR) facility with tertiary treatment. The Elmira WWTP, originally constructed in 1967, was expanded in 1983 and again in 2000.

The Elmira WWTP is operated under Ministry of the Environment (MOE) Amended C of A No. 2530-84BL9Q issued June 8th, 2010. The Elmira WWTP has an average day C of A rated capacity of 7,800 m^3/d.

Table 2.1 summarizes the major unit process design parameters for the plant. Figure 2.1 presents an aerial view of the WWTP and Figure 2.2 presents a process flow diagram (PFD) of the WWTP.

Raw wastewater enters the WWTP via an off-site sewage pumping station (SPS). The SPS consists of a coarse mechanical bar screen system located in a separate screening room and five submersible sewage pumps (four pumps rated for 200 L/s each, and one jockey pump rated for 100 L/s).

The Elmira WWTP is serviced by four equalization tanks. Equalization Tanks No. 1 and No. 2 are located on-site at the Elmira WWTP. Equalization Tanks No. 3 and No. 4 are located adjacent to the Raw Influent SPS. An additional two equalization tanks (Equalization Tanks No. 5 and No. 6), which will be located beside Equalization Tanks No. 3 and No. 4 at the SPS, are currently under construction. Raw influent pumped to the WWTP that exceeds 225 L/s is delivered to Equalization Tanks No. 1 and No. 2 via a side spill weir on the headworks effluent chamber. If flows still exceed 225 L/s, flows are diverted to Equalization Tanks No. 3 and No. 4 by opening a modulating valve on the pump discharge header. Once flow has subsided and capacity is available at the Elmira WWTP, flow from Equalization Tanks No. 1 and No. 2 is pumped back to the headworks effluent chamber, and flow from Equalization Tanks No. 3 and No. 4 flows via gravity back to the Raw Influent SPS. Based on the site visit and conversations with the operators, Equalization Tanks No. 1 and No. 2 have not been used, due to issues with the side weir elevation on the headworks effluent channel.

Raw wastewater at the WWTP passes through two mechanically cleaned bar screens and two vortex grit removal tanks. Screened and degritted wastewater flows to two circular primary clarifiers. According to the Region, the wastewater discharged from the pre-treatment facilities at one of the major industrial contributors ("Company D") is discharged into one of the two primary clarifiers. Primary effluent is combined with the RAS stream and flows to two bioreactors. Each bioreactor is baffled into five separate cells arranged as follows: anoxic, anaerobic, swing zone (anoxic/aerboic), aerobic, and aerobic. The anoxic, anaerobic, and swing zones are equipped with mixers. The swing zones and aerobic zones are equipped with fine bubble diffusers. The bioreactors are capable of operating in step feed as required. Currently, the bioreactors are operated as two treatment trains in parallel, and the swing zone is operated as an anoxic zone during the summer and an aerobic zone during the remaining part of the year. Recycle pumps within the bioreactors allow for

internal mixed liquor recycling from the final aerobic zone to the swing zone. Ferric chloride is added to the common outlet chamber to augment the biological phosphorus removal when necessary. Provisions exist to add sodium hypochlorite to the RAS line for control of filamentous micro-organisms.

There are three circular secondary clarifiers. The combined mixed liquor from the bioreactors is distributed to the three secondary clarifiers. The secondary effluent flows to two automatic backwash sand filters and is disinfected by UV prior to discharge to Canagagigue Creek. The UV system consists of two banks of UV lamps installed in two disinfection channels. Provisions exist for chlorination in the event of plant by-pass. Effluent is discharged by gravity to Canagagigue Creek under normal conditions. In the event that creek water levels are high, an effluent pumping system, consisting of four submersible pumps (three pumps rated for 79.5 L/s and one pump rated for 75.2 L/s) which are available.

Primary sludge is fermented in a fermenter tank. The supernatant from the fermenter tank is returned to the anaerobic zone to facilitate biological phosphorus removal. The fermenter sludge is combined with ferric chloride in a rapid mix tank and dewatered in an automatic plate and frame press. Waste activated sludge (WAS) and scum generated is combined with lime in a rapid mix tank and dewatered in the automatic plate and frame press. Sludge digestion is currently not provided at the Elmira WWTP. Sludge cake is landfilled for final disposal.

Table 2.1 Elmira WWTP Unit Process Table

Unit Process	Design Parameter [(1), (2)]
Equalization Storage	
On-Site Equalization Tanks (#1/2) at WWTP:	
Total Volume	1,090 m^3
Off-Site Equalization Tanks (#3/4/5/6) at SPS:	
Quantity	4
Total Volume	5,200 m^3
Total Equalization Volume (On- and Off-Site)	6,290 m^3
Raw Sewage Pumping Station	
Screening	
Type	Coarse - Mechanically cleaned
Number	1
Pumping	
Quantity	4 (3 duty, 1 standby) + 1 jockey
Capacity (Each)	200 L/s @ 14.4 m TDH (17,280 m^3/d)
Capacity (Jockey)	100 L/s (8,640 m^3/d) @ 14.4 m TDH
Capacity (Firm)	500 L/s [(3)]
Screening	
Type	Mechanically cleaned
Number	2

Table 2.1 Elmira WWTP Unit Process Table

Unit Process	Design Parameter [(1), (2)]
Grit Removal	
Type	Vortex
Number	2
Firm Capacity	19,500 m^3/d
Total Capacity	39,000 m^3/d
Primary Clarification	
Type	Circular
Number	2
Dimensions	12.19 m diameter, 2.43 m SWD
Surface Area (each)	117 m^2
Surface Area (total)	234 m^2
Raw Sludge Pumps	
Number	2 pumps (duty, standby),
Capacity (each)	12.5 L/s @ 3.96 m TDH
Scum Pump	
Capacity	1 pump @ 7.6 L/s
Bioreactors	
Type	Pre-Anoxic
Number	2
Dimensions	6.14 m x 5.78 m x 4.5 m
Volume (each)	160 m^3
Volume (total)	320 m^3
Type	Anaerobic
Number	2
Dimensions	6.14 m x 5.78 m x 4.5 m
Volume (each)	160 m^3
Volume (total)	320 m^3
Type	Swing (Anoxic / Aerobic)
Number	2
Dimensions	5.35 m x 5.78 m x 4.5 m
Volume (each)	139 m^3
Volume (total)	278 m^3
Type	Aerobic
Number	4
Dimensions	16.9 m x 5.78 m x 4.5 m
Volume (each)	439 m^3
Volume (total)	1,756 m^3
Internal Mixed Liquor Recycle Pumps	
Number	2 (one pump per train)
Capacity (each)	196 L/s @ 1.5 m TDH
Blowers	
Number	3 (2 duty, 1 standby)
Type	Centrifugal
Capacity (each)	1,636 m^3/hr
Firm Capacity	3,372 m^3/hr
Total Capacity	4,908 m^3/hr

Table 2.1 Elmira WWTP Unit Process Table

Unit Process	Design Parameter [(1), (2)]
Secondary Clarification No. 1	
Type	Circular
Number	1
Dimensions	27.4 m diameter
Surface Area	590 m^2
Return Activated Sludge Pumping	
Number	3 (2 duty, 1 standby)
Capacity (each)	30.1 L/s
Waste Activated Sludge Pumping	
Number	2 (1 duty, 1 standby)
Capacity (each)	7.6 L/s
Secondary Clarification No. 2 and 3	
Type	Circular
Number	2
Dimensions	13.7 m diameter x 3.65 m SWD
Surface Area (each)	147 m^2
Return Activated Sludge Pumping	
Number	4 (2 duty, 2 standby)
Capacity (each)	2 pumps @ 75 L/s; 2 pumps @ 11 L/s
Waste Activated Sludge Pumping	
Number	2 (1 duty, 1 standby)
Capacity (each)	7.6 L/s
Tertiary Filters	
Type	Shallow Bed Travelling Bridge Sand Filter
Media	Single Media, 280 mm Depth Silica Sand
Number	2
Surface Area (each)	68.4 m^2
Surface Area (total)	136.8 m^2
UV Disinfection	
Type	UV Disinfection
Channels	2
Banks	4 (2 banks per channel)
Capacity (per bank)	4,875 m^3/d
Capacity (firm)	14,625 m^3/d
Capacity (total)	19,500 m^3/d
Plant Bypass Disinfection	
Type	Chlorine
Storage	2 tanks, each at 4,500 L
Number of Pumps	4 (2 duty, 2 standby)
Capacity (each)	30 L/hr
Effluent Pumping	
Number / Capacity	3 pumps @ 79.5 L/s @ 4.2 m TDH 1 pump @ 75.2 L/s @ 4.2 m TDH

Table 2.1 Elmira WWTP Unit Process Table

Unit Process	Design Parameter [(1), (2)]
Fermenter	
Tank Volume	377 m^3
Sludge Transfer Pump Capacity	0.15 L/s to 1.51 L/s
Sludge Blending	
Tank Volume	377 m^3
Sludge Transfer Pump Capacity	0.15 L/s to 1.51 L/s
Sludge Dewatering	
Type	Automatic Plate and Frame

Notes:
1. Certificate of Approval Number 2530-84BL9Q.
2. Elmira Wastewater Treatment Plant Upgrade and Expansion, Record Drawings (Stantec, 2002)
3. According to Elmira WWTP Storage Expansion Preliminary Assessment Report (Stantec, 2009a), firm capacity has not been confirmed with pumps and system curves.

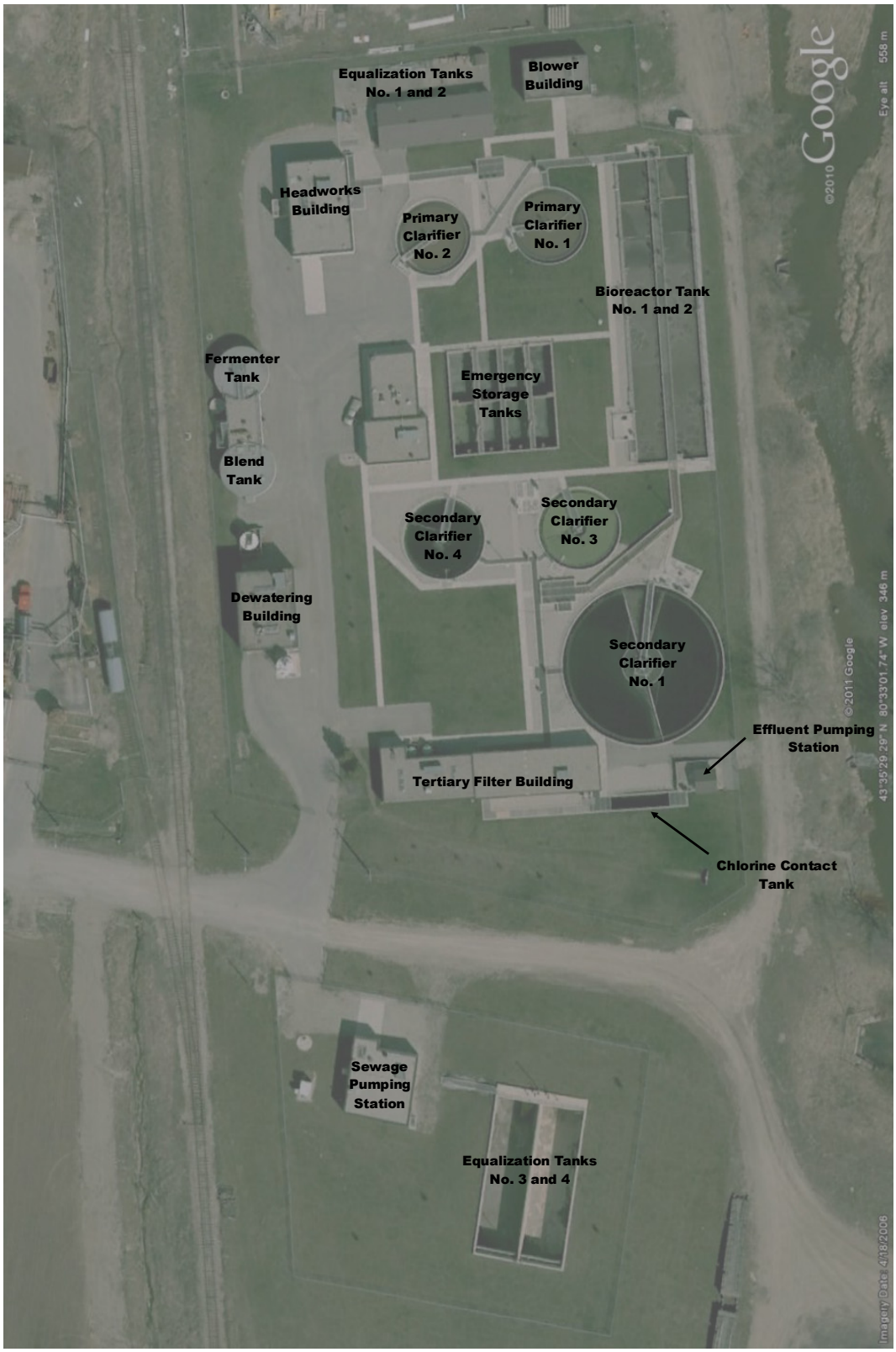


Figure 2.1 Elmira WWTP - Aerial View

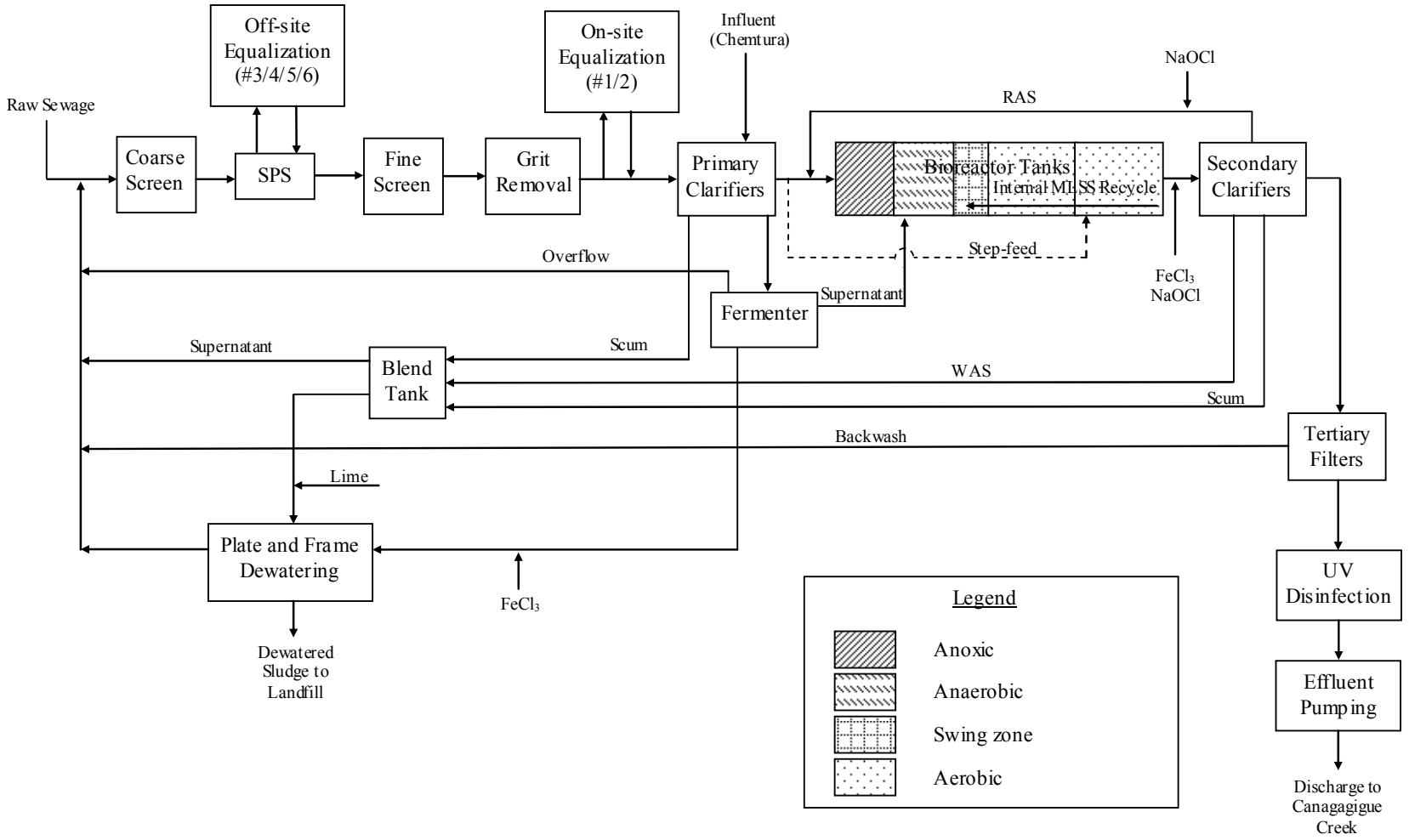


Figure 2.2 Elmira WWTP - Liquid Stream Flow Schematic

2.1 Treatment Objectives and Compliance Requirements

The C of A specifies concentration objectives and non-compliance limits for carbonaceous biochemical oxygen demand ($cBOD_5$), total suspended solids (TSS), total phosphorous (TP), total ammonia nitrogen (TAN) and *E. coli*. The C of A also specifies that the pH of the effluent should be between 6.0 and 9.5 and that the effluent shall not be acutely lethal to Rainbow Trout and *Daphnia Magna*. The C of A effluent requirements for the Elmira WWTP are summarized in Table 2.2.

Table 2.2 C of A Objectives and Non-compliance Limits (C of A No 2530-84BL9Q)

Parameter	Effluent Objectives	Non-Compliance Limits	
	Concentration (1)	Concentration (1)	Total Loading (2)
$cBOD_5$	5.0 mg/L	10.0 mg/L	78.0 kg/d
TSS	5.0 mg/L	10.0 mg/L	78.0 kg/d
TP	0.2 mg/L	0.5 mg/L	3.9 kg/d
TAN (May-Oct)	0.4 mg/L	0.7 mg/L	5.5 kg/d
TAN (Nov-Apr)	1.0 mg/L	2.0 mg/L	15.6 kg/d
pH	Between 6.5 to 9.0 inclusive	Between 6.0 to 9.5 inclusive	-
E .coli (3)	-	200 counts/100 mL	-

Notes:
1. Based on monthly average concentration values.
2. Based on the annual average loading.
3. Based on monthly geometric mean density.

2.2 Raw Wastewater Flows and Characteristics

2.2.1 Historical Flow

A summary of the annual average day flows (ADF) and peak day flows (PDF) of the plant effluent over the period January 2008 to December 2010 is presented in Table 2.3. The effluent flow is measured via a weir and ultrasonic level located upstream of the final effluent pumping station.

Table 2.3 Summary of Historical Plant Flow (2008 – 2010)

Year	Average Day Flow (m^3/d)	Peak Day Flow	
		(m^3/d)	Factor
2008	4,290	22,545	5.3
2009	4,098	11,835	2.9
2010	4,177	9,789	2.3
Average	4,188	-	-
Maximum	-	22,545	-
C of A Rated Capacity	*7,800*	*19,500* (2)	*2.5*

Notes:
1. Average day flow values based on monthly average flows.
2. C of A peak flow capacity.

Based on Table 2.3, the Elmira WWTP is currently operating at 54 percent of the C of A rated average day capacity. In December 2008, the PDF through the Elmira WWTP exceeded the C of A rated peak capacity.

Under normal operating conditions, flows to the SPS upstream of the Elmira WWTP exceeding 19,500 m^3/d are pumped to Equalization Tanks No. 3 and No. 4. Therefore, the peak flows to the SPS may be higher than those reported in Table 2.3. In the event that the flows conveyed to the Elmira WWTP exceed 19,500 m^3/d, the original design intent was to divert flow to Equalization Tanks No. 1 and No. 2 via a side weir in the primary clarifier influent distribution chamber. However, due to hydraulic issues with the side weir elevations (Cole Engineering, 2010), there has been difficulty in diverting flows to Equalization Tanks No. 1 and No. 2. According to the Region, issues with directing flows to Equalization Tanks No. 1 and No. 2 are currently being addressed through the replacement of the existing overflow control weir in the primary bypass channel with a flow-control bypass gate. Furthermore, due to design issues with the secondary clarifiers, flows approaching 5,616 m^3/d have been historically directed to Equalization Tanks No. 3 and No. 4 (Stantec, 2008).

A summary of the annual ADF of the plant effluent with estimated contributions from various contributors over the period January 2008 to December 2010 is presented in Table 2.4.

Table 2.4 Summary of Historical Flows from Industrial Contributors (2008 – 2010)

Year	Average Day Flow (m^3/d)						
	Domestic and Others (1)	"Company A"	"Company B"	"Company C"	"Company D"	"Company E" (2)	Total
2008	3,957	70	6	98	84 (3)	75	4,290
2009	3,788	57	5	89	84	75	4,098
2010	3,816	95	5	102	84 (3)	75	4,177
Average	3,854	74	5	96	84	75	4,188

Notes:
1. Calculated based on Total Effluent ADF minus contributions from major individual industrial contributors. This value represents the domestic commercial, institutional, and other industries contributing to wastewater flows to Elmira WWTP.
2. According to the Region.
3. Estimated based on 2009 ADF for "Company D".

Based on the current service population of 10,011 and ADF from domestic commercial, institutional, and other industries, the historic per capita flow was approximately 385 L/capita·d. Typical per capita flows in the Region range between 250 L/capita.d to 300 L/capita.d for the small Regional systems, which are considerably lower than the historic numbers seen in at the Elmira WWTP. Moreover, a review of the flows in the snow melt season clearly indicates that these are sustained events lasting weeks. Such sustained but diluted flows can adversely affect the performance of the treatment processes.

Figure 2.3 presents the historic Elmira WWTP effluent flows for the study period from January 2008 to December 2010.

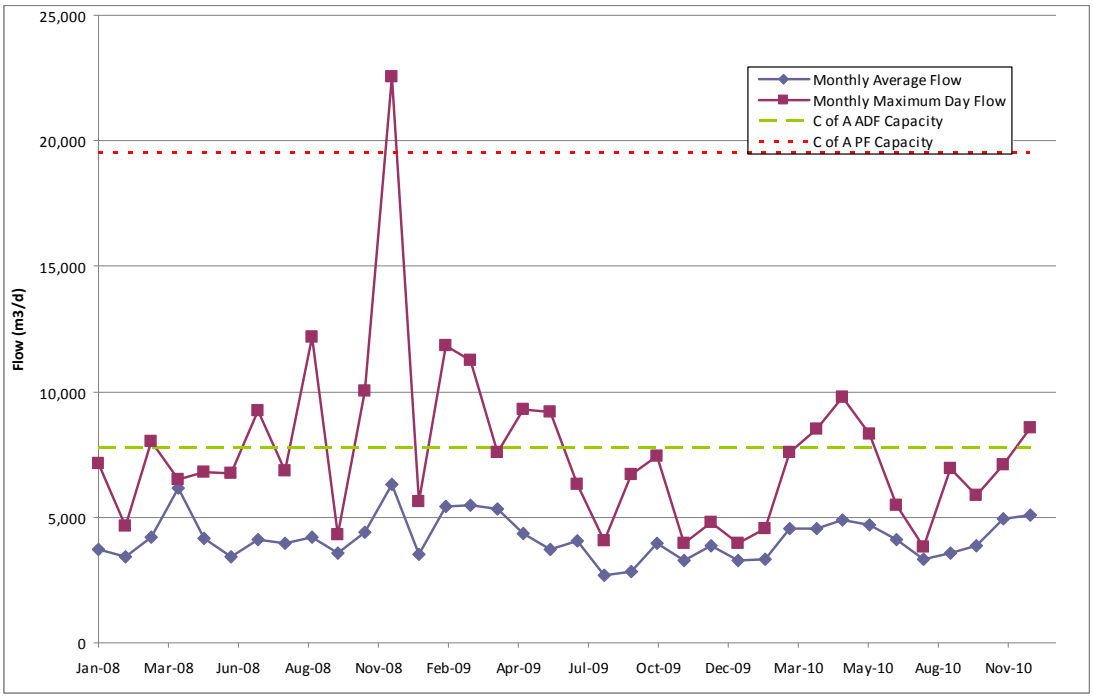


Figure 2.3 Elmira WWTP Effluent Flow (2008 - 2010)

A number of bypass events occurred in 2008, mainly in the spring and winter months due to sustained high flows caused by rain and snow melt. Historically the period of such events last a couple of days to weeks in a stretch. Table 2.5 summarizes the reported historical Elmira WWTP bypass events during the year 2008.

Table 2.5 Summary of Historical Plant Bypass Events (2008)

Start Date	End Date	Estimated Volume Discharged (m^3)
January 7, 2008	January 11, 2008	25,056
February 5, 2008	February 7, 2008	6,372
February 15, 2008	February 16, 2008	884
February 17, 2008	February 19, 2008	6,830
December 27, 2008	December 28, 2008	3,024

Notes:
1. Average day flow values based on monthly average flows.

All bypass events summarized in Table 2.5 were discharged from Equalization Tanks No. 3 and No. 4 at the SPS. Discharged effluent from Equalization Tanks No. 3 and No. 4 receives coarse screening from the raw sewage pumping station, settling in the equalization tank, and sodium hypochlorite disinfection prior to being discharged. There were an additional three tertiary filter bypass events that occurred in March 2008; in these events, the secondary effluent received UV disinfection prior to being

discharged. All appropriate authorities were notified and samples were submitted for laboratory analysis for each of the bypass events.

2.2.2 Raw Wastewater Quality

Historical raw wastewater characteristics are presented in Table 2.6.

The raw wastewater samples are taken at the influent pump station by a 24 hour composite sampler. The raw wastewater concentrations summarized in Table 2.6 includes wastewater from domestic and commercial sources as well as WWTP return streams and wastewater from four of the five major industrial contributors in Elmira (labelled as "Company A", "Company B", "Company C", and "Company E"). Wastewater from "Company D" is not captured in the recorded raw wastewater concentrations data. According to the Region, flows from "Company D" discharge directly ahead of the two primary clarifiers.

Table 2.6 Raw Wastewater Concentrations (2008 – 2010)

Year	Average Concentration (mg/L)			
	$cBOD_5$	TSS	TP	TKN
2008	378	571 (1)	7.4	77.0
2009	395	326	5.2	51.2
2010	471	385	7.2	57.0
AVERAGE	**415**	**427**	**6.6**	**61.7**
Typical Raw Sewage Concentrations (1)	*110 mg/L (low)* *190 mg/L (med)* *350 mg/L (high)*	*120 mg/L (low)* *210 mg/L (med)* *400 mg/L (high)*	*4 mg/L (low)* *7 mg/L (med)* *12 mg/L (high)*	*20 mg/L (low)* *40 mg/L (med)* *70 mg/L (high)*

Notes:
1. August 2008 TSS data is missing and is therefore not included in the annual average for 2008.
2. Metcalf & Eddy (2003) for low, medium, and high strength sewage.

The raw wastewater concentrations are representative of a high strength wastewater with respect to $cBOD_5$, TSS, and TKN, and medium strength with respect to TP (Metcalf & Eddy, 2003).

A summary of the 2008 to 2010 historical industrial loading contributions is presented in Table 2.7.

Table 2.7 Industrial Loading Contributions to Recorded Raw Wastewater Quality (2008 – 2010)

Industry	Avg. Flows (m^3/d)	Average Concentration (mg/L)				Average Loadings (kg/d)			
		$cBOD_5$	TSS	TP	TKN	$cBOD_5$	TSS	TP	TKN
"Company A" [2]	74	347	179	9.4	-	23	12	0.6	-
"Company B"[3]	5	1,617	401	18.3	65.1	9	2	0.1	0.3
"Company C"[2]	96	5,829	1,349	37.0	468.6	562	129	3.6	45.2
"Company E"[4]	75[1]	5,432	4,591	15.1	141.5	407	344	1.1	10.6
Total	**250**	**4,004**	**1,945**	**21.8**	**224.0**	**1,001**	**487**	**5.4**	**56.1**

Notes:
1. According to the Region.
2. Average concentrations based on 34 samples taken between 2008 and 2010.
3. Average concentrations based on 32 samples taken between 2008 and 2010.
4. Average concentrations based on 27 samples taken between 2008 and 2010.

Table 2.8 Summary of Historical Raw Sewage Concentrations and Loadings from Industrial Contributors (2008 – 2010)

Industry	Average Loadings (kg/d)			
	$cBOD_5$	TSS	TP	TKN
Recorded Raw Wastewater	1,703	1,752	27.1	253.2
Industrial[3] Contribution	1,001	487	5.4	56.1
Estimated Domestic[4] Contribution	702	1,265	21.7	197.1
Estimated Per Capita Domestic Loadings [1]	70	126	2.2	19.7
Typical Per Capita Loadings [2]	*75*	*90*	*3.3*	*13.3*

Notes:
1. Based on a current population of 10,011. Per Capita Domestic Loadings are based the Estimated Domestic Contribution calculated based from the Total Loadings minus the Industrial Contribution.
2. Metcalf & Eddy (2003).
3. Total industrial contributions from four of the five major industrial contributors in Elmira, including "Company A", "Company B", "Company C", and "Company E".
4. Domestic contributions include domestic, commercial, institutional, and other industries contributing to wastewater flows to Elmira WWTP excluding flows from the five major industrial contributors.

Based on Table 2.8, the $cBOD_5$ and TP loadings were slightly below typical per capita loadings, TSS and TKN were above typical values. The high TSS and TKN loadings are likely due to the internal recycle streams and the industrial contribution. The four internal recycle streams include fermenter overflow, blend tank supernatant, filter backwash, and sludge in dewatering filtrate. Due to historic sludge dewatering capacity limitations, overflows from the blend tank have likely contributed to the historically high per capita domestic TSS and TKN loadings; however, the capacity limitations of the existing plate and frame dewatering press are currently being addressed by the Region through the provision of a contracted belt press, pending a

new centrifuge dewatering system. The filter backwash water remains a likely contributor to the high calculated per capita domestic TSS loadings.

Historical "Company D" wastewater concentrations and loadings are shown in Table 2.9.

Table 2.9 "Company D" Wastewater Characteristics (2008 – 2010)

Year	Average Concentration (mg/L) [1]				Average Loadings (kg/d)			
	$cBOD_5$	TSS	TP	TKN	$cBOD_5$	TSS	TP	TKN
2008	503	97	0.8	34.5	42	8	0.1	2.9
2009	735	35	0.7	17.3	62	3	0.1	1.5
2010	615	37	0.9	11.6	52	3	0.1	1.0
AVERAGE	**617**	**56**	**0.8**	**21.1**	**52**	**5**	**0.1**	**1.8**

Notes:
1. Average $cBOD_5$ concentrations based on 59 samples taken between 2008 and 2010. Average TSS, TP, and TKN concentrations based on 27 samples taken between 2008 and 2010.

Table 2.10 presents the overall combined wastewater flows and loadings to the Elmira WWTP.

Table 2.10 Historic Overall Flows and Loadings to the Elmira WWTP

Industry	Average Flows (m^3/d)	$cBOD_5$	TSS	TP	TKN
Domestic[1] Contribution	3,854	702 kg/d	1,265 kg/d	21,7 kg/d	197 kg/d
Industrial[2] Contribution	250	1,001 kg/d	487 kg/d	5.4 kg/d	56.1 kg/d
"Company D" Contribution	84	52 kg/d	5 kg/d	0.1 kg/d	1.8 kg/d
Total to Elmira WWTP	4,188	1,755 kg/d	1,757 kg/d	27.2 kg/d	255 kg/d
Equivalent Concentration	-	419 mg/L	420 mg/L	6.5 mg/L	60.9 mg/L

Notes:
1. Domestic contributions include domestic commercial, institutional, and other industries contributing to wastewater flows to Elmira WWTP excluding flows from the five major industrial contributors in Elmira.
2. Total industrial contributions from four of the five major industrial contributors in Elmira, including "Company A", "Company B", "Company C", and "Company E".

2.2.3 Effluent Wastewater Quality

The historical effluent quality with respect to the key parameters, including $cBOD_5$, TSS, TP, and TAN is summarized in Table 2.11.

Table 2.11 Historical Effluent Quality (2008 -2010)

Year	Average Concentration (mg/L)				
	$cBOD_5$	**TSS**	**TP**	**TAN (May-Oct)**	**TAN (Nov-Apr)**
2008	3.4 (9.0)	6.6 (27.9)	0.18 (0.48)	4.01 (12.67)	2.44 (8.83)
2009	2.3 (3.9)	2.8 (4.5)	0.08 (0.11)	0.11 (0.17)	5.66 (11.50)
2010	2.3 (3.1)	2.8 (3.7)	0.14 (0.31)	0.11 (0.16)	0.63 (1.96)
C of A Objective	*5*	*5*	*0.2*	*0.4*	*1.0*
C of A Non-Compliance Limit (1)	*10*	*10*	*0.5*	*0.7*	*2.0*

Notes:
1. Values in parenthesis represent maximum monthly average concentrations.
2. Based on monthly average concentrations.

Based on the historical plant effluent, the Elmira WWTP has been able to achieve its effluent compliance limits for the majority of the historic review period. There have been a few occasions when the effluent monthly average exceeds the C of A Non-Compliance limits for TSS and TAN concentration parameters.

- The TSS monthly average concentration exceeded the C of A non-compliance limit in March and April of 2008 with monthly average concentrations of 13.0 mg/L and 27.9 mg/L, respectively. Both TSS exceedances events occurred during the tertiary bypass events which lasted from March 15, 2008 to April 11, 2008.
- The TAN monthly average concentration exceeded the C of A non-compliance limit in March, April, May and June of 2008 and February, March and April of 2009.

A graph summarizing the historical effluent TAN concentrations is presented in Figure 2.4. Only partial nitrification was achieved over the winter and spring months of 2008 and 2009; however, nitrification was achieved year-round in 2010.

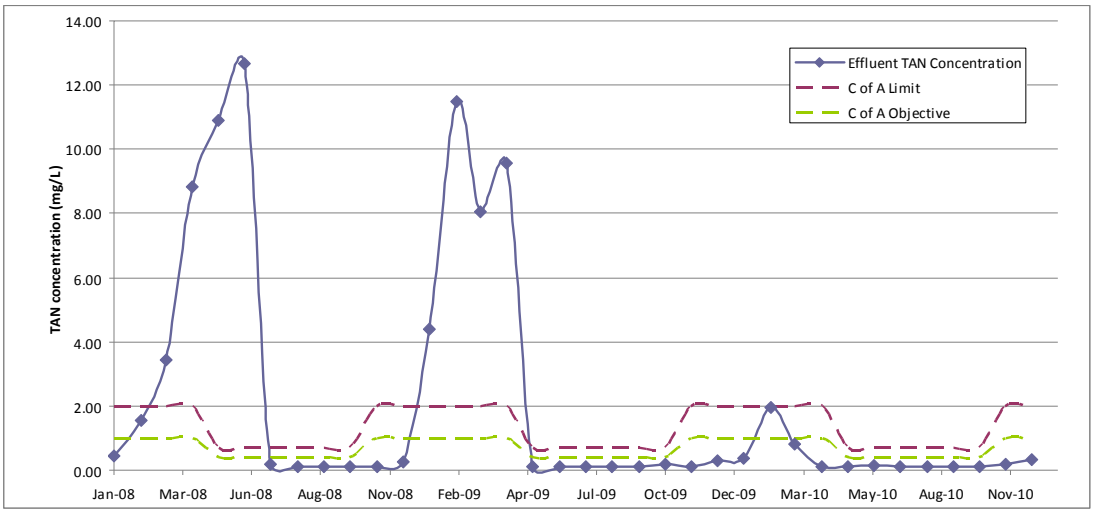


Figure 2.4 Effluent TAN Concentrations

The historical effluent wastewater loading, with respect to $cBOD_5$, TSS, and TP is summarized in Table 2.12 for the plant effluent.

Table 2.12 Historic Effluent Wastewater Loadings (2008 -2010)

Year	Average Loadings (kg/d)		
	$cBOD_5$	**TSS**	**TP**
2008	15.0 (49.6)	32.1 (172.0)	0.79 (2.96)
2009	9.2 (13.6)	11.6 (21.9)	0.33 (0.55)
2010	9.8 (13.0)	11.6 (15.6)	0.59 (1.03)
C of A Non-Compliance Limit (1)	*78.0*	*78.0*	*3.9*

Notes:
1. Values in parenthesis represent maximum monthly average load values.
2. Based on annual average loading.

All annual average loadings over the review period are within the C of A non-compliance limits for each of the parameters.

3. EXISTING ST. JACOBS WWTP

The St. Jacobs WWTP is a Class III, Extended Aeration process with tertiary treatment. The St. Jacobs WWTP was originally constructed in 1971, and expanded in 2000.

The St. Jacobs WWTP is operated under MOE C of A No. 3-0690-99-006 issued October 21, 1999. The St. Jacobs WWTP has an average day C of A rated capacity of 1,450 m^3/d.

Table 3.1 summarize the major unit process design parameters for the plant. Figure 3.1 presents an aerial view of the WWTP and Figure 3.2 presents a PFD of the WWTP.

Raw wastewater enters the WWTP from a SPS. The SPS consists of three submersible sewage pumps rated at 42 L/s each. Raw wastewater passes through the grinder/auger screen and vortex grit removal tank. Screened and degritted wastewater is combined with RAS and flows to an oxidation ditch. The oxidation ditch is aerated by two rotors.

The mixed liquor from the oxidation ditch is distributed to two secondary clarifiers. The secondary effluent flows to three continuous backwash sand filters and is disinfected by UV prior to discharge to Conestogo River. The UV system consists of one bank of UV lamps installed in one disinfection channel. Provisions exist for chlorination in the event of plant by-pass.

There is dual point alum addition for phosphorus removal. Alum is added to the clarifier distribution chamber prior to secondary clarification and to the secondary clarifier effluent prior to tertiary treatment and disinfection.

WAS is stored in a 123 m^3 aerated biosolids holding tank prior to being hauled away by truck for stabilization prior to land application. A further 40 m^3 aerated biosolids holding tank located at the control building is currently not being used.

Table 3.1 St. Jacobs WWTP Unit Process Table

Unit Process	Design Parameter (1)
Raw Sewage Pumping	
Quantity	3
Capacity (Each)	42 L/s @ 11 m TDH (3,629 m^3/d)
Firm Capacity	5,184 m^3/d
Screening	
Type	Grinder/Auger
Number	1
Capacity	5,676 m^3/d
Grit Removal	
Type	Vortex
Number	1
Capacity	5,184 m^3/d
Bioreactor	
Type	Oxidation Ditch
Number	1
Volume	907 m^3
Rotors	
Number	2
Total Maximum Oxygen Transfer Rate	1286 kg O_2/day
Secondary Clarification	
Type	Circular
Number	2
Dimensions	11.5 m diameter
Surface Area (each)	104 m^2
Surface Area (total)	208 m^2
RAS/WAS Pumping	
Number	2
Capacity (each)	41 L/s @ 7.5 m TDH
Tertiary Filters	
Number	3
Surface Area (total)	13.9 m^2

Table 3.1 St. Jacobs WWTP Unit Process Table

Unit Process	Design Parameter (1)
Disinfection	
Type	UV Disinfection
Channels	1
Capacity	3,625 m^3/d
Alum Addition for Phosphorus Removal	
Alum Feed	
Number	1
Capacity	8.4 L/s
Plant Bypass Disinfection	
Sodium Hypochlorite Feed	
Number	4
Capacity	2 pumps @ 1.0 L/h
	2 pumps @ 32 L/h
Aerated Biosolids Holding Tank	
Number	2
Tank No. 1 Volume	123 m^3
Tank No. 2 Volume	40 m^3 (2)

Notes:
1. Certificate of Approval Number 3-0690-99-006.
2. (Acres & Associated, 1999)

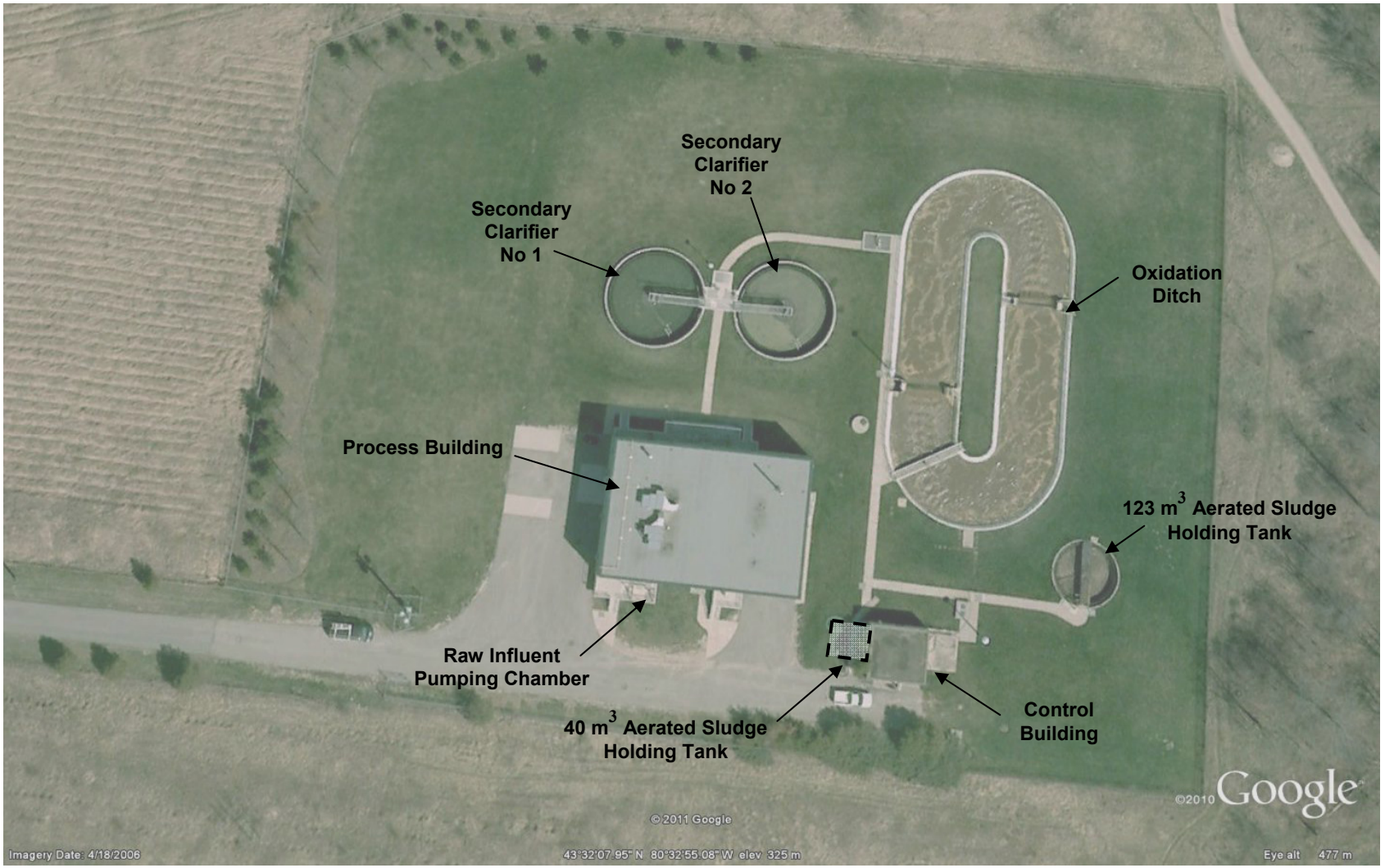


Figure 3.1 St. Jacobs WWTP - Overhead View

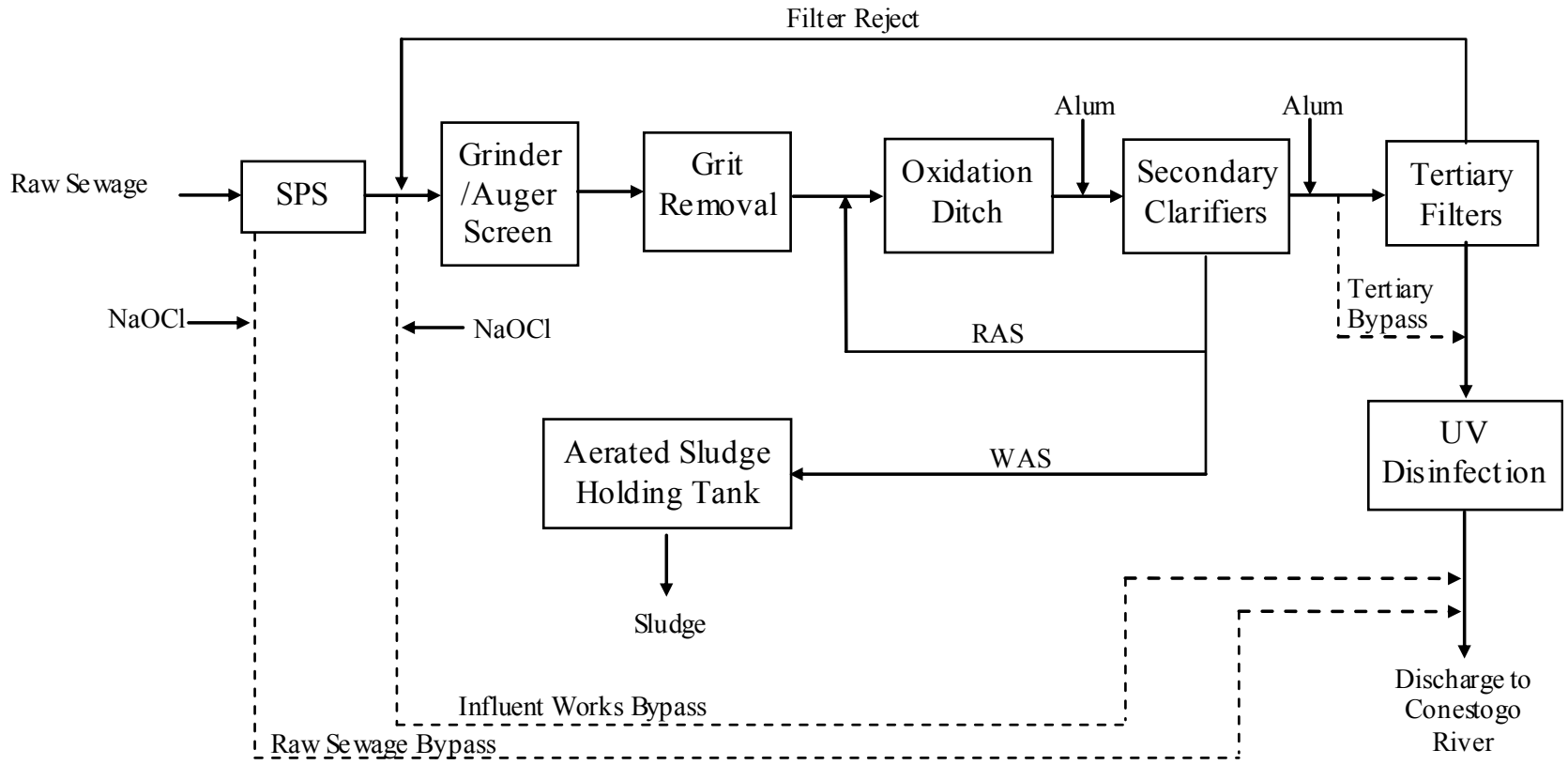


Figure 3.2 St. Jacobs WWTP - Liquid Stream Flow Schematic

3.1 Treatment Objectives and Compliance Requirements

The C of A specifies concentration objectives and non-compliance limits for $cBOD_5$, TSS, TP, TAN and *E. coli* concentrations. The C of A effluent requirements for the St. Jacobs WWTP are summarized in Table 3.2.

Table 3.2 C of A Objectives and Non-compliance Limits (C of A No 3-0690-99-006)

Parameter	Effluent Objectives		Non-Compliance Limits	
	Concentration (1)	Total Loading	Concentration (1)	Total Loading
$cBOD_5$	5.0 mg/L	7.3 kg/d (2)	10.0 mg/L	14.5 kg/d (2)
TSS	5.0 mg/L	7.3 kg/d (2)	10.0 mg/L	14.5 kg/d (2)
TP	0.2 mg/L	0.3 kg/d (2)	0.3 mg/L	0.44 kg/d (2)
TAN (May-Oct)	0.7 mg/L	1.0 kg/d (3)	1.0 mg/L	1.5 kg/d (3)
TAN (Nov-Apr)	1.0 mg/L	1.5 kg/d (3)	2.0 mg/L	2.9 kg/d (3)
E .coli (4)	100 counts/100mL	-	200 counts/100 mL	-

Notes:
1. Based on monthly average concentration values.
2. Based on the annual average loading during any calendar year.
3. Based on the monthly concentration of the parameter multiplied by the average daily flow over the corresponding monthly period the sample was taken, exceeds its corresponding loading.
4. Based on monthly geometric mean.

3.2 Raw Wastewater Flows and Characteristics

3.2.1 Historical Flow

Raw sewage flows pumped from the raw sewage pumping station to the St. Jacobs WWTP is measured by an electromagnetic flowmeter.

A summary of the ADF and PDF over the period January 2008 to December 2010 is presented in Table 3.3.

Table 3.3 Summary of Historical Plant Flow (2008 – 2010)

Year	Average Day Flow (m^3/d)	Peak Day Flow	
		(m^3/d)	Factor
2008	1,253	3,652	2.9
2009	978	3,487	3.6
2010	799	1,873	2.3
Average	1,010	-	-
Maximum	-	3,652	-
C of A Rated Capacity	*1,450*	-	-

Notes:
1. Average day flow values based on monthly average flows.

Based on Table 3.3, the St. Jacobs WWTP is currently operating at 70 percent of the C of A rated average day capacity. Peak hourly flow data was not available at the time of study. Peak flows through the plant are controlled by the on-site pumping station. The firm capacity of the three submersible raw sewage pumps is 5,184 m^3/d; therefore, it is estimated that the historic PIF through the St. Jacobs WWTP was 5,184 m^3/d. This peak hourly flow is equivalent to a design peak hour factor of 3.58.

Based on the current service population of 1,836, the historic per capita flow was approximately 550 L/capita·d. Typical per capita flows in the Region range between 250 L/capita.d to 300 L/capita.d for the small Regional systems, which are considerably lower than the historic numbers for Elmira and St. Jacobs. Moreover, a review of the flows in the snow melt season clearly indicates that these are sustained events lasting weeks. Such sustained but diluted flows can adversely affect the performance of the treatment processes. The expected peak instantaneous flow factor, based on the current service population of 1,783 and the associated Harmon Peaking factor, was estimated to be 3.6. Historically, the peak day flow factor has been recorded as high as 3.6; it is therefore likely that the actual peak instantaneous flow factor has exceeded 3.6. These results are consistent with elevated levels of I/I in the collection system.

Figure 3.3 presents the flows to the St. Jacobs WWTP for the study period from January 2008 to December 2010.

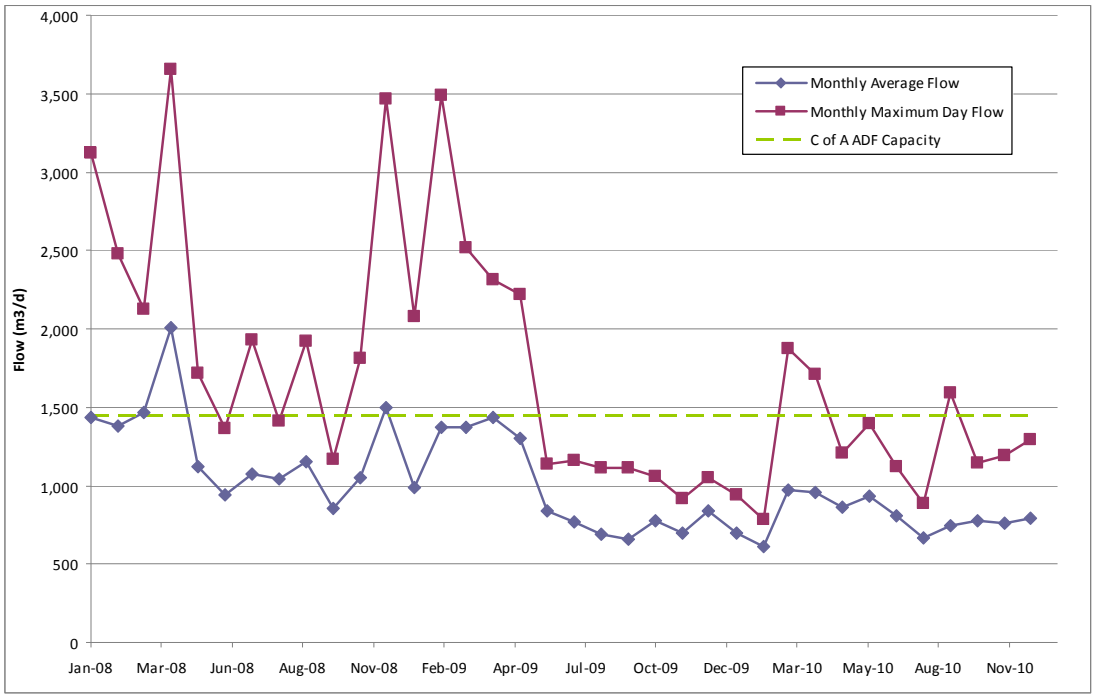


Figure 3.3 St. Jacobs WWTP Flow (2008 - 2010)

Three bypass events occurred at the St. Jacobs WWTP in 2008. From January 8 to January 9, approximately 2,500 m^3 of raw sewage was bypassed. From April 1 to April 3, approximately 2,000 m^3 of raw sewage was bypassed. On December 28, approximately 1,200 m^3 of raw sewage was bypassed. In all three events, the raw sewage was disinfected with sodium hypochlorite prior to being blended with final effluent and discharged. All appropriate authorities were notified and samples were submitted to the lab for each of these events.

3.2.2 Raw Wastewater Quality

The raw wastewater entering the St. Jacobs WWTP includes wastewater primarily from domestic and commercial sources. There are no large industrial contributors located in St. Jacobs.

Historical raw wastewater characteristics are shown in Table 3.4.

Table 3.4 Raw Wastewater Characteristics (2008 – 2010)

Year	Average Concentration (mg/L)			
	$cBOD_5$	TSS	TP	TKN
2008	122	185	4.8	35.6
2009	156	204	4.7	33.6
2010	102	126	4.1	29.6
AVERAGE	**127**	**172**	**4.5**	**32.9**
Typical Raw Sewage Concentrations (1)	*110 mg/L (low)* *190 mg/L (med)* *350 mg/L (high)*	*120 mg/L (low)* *210 mg/L (med)* *400 mg/L (high)*	*4 mg/L (low)* *7 mg/L (med)* *12 mg/L (high)*	*20 mg/L (low)* *40 mg/L (med)* *70 mg/L (high)*

Notes:
1. Metcalf & Eddy (2003) for low, medium and high strength sewage.

Based on the results presented in Table 3.4, the raw wastewater concentrations are representative of a low to medium strength wastewater with respect to $cBOD_5$ and TP, and medium strength with respect to TSS and TKN (Metcalf & Eddy, 2003).

3.2.3 Effluent Wastewater Quality

The historical effluent quality with respect to the key parameters, including $cBOD_5$, TSS, TP, and TAN is summarized in Table 3.5.

Table 3.5 Historical Effluent Quality (2008 - 2010)

Year	Average Concentration (mg/L)				
	$cBOD_5$	TSS	TP	TAN (May-Oct)	TAN (Nov-Apr)
2008	2.0 (2.1)	3.2 (5.3)	0.18 (0.80)	0.30 (0.68)	0.35 (1.25)
2009	2.1 (2.9)	4.4 (10.6)	0.13 (0.24)	0.21 (0.52)	0.32 (0.72)
2010	2.0 (2.3)	3.3 (8.0)	0.13 (0.24)	0.13 (0.26)	0.28 (0.67)
C of A Objective	*5*	*5*	*0.2*	*0.7*	*1.0*
C of A Non-Compliance Limit (1)	*10*	*10*	*0.3*	*1.0*	*2.0*

Notes:
1. Values in parenthesis represent maximum monthly average concentrations.
2. Based on monthly average concentrations.

Based on the historical plant effluent, the St. Jacobs WWTP has been able to achieve its effluent compliance limits for the majority of the historic review period. There have been a few occasions when the effluent monthly average exceeds the C of A Non-Compliance limits for TSS and TP concentration parameters.

- The TSS monthly average concentration exceeded the C of A non-compliance limit in February 2009.
- The TP monthly average concentration exceeded the C of A non-compliance limit in August 2008.

The historical effluent wastewater loading, with respect to $cBOD_5$, TSS, and TP is summarized in Table 3.6 for the plant effluent.

Table 3.6 Historic Effluent Wastewater Loadings (2008 - 2010)

Year	Average Loadings (kg/d)		
	$cBOD_5$	TSS	TP
2008	2.5 (4.0)	4.2 (7.9)	0.22 (0.83)
2009	2.0 (2.9)	5.1 (14.5)	0.13 (0.25)
2010	1.6 (2.0)	2.6 (4.9)	0.11 (0.22)
C of A Objective	*7.3*	*7.3*	*0.3*
C of A Non-Compliance Limit (1)	*14.5*	*14.5*	*0.44*

Notes:
1. Values in parenthesis represent maximum monthly average load values.
2. Based on annual average loading.

All annual average loadings are within the C of A objectives and non-compliance limits for each of the parameters.

4. REVIEW OF ELMIRA WWTP HISTORIC UNIT PROCESS OPERATION

4.1 Methodology

This section reviews historic operating conditions and performance of all major unit processes. The historic performance of the unit processes were assessed based on MOE Design Guidelines (MOE, 2008) and other typical design criteria.

4.2 Influent Equalization

The Elmira WWTP is serviced by six equalization tanks with a total capacity of 6,290 m^3. Equalization Tanks No. 1 and No. 2 are located on-site, at the Elmira WWTP and have a capacity of 1,090 m^3. Equalization Tanks No. 3 and No. 4 are located adjacent to the Raw Influent Sewage Pumping Station and have a capacity of 2,600 m^3. Two equalization tanks were recently commissioned. Equalization Tanks No. 5 and No. 6 have a capacity of 2,600 m^3 and are located beside Equalization Tanks No. 3 and No. 4.

Historically, there has been a number of bypass events at the Elmira WWTP. These bypass events have generally been the result of prolonged/sustained snow-melt events. During all such events, plant hydraulics have been limited by the secondary clarifier capacity. The secondary clarifier capacity limitations, discussed in further detail in Section 4.1.6, have resulted in the need to direct flow to Equalization Tanks No. 3 and No. 4 if flows exceed about 5,616 m^3/d (Stantec, 2008). This flow is far lower than the original design peak flow and the C of A peak flow capacity of 19,500 m^3/d.

Work continues to be undertaken in Elmira to reduce I/I which will result in lower peaking factors in the future. Based on TM 5 (XCG, 2011), current ongoing I/I reduction programs include flow monitoring and CCTV inspections to identify issues, fixing I/I problems as they are identified, extensive work to replace existing infrastructure at the Birdland area, and a sump pump installation program. It was also noted in TM5 that new equalization storage tanks were being constructed as part of the current upgrade project to attenuate peak flows into the plant (XCG, 2011). These tanks were commissioned in summer 2011. Improvements to the influent pump station which includes replacement and automation of the bypass valves and replacement of the bypass weir to improve control of bypass flows and restore functionality to Equalization Tanks No. 1 and No. 2 are being completed as part of the next phase of upgrades at the Elmira WWTP. Upgrades to the secondary clarifier are also included in this contract, which is expected to be tendered in Fall 2011.

As historical hourly raw sewage flow data (upstream of equalization tanks) were not available at time of study, the magnitude and duration of historical wet weather flow events cannot be determined.

4.3 Preliminary Treatment

Preliminary treatment at the Elmira WWTP consists of two parallel channels, each containing a mechanically cleaned bar screen and a vortex grit removal tank. The screenings from the bar screen is compacted with a screening press prior to disposal. Grit from the vortex grit removal tank is washed in a vortex grit classifier prior to disposal. According to the C of A, each grit removal unit has a capacity of 19,500 m^3/d.

4.4 Primary Clarifiers

The Elmira WWTP has two circular primary clarifiers, each with a diameter of 12.19 m with a side wall depth (SWD) of 2.43 m, each providing a surface area of 117 m^2 for a total surface area of 234 m^2. WAS co-thickening in the primary clarifiers is not practiced at the Elmira WWTP. Two raw sludge pumps, each with a capacity of 12.5 L/s, transfer raw sludge to the fermenter tank for VFA production. One scum pump with the capacity of 7.6 L/s transfers scum to the sludge blend tank for blending and storage.

Table 4.1 presents the historic operating conditions for the primary clarifiers.

Table 4.1 Historic Operating Conditions – Primary Clarifiers (2008 – 2010)

Parameter	Historic Value			Typical Design Guidelines
	2008	2009	2010	
Number of Clarifiers	2			n/a
Total Clarifier Surface Area (m^2)	234			n/a
Historical PDF (m^3/d)	22,545	11,835	9,789	n/a
Peak Day SOR ($m^3/m^2 \cdot d$)	96	51	42	< 80 m^3/m^2/d (1)

Notes:
n/a – not applicable
SOR – surface overflow rate
1. MOE Design Guidelines (2008) for primary clarifiers not receiving waste activated sludge.

In 2008, the primary clarifiers were operated at a Peak Day SOR approximately 20 percent greater than the typical peak day design value of 80 $m^3/m^2 \cdot d$. In 2009 and 2010, the lower PDF resulted in reduced Peak Day SOR below the typical design value.

4.5 Bioreactors

The Elmira WWTP has two bioreactors, each is divided with baffle walls into five cells: anoxic, anaerobic, swing zone, aerobic, and aerobic. Each bioreactor has a volume of 1,337 m^3, for a total volume of 2,674 m^3. Mixing in the anoxic, anaerobic, and swing zone is provided by submersible mixers. Aeration in the aerobic and swing zone is provided by three centrifugal blowers and fine bubble diffusers, each with an aeration capacity of 1,636 m^3/hr. The swing zone is operated as an anoxic zone during the summer and an aerobic zone during the remaining part of the year.

Table 4.2 presents the historic operating conditions for the bioreactors.

During summer operation of the bioreactors, with the exception of the anoxic zone SRT, aerobic SRT, and overall SRT, all parameters were within the typical design parameters. The anoxic SRT, aerobic SRT, and overall SRT have been below the typical design parameters during the summer due to the higher than typical influent BOD_5 loading.

During the fall, winter, and spring operation of the bioreactors, with the exception of the anoxic zone hydraulic retention time (HRT), anoxic zone SRT, and overall SRT, all parameters were within the typical design parameters. The anoxic zone HRT is only slightly below the typical design HRT and is a result of the reduced anoxic zone volume from operation of the swing zones as aerobic zones during non-summer months. The low anoxic zone SRT, aerobic zone SRT, and overall SRT is due to the higher than typical influent BOD_5 loading.

The low historical aerobic SRT and overall SRT is a result of the high influent BOD_5 loading historically observed. The low aerobic SRT and overall SRT may result in limited nitrification capacity. Based on review of historical effluent quality data, nitrification has been achieved in most years except in winter of 2008 and spring of 2009, when only partial nitrification was achieved due to prolonged snow melts and loss of nitrifiers in the bioreactors.

As part of the next phase of upgrades at the WWTP, a new influent flow distribution chamber will be constructed to improve distribution of flows to the two bioreactors. A new dissolved oxygen (DO) control system will also be included in the contract to improve energy efficiency. The next phase of upgrades is expected to be tendered in fall 2011.

Table 4.2 Historic Operating Conditions - Bioreactors (2008 – 2010)

Parameter	Historic Average Value		Typical Design Parameters
	Summer Operation	Non-Summer Operation	
Number of Bioreactors	2		n/a
Anoxic Volume (m^3)	598	320	n/a
Anaerobic Volume (m^3)	320		n/a
Aerobic Volume (m^3)	1,756	2,034	n/a
Total Volume (m^3)	2,674		n/a
ADF (m^3/d)	4,188		n/a
BOD_5 Influent (mg/L)	327 (3)		n/a
$cBOD_5$ Effluent (mg/L)	2.7		n/a
MLSS (mg/L)	3,827		1,500 to 4,000 (1) 2,000 to 5,000 (2)
MLVSS (mg/L)	2,625		n/a
MLVSS:MLSS	0.69		n/a
Overall F/M_v (d^{-1})	0.2		0.1 - 0.25 (2)
Anoxic Zone HRT (hrs)	3.4	1.8	2 - 8 (1) 0.5 to 10 (2)
Anaerobic HRT (hrs)	1.8	1.8	0.5 - 0.75 (1) 0.5 to 2.0 (2)
Aerobic HRT (hrs)	10.1	11.7	6 - 12 (1) 4 to 12 (2)
Overall HRT (hrs)	15.3		5 to 24 (2)
Anoxic Zone SRT (days) (4)	1.9	1.0	2 - 8 (1)
Anerobic Zone SRT (days) (4)	1.0	1.0	0.3 - 0.5 (1)
Aerobic SRT (days) (4)	5.7	6.6	6 - 12 (1)
Overall SRT (days) (4)	8.6		10 to 40 (2)

Notes:
n/a - not available
F/M_v – food to micro-organisms ratio
HRT – hydraulic retention time
MLSS / MLVSS – mixed liquor suspended solids / mixed liquor volatile suspended solids
OLR – organic loading rate
SRT – solids retention time
1. WEF (2010).
2. MOE (2008) for Combined Biological Nitrogen and Phosphorus Removal Plant
3. Estimated based on historic influent $cBOD_5$(including "Company D" flows), an assumed BOD_5 removal of 35 % in the primary clarifiers, and BOD_5:$cBOD_5$ of 1.2.
4. Estimated based on a typical yield of 0.6 kg VSS/kg BOD_5.

4.6 Secondary Clarifiers

The Elmira WWTP has three secondary clarifiers: Secondary Clarifier No. 1 (SC1), Secondary Clarifier No. 3 (SC3), and Secondary Clarifier No. 4 (SC4). SC1 has a 27.4 m diameter, providing a surface area of 590 m^2. RAS pumping from SC1 is provided by three RAS pumps, each rated at 30.1 L/s. WAS pumping from SC1 is provided by two WAS pumps, each rated at 7.6 L/s. SC 3 and SC 4 each have a 13.7 m diameter and each provide a surface area of 147 m^2. Sludge from SC 3 and SC4 are combined in a RAS/WAS chamber. RAS pumping from SC 3 and SC4 is provided by four pumps, two rated at 75 L/s and two at 11 L/s. WAS pumping from SC3 and SC4 is provided by two pumps rated at 7.6 L/s. Ferric chloride addition for phosphorus removal is provided upstream of the secondary clarifiers.

Based on the Stantec Field Investigations Report (Stantec, 2008), when SC3 and SC4 are operated with the 11 L/s pump, sludge accumulates within the clarifiers resulting in high sludge blanket levels. When SC3 and SC4 is operated with the 75 L/s pump at the lowest VFD speed, the high drawdown rates results in water levels below the effluent weir level. In addition, the uneven lengths of sludge underflow pipes on SC3 and SC4 have resulted in uneven sludge withdrawal from the clarifiers (Stantec, 2008).

The CH2M HILL Review of Elmira WWTP Design and Operation Report (CH2M HILL, 2008) further identifies that 30.1 L/s pumps associated with the SC1 RAS pumping may have insufficient capacity to meet design peak flows.

Due to the lack of RAS pumping capacity, during high flow events the sludge blanket may rise, resulting in some solids washout from the secondary effluent and spikes in the effluent TSS concentration. The Region has retained Cole Engineering for a final design of the RAS pumping system, to address the above issues. Tender package is slated to be issued in fall 2011, with final construction/installation completed by fall 2012.

Table 4.3 presents the historic operating conditions of the secondary clarifiers. Due to operating issues with SC3 and SC4, the normal operation is to have SC1 online and SC3 and SC4 in standby. (CH2M Hill, 2008). During the time of the site visit, only SC1 was in operation. Therefore, the historic operating conditions for the secondary clarifier operating parameters have been calculated based on only SC1 in operation.

Table 4.3 Historic Operating Conditions - Secondary Clarifiers (2008 - 2010)

Parameter	Historic Average Value			Typical Design Guidelines
	2008	2009	2010	
Total Number of Secondary Clarifiers	3			n/a
Number of Secondary Clarifiers in Operation	1			n/a
Surface Area of Clarifiers in Operation (m^2)	590			n/a
PHF (m^3/d)	n/a	n/a	n/a	n/a
PDF (m^3/d)	22,545	11,835	9,789	n/a
RAS Flow (m^3/d) (2)	5,307	1,890	2,224	n/a
MLSS (mg/L) (2)	4,934	3,454	3,093	n/a
Peak Hourly SOR ($m^3/m^2 \cdot d$)	n/a	n/a	n/a	< 37 $m^3/m^2/d$ (1)
Peak Daily SOR ($m^3/m^2 \cdot d$)	38	20	17	n/a
Peak Daily SLR ($kg/m^2 \cdot d$)	233	80	63	< 170 $kg/m^2/d$ (1)

Notes:

n/a - not available or not applicable

1. MOE Design Guidelines (2008) for conventional activated sludge with chemical addition for phosphorus removal.
2. Based on the annual average of the daily MLSS/RAS data for each corresponding year.

In 2008, the secondary clarifiers were operated at a Peak Day solids loading rate (SLR) of approximately 37 percent greater than the typical peak day design value of 170 $kg/m^2 \cdot d$. In 2009 and 2010, the lower PDF resulted in reduced Peak Day SLR below the typical design value. Historical PHF data were not available; therefore, the Peak Hourly SOR could not be evaluated. The computation of the Peak Day SOR showed that the 2008 SOR was above the typical design Peak Hour SOR value; however, this was only a one time occurrence in 2008. The next highest flow event that occurred in 2008 was at a flow of 14,494 m^3/d, this corresponds to a SOR of 25 $m^3/m^2 \cdot d$ which is within the typical design Peak Hour SOR value. Although only one secondary clarifier was in operation, in recent years the SOR and SLR were within the design guideline values.

Elmira WWTP is a BNR plant, which can be sensitive to flow and load fluctuations. The high diurnal variation requires that this be balanced through the use of the equalization tanks. Plant staff have been diligent to ensure that the equalization tanks are empty before the onset of a wet weather event and make sure that tanks are empty every morning.

4.7 Fermenter

The Elmira WWTP has one fermenter tank receiving raw sludge from the primary clarifier. The purpose of the fermenter is to produce VFAs that are returned to the anaerobic cell of the bioreactors to facilitate the biological phosphorus removal process. The fermenter has a volume of approximately 377 m^3. Based on a report

completed by Stantec (Stantec, 2009), the fermenter is currently operated as a flow through tank with some sludge wasted to dewatering, while the majority of the sludge is re-introduced back into the bioreactor via the supernatant. This practice increases the TSS loading to the bioreactor.

The Region has addressed the current plate press capacity limitations through the provision of an contracted belt press. This has ensured that the fermenter is operated according to its design philosophy and limited re-introduction of sludge to the plant takes place. The fermenter will also be upgraded in the next contract at the Elmira WWTP with the introduction of a new solids interface and level measurement and associated instrumentation upgrades.

4.8 Tertiary Treatment

Tertiary treatment at the Elmira WWTP is currently provided by two shallow bed travelling bridge sand filters. Each filter has a surface area of 68.4 m^2. The combined surface area of both filters is 136.8 m^2.

Table 4.4 presents the historic operating conditions for the tertiary filters.

Table 4.4 Historic Operating Conditions - Tertiary Treatment (2008 - 2010)

Parameter	Historic Average Value			Typical Design Guidelines
	2008	2009	2010	
Total Number of Filters	2			n/a
Total Surface Area of Filters (m^2)	136.8			n/a
PHF (m^3/d)	n/a	n/a	n/a	n/a
PDF (m^3/d)	22,545	11,835	9,789	n/a
Peak Hourly Filtration Rate (L/m^2·s)	n/a	n/a	n/a	< 2.1 L/m^2·s (1)
Peak Daily Filtration Rate (L/m^2·s)	1.9	1.0	0.8	n/a
Peak Daily SLR (mg/m^2·s) (2)	29	15	12	< 51 mg/m^2·s (1)

Notes:

n/a - not available or not applicable

1. MOE Design Guidelines (2008) for shallow bed filters.
2. Based on an assumed secondary effluent TSS concentration of 15 mg/L.

Historical PHF data were not available; therefore, the Peak Hourly filtration rates could not be evaluated. The computation of the Peak Day filtration rates showed that although all values were within typical design guidelines, the 2008 peak day filtration rate approached close to the typical design peak hour filtration rate; however, this was only a one time occurrence. The next highest flow event that occurred in 2008 was at a flow of 14,494 m^3/d, which corresponds to a filtration rate of 1.2 L/m^2·s, well within the typical design value.

The filters send about 40 L/s of backwash flow to the head of the plant, which is a significant proportion of the influent wet weather flow. The filter backwash likely

contains high concentrations of TSS and TP, which contributes to the high TSS concentrations observed in the influent wastewater.

With the exception of the TSS exceedances recorded in March and April of 2008 when the tertiary filters were bypassed, the historic effluent TP and TSS concentrations have remained below the C of A non-compliance limits. Therefore, the existing tertiary filters are providing an adequate level of treatment.

4.9 Disinfection

Disinfection at the Elmira WWTP is provided by a Trojan Model 3000A UV system (Cole Engineering, 2010). The disinfection system consists of two UV disinfection channels, each channel equipped with two banks of low pressure UV lamps. Each bank is rated at 4,875 m^3/d for a total capacity of 19,500 m^3/d. Historically, over the review period from 2008 to 2010, there have been no non-compliance events with respect to *E.coli*; therefore, the existing UV disinfection system is providing an adequate level of treatment.

4.10 Sludge Dewatering

Sludge handling at the Elmira WWTP is provided by a blend tank, day tank, and a plate and frame filter press. Sludge cake is landfilled for final disposal. The blend tank receives primary scum from the primary clarifiers, secondary scum from the secondary clarifiers, fermenter scum, and WAS. The blend tank has a volume of 377 m^3. The contents are blended and allowed to settle. The supernatant from the blend tank is returned to the influent pumping station while the sludge is transferred to the day tank and mixed with lime. Supernating is currently not practiced, except for emergency overflow situations (Cole Engineering, 2010).

The day tank receives sludge from the fermenter tank and blend tank. The day tank provides mixing and storage prior to dewatering in the plate and frame filter press. The current plate and frame filter press is not providing sufficient capacity to meet the dewatering needs of the Elmira WWTP resulting in the supernating of raw sludge in the fermenter to the bioreactors, and overflows from the blend tank into the influent SPS. Historically, the filter press dewaters six 12.5 m^3 batches per day, Monday to Friday (Stantec, 2008). This is equivalent to 375 m^3 of sludge dewatered per week. As historical sludge production data were not available at time of study, the historical sludge production rates could not be assessed.

The Region has installed an external belt press to alleviate the bottlenecks of the current internal press. The Region has also retained Cole Engineering to design a new centrifuge dewatering system, which is slated for tender issuance in Fall 2011 and will be in service by Fall 2012.

4.11 Ongoing and Planned Upgrades

Currently, various upgrades and changes are being made to improve operation and restore the capacity of the Elmira WWTP. Two equalization tanks (Equalization Tanks No. 5 and No. 6) were recently commissioned. Additional upgrades expected to tender in Fall 2011 includes upgrades to Equalization Tanks No. 1 and 2 control weir, aeration influent distribution control, secondary clarifier RAS pumping, instrumentation and controls for aeration, UV disinfection system, and effluent pumping. The Fall 2011 tender will also include a new centrifuge dewatering unit and fermenter solids level measurement and control.

In addition, changes being made by some of the major industrial contributors will result in reduced raw influent loadings and increased plant capacity. According to the Region, a major industrial contributor in Elmira, "Company E", has committed to relocating their facility by March 2012. "Company C" has installed treatment equipment in September 2010 to reduce their wastewater loadings and bring them into compliance with their discharge agreements with the Region.

5. PRELIMINARY PROCESS CAPACITY ASSESSMENT - ELMIRA WWTP

5.1 Methodology

The preliminary process capacity assessment was performed using traditional desktop analytical methods, using historical plant operational data, plant design criteria, and approved C of A effluent limits and objectives, capacities, as well as typical design guidelines.

According to the Region, a major industrial contributor in Elmira ("Company E") has committed to relocating their facility by March 2012. "Company C" installed treatment equipment in September 2010 to reduce their wastewater loadings and bring them into compliance with their discharge agreements with the Region. For the purpose of estimating the existing capacity of the Elmira WWTP, the anticipated loadings and equivalent influent concentrations to the Elmira WWTP based on these changes in the industrial loads are presented in Table 5.1.

Table 5.1 Anticipated Flows and Loadings to the Elmira WWTP

Industry	Average Flows (m^3/d)	$cBOD_5$	TSS	TP	TKN
Domestic(1) Contribution	3,854	702 kg/d	1,265 kg/d	21.7 kg/d	197 kg/d
"Company A" Contribution	74	23 kg/d	12 kg/d	0.6 kg/d	-
"Company B" Contribution	5	9 kg/d	2 kg/d	0.1 kg/d	0.3 kg/d
"Company C" Contribution (2)	96	256 kg/d	77 kg/d	2.5 kg/d	30.7 kg/d
"Company D" Contribution	84	52 kg/d	5 kg/d	0.1 kg/d	1.8 kg/d
Total to Elmira WWTP	4,113	1,042 kg/d	1,361 kg/d	25 kg/d	230 kg/d
Equivalent Concentration	-	253 mg/L (3)	331 mg/L	6.1 mg/L	56 mg/L

Notes:
1. Domestic contributions include domestic commercial, institutional, and other industries contributing to wastewater flows to Elmira WWTP excluding flows from the five major industrial contributors in Elmira.
2. "Company C" loadings based on a cBOD5 concentration of mg/L, TSS of mg/L, TP of mg/L, and TKN of mg/L as stipulated in the surcharge agreement.
3. Based on BOD_5:$cBOD_5$ of 1.2, the equivalent BOD_5 concentration is 304 mg/L.

5.2 Preliminary Treatment

Preliminary treatment at the Elmira WWTP consists of two parallel channels, each containing a mechanically cleaned bar screen and a vortex grit removal tank. Each grit removal unit has a capacity of 19,500 m^3/d.

5.3 Primary Clarifiers

Based on a design maximum day SOR of 80 $m^3/m^2/d$ and average day SOR of 40 $m^3/m^2/d$ for primary clarifiers not receiving WAS for co-thickening (MOE, 2008) and the existing total surface area of 234 m^2, the existing primary clarifiers have a peak day flow capacity of 18,720 m^3/d and a average day flow capacity of 9,360 m^3/d.

5.4 Bioreactors

The Elmira WWTP has two bioreactors, each is divided with baffle walls into five cells: anoxic, anaerobic, swing zone, aerobic, and aerobic. Each bioreactor has a volume of 1,337 m^3, for a total volume of 2,674 m^3. The volumes of the anoxic zone, anaerobic zone, swing zone, first aerobic zone, and second aerobic zone are 320 m^3, 320 m^3, 278 m^3, 878 m^3, and 878 m^3 respectively.

Mixing in the anoxic, anaerobic, and swing zone is provided by submersible mixers. Aeration in the aerobic and swing zone is provided by three centrifugal blowers and fine bubble diffusers, each with an aeration capacity of 1,636 m^3/hr. The swing zone is operated as an anoxic zone during the summer and an aerobic zone during the remaining part of the year.

Table 5.2 presents the preliminary capacity assessment for the existing bioreactors.

Table 5.2 Bioreactors – Preliminary Capacity Assessment (BNR)

Limiting Parameter	Estimated ADF Capacity	
	Summer Operation	Non-Summer Operation
Anoxic Zone SRT > 2 d (1)	7,188 m^3/d (3)	3,847 m^3/d (3)
Anaerobic Zone SRT > 0.3 d (1)	47,922 m^3/d (3)	
Aerobic Zone SRT > 6 d (1)	7,036 m^3/d (3)	8,150 m^3/d (3)
Overall SRT > 10 d (2)	6,429 m^3/d (3)	
Estimated ADF Capacity	**6,429 m^3/d**	**3,847 m^3/d**
Overall Estimated ADF Capacity	**3,847 m^3/d (4)**	

Notes:
1. WEF (2010).
2. MOE (2008) for Combined Biological Nitrogen and Phosphorus Removal Plant.
3. Estimated based on an assumed BOD_5 removal of 35 % in the primary clarifiers, assumed MLSS concentration of 4,000 mg/L, historic MLVSS:MLSS ratio of 0.69, typical yield of 0.6 kg VSS/kg BOD_5, effluent $cBOD_5$ objective of 5 mg/L, and BOD_5:$cBOD_5$ of 1.2
4. The calculated capacities of the bioreactors are lower than the C of A design capacity due to the greater BOD_5 loadings used in this calculation as compared to the BOD_5 loadings originally used to design the Elmira WWTP.

Based on Table 5.2, the existing bioreactors have an average day flow capacity of 3,847 m^3/d limited by the anoxic zone SRT when operating the swing zone as an aerobic zone. Operation of the swing zone as an anoxic zone would increase the capacity to 6,429 m^3/d limited by the overall SRT.

The calculated capacities of the bioreactors are lower than the C of A design capacity due to the greater BOD_5 loadings used in this calculation as compared to the BOD_5 loadings originally used to design the Elmira WWTP. In the Preliminary Design Report prepared by Stanley Consulting (Stanley, 1998), the design was based on an annual average raw wastewater BOD_5 concentration of 190 mg/L; this is lower than the current BOD_5 concentration of 304 mg/L as presented in Table 5.1.

5.5 Secondary Clarifiers

The preliminary capacity assessment of the existing secondary clarifiers and RAS pumping is presented in Table 5.3.

Table 5.3 Secondary Clarifiers – Preliminary Capacity Assessment

Limiting Parameter (1)	Peak Flow Capacity
Peak Hourly SOR < 37 $m^3/m^2/d$	32,708 m^3/d
Peak Daily SLR < 170 $kg/m^2/d$	29,770 m^3/d (2)
Estimated PDF Capacity	**29,770 m^3/d**

Notes:
1. MOE Design Guidelines (2008) for conventional activated sludge with chemical addition for phosphorus removal.
2. Based on assumed MLSS concentration of 4,000 mg/L, C of A ADF capacity of 7,800 m^3/d and RAS:ADF ratio of 1.0.

Based on the preliminary assessment shown in Table 5.3, the existing secondary clarifiers have a peak day flow capacity of 29,770 m^3/d and peak hourly flow capacity of 32,708 m^3/d, limited based SLR.

5.6 Tertiary Treatment

Tertiary treatment at the Elmira WWTP is currently provided by two shallow bed travelling bridge sand filters. Each filter has a surface area of 68.4 m^2. The combined surface area of both filters is 136.8 m^2. Based on a maximum filtration rate of 2.1 $L/m^2 \cdot s$ (MOE, 2008), the peak hourly flow capacity of the tertiary filters is 24,821 m^3/d. Under high flow conditions, the filters will continuously backwash, increasing the flows to the plant.

5.7 Disinfection

Disinfection at the Elmira WWTP is provided by a Trojan Model 3000A UV system (Cole Engineering, 2010). The disinfection system consists of two UV disinfection channels, each channel equipped with two banks of low pressure UV lamps. Each bank is rated at 4,875 m^3/d for a total capacity of 19,500 m^3/d.

5.8 Sludge Dewatering

Sludge handling at the Elmira WWTP is provided by a blend tank, day tank, and a plate and frame filter press. Sludge cake is landfilled for final disposal. The Region has also retained Cole Engineering to design a new centrifuge dewatering system, which is slated for tender issuance in fall 2011 and in service by fall 2012. The new centrifuge dewatering is expected to have a capacity of 15 m^3/hr.

Based on a 35 percent BOD_5 and 65 percent TSS removal efficiency in the primary clarifier (MOE, 2008), 6 percent thickened fermenter sludge concentration (Stanley, 1998), 0.8 percent WAS concentration (Metcalf & Eddy, 2003), and 15 m^3 of sludge dewatered per hour, the equivalent ADF capacity is about 9,230 m^3/d.

6. REVIEW OF ST. JACOBS WWTP HISTORIC UNIT PROCESS OPERATION

6.1 Methodology

This section reviews historic operating conditions and performance of all major unit processes at the St. Jacobs WWTP. The historic performance of the unit processes were assessed based on MOE Design Guidelines (MOE, 2008) and other typical design criteria.

6.2 Preliminary Treatment

Preliminary treatment at the St. Jacobs WWTP consists of screening followed by grit removal. Screening is provided by a grinder/auger screen with a capacity of 5,676 m^3/d, with a standby manually cleaned bar screen in a parallel channel. Grit removal is provided by a vortex grit removal system with a capacity of 5,184 m^3/d. Grit from the vortex grit removal tank is washed in a vortex grit classifier prior to disposal.

6.3 Bioreactors

The secondary treatment system at the St. Jacobs WWTP consists of 907 m^3 oxidation ditch and secondary clarifiers. Aeration of the oxidation ditch is provided by two rotors. Based on the C of A, the rotors have a total maximum oxygen transfer rate of 1,286.4 kg O_2/day.

Table 6.1 presents the historic operating conditions for the bioreactors.

Based on Table 6.1, the oxidation ditch has historically been operated within the typical design parameters.

During a site visit, cold weather was identified as a process limitation at the St. Jacobs WWTP. During cold weather conditions, frequent icing around the rotors causes problems with the proper functioning of the rotors, limiting the aeration efficiency and limiting nitrification. Over the review period, from 2008 to 2010, the temperature of the mixed liquor have reached temperatures as low as 3°C.

Table 6.1 Historic Operating Conditions - Bioreactors (2008 – 2010)

Parameter	Historic Average Value	Typical Design Parameters
Number of Bioreactors	1	n/a
Volume (m^3)	907	n/a
ADF (m^3/d)	1,010	n/a
BOD_5 Influent (mg/L)	152 (2)	n/a
BOD_5 Effluent (mg/L)	2.4 (3)	n/a
MLSS (mg/L)	3,835	3,000 - 5,000 (1)
MLVSS (mg/L)	2,876	n/a
MLVSS:MLSS	0.75	n/a
HRT (hrs)	22	15 - 30 (1)
OLR (kg BOD_5/(m^3·d))	0.17	0.1 - 0.3 (1)
F/M_v (d^{-1})	0.06	0.04 - 0.10 (1)
SRT (days)	29 (4)	15 - 30 (1)

Notes:
n/a - not available
F/M_v – food to micro-organisms ratio
HRT – hydraulic retention time
MLSS / MLVSS – mixed liquor suspended solids / mixed liquor volatile suspended solids
OLR – organic loading rate
SRT – solids retention time
1. Metcalf and Eddie (2003) for Oxidation Ditch
2. Based on historic influent $cBOD_5$ and BOD_5:$cBOD_5$ of 1.2.
3. Based on historic effluent $cBOD_5$ and BOD_5:$cBOD_5$ of 1.2.
4. Estimated based on a typical yield of 0.6 kg VSS/kg BOD_5.

6.4 Secondary clarifiers

The St. Jacobs WWTP has two secondary clarifiers, each 11.5 m in diameter, equivalent to a 104 m^2 surface area. The total surface area for both clarifiers is 208 m^2. RAS and WAS pumping for each secondary clarifier is provided by a pump rated at 41 L/s.

Table 6.2 presents the historic operating conditions of the secondary clarifiers.

Based on Table 6.2, the secondary clarifiers have historically been operated within the typical design parameters. Historical PHF data were not available; therefore, the Peak Hourly SOR could not be evaluated.

During a site visit, the secondary clarifiers were covered with a semi-permanent structure to protect against freezing. Based on conversations with the operators, at ambient temperatures below -10°C the clarifiers may still form floating ice.

Table 6.2 Historic Operating Conditions - Secondary Clarifiers (2008 - 2010)

Parameter	Historic Average Value			Typical Design Guidelines
	2008	2009	2010	
Number of Secondary Clarifiers	2			n/a
Surface Area (m^2)	208			n/a
PHF (m^3/d)	n/a	n/a	n/a	n/a
PDF (m^3/d)	3,652	3,487	1,873	n/a
ADF (m^3/d)	1,253	978	799	n/a
MLSS (mg/L)	3,991	4,091	3,416	n/a
Peak Hourly SOR ($m^3/m^2 \cdot d$)	n/a	n/a	n/a	< 37 $m^3/m^2/d$ (1)
Peak Daily SOR ($m^3/m^2 \cdot d$)	18	17	9	n/a
Peak Daily SLR ($kg/m^2 \cdot d$)	106 (2)	97 (2)	50 (2)	< 170 $kg/m^2/d$ (1)

Notes:

n/a - not available or not applicable

1. MOE Design Guidelines (2008) for extended aeration activated sludge process with chemical addition for phosphorus removal.
2. Estimated based on RAS Flow:ADF of 1.5.

6.5 Tertiary Treatment

Tertiary treatment at the St. Jacobs WWTP is currently provided by three continuous backwash sand filters. The filters have a total surface area of 13.9 m^2.

Table 6.3 presents the historic operating conditions for the tertiary filters.

Historical PHF data were not available; therefore, the Peak hourly filtration rates could not be evaluated. Historically, the peak day filtration rate has been as high as 3 $L/m^2 \cdot s$. It is therefore likely that at historic peak hourly flows, the design peak hourly filtration rate of 3 $L/m^2 \cdot s$ has been exceeded.

Review of historic effluent quality data shows that the TSS monthly average concentration exceeded the C of A non-compliance limit in February 2009 and TP monthly average concentration exceeded the C of A non-compliance limit once in August 2008. With the exception of these two exceedances, the historic effluent TP and TSS concentrations have remained below the C of A non-compliance limits. Therefore, the existing tertiary filters are providing an adequate level of treatment.

Table 6.3 Historic Operating Conditions - Tertiary Treatment (2008 - 2010)

Parameter	Historic Average Value			Typical Design Guidelines
	2008	2009	2010	
Total Number of Filters	3			n/a
Total Surface Area of Filters (m^2)	13.9			n/a
PHF (m^3/d)	n/a	n/a	n/a	n/a
PDF (m^3/d)	3,652	3,487	1,873	n/a
Peak Hourly Filtration Rate ($L/m^2 \cdot s$)	n/a	n/a	n/a	< 3 $L/m^2 \cdot s$ (1)
Peak Daily Filtration Rate ($L/m^2 \cdot s$)	3.0	2.9	1.6	n/a

Notes:
n/a - not available or not applicable
1. St. Jacobs WWTP Preliminary Design Report (Stanley, 1998) for Parkson Corporation DynaSand® Filter.

6.6 Disinfection

Disinfection at the St. Jacobs WWTP is provided by an open channel gravity flow UV disinfection system with a capacity of 3,625 m^3/d (Stanley, 1998). Historically, over the review period from 2008 to 2010, there has been only one non-compliance event with respect to *E.coli* which occurred in January of 2009 with a monthly geometric mean density of 275 organisms per 100 mL. With the exception of this onetime exceedance, the historic effluent *E.coli* have remained below the C of A non-compliance limits. Therefore, the existing UV disinfection system is providing an adequate level of treatment.

6.7 Sludge Handling

Sludge handling at the St. Jacobs WWTP is provided by two aerated biosolids holding tanks, one with a capacity of 123 m^3 and the second one with a capacity of 40 m^3. The total combined storage volume is 163 m^3. The 123 m^3 biosolids holding tank is equipped with two aspirating aerator units, each with an oxygen transfer rate of 68 kg O_2/d. The 40 m^3 holding tank is equipped with a 2.3 kW air blower. Based on the site visit and conversations with the operators, only the 123 m^3 sludge holding tank is currently being used.

Table 6.4 summarizes the historic sludge production at the St. Jacobs WWTP.

Table 6.4 Historic Sludge Production (2008 – 2010)

Year	Quantity of Sludge Produced (m^3/year)	ADF (m^3/d)	Liquid Sludge Generation Rate (L/m^3)	Typical Generation Rate (L/m^3)
2008	2,987	1,253	6.5	13.3 (1)
2009	2,719	978	7.6	
2010	2,498	799	8.6	
Average	2,735	1,010	7.4	

Notes:
1. MOE Design Guidelines (2008) for extended aeration activated sludge process with chemical addition for phosphorus removal.

Based on Table 6.4, the historic average liquid sludge generation rate was 2,735 m^3 per year, this is equivalent to 7.4 m^3 of sludge produced per day. Although it appears that the liquid sludge generation rate was lower than typical, historical sludge quality data were not available at the time of study; therefore, historical dry solids sludge generation was not assessed.

Biosolids produced at the St. Jacobs WWTP are transported another Regional WWTP for digestion and final disposal.

Based on providing six days of storage as defined in the St. Jacobs Preliminary Design Report (Stanley, 1998), the storage volume required is 45 m^3. It would appear that there is sufficient storage volume. Additional information on the historic sludge haulage schedule is required to determine if the recommended sludge storage duration is sufficient.

7. PRELIMINARY CAPACITY ASSESSMENT - ST. JACOBS WWTP

The preliminary process capacity assessment was performed using traditional desktop analytical methods, using historical plant operational data, plant design criteria, and approved C of A capacities, as well as typical design guidelines.

Table 7.1 presents the influent characteristics and operating parameters utilized for this assessment.

Table 7.1 Preliminary Capacity Assessment – Operating Parameters

Parameter	Value
Influent BOD_5	152 mg/L (1)
Influent TSS	172 mg/L
Influent TP	4.5 mg/L
Influent TKN	32.9 mg/L

Notes:
1. Based on historical $cBOD_5$ of 127 mg/L and BOD_5:$cBOD_5$ of 1.2.

7.1 Preliminary Treatment

Preliminary treatment at the St. Jacobs WWTP consists of screening followed by grit removal. Screening is provided by a grinder/auger screen with a capacity of 5,676 m^3/d, a standby manually cleaned bar screen also exists in a parallel channel. Grit removal is provided by a vortex grit removal system with a capacity of 5,184 m^3/d. For the purpose of this preliminary capacity assessment, the PHF capacity of the preliminary treatment is 5,184 m^3/d.

7.2 Bioreactors

Table 7.2 presents the preliminary capacity assessment for the existing bioreactors.

Table 7.2 Bioreactors – Preliminary Capacity Assessment

Limiting Parameter (1)	Estimated ADF Capacity (2)
HRT > 15 h	1,451 m^3/d
OLR = 0.3 kg/m^3/d	1,785 m^3/d
F/M_v = 0.1 d^{-1}	1,562 m^3/d
SRT = 15 d	1,807 m^3/d (3)
Estimated ADF Capacity	**1,451 m^3/d**

Notes:
1. Metcalf and Eddie (2003) for Oxidation Ditch.
2. Based on assumed MLSS concentration of 3,500 mg/L and historic MLVSS:MLSS ratio of 0.75.
3. Estimated based on a typical yield of 0.6 kg VSS/kg BOD_5, effluent $cBOD_5$ objective of 5 mg/L, and BOD_5:$cBOD_5$ of 1.2

Based on Table 7.2, the existing bioreactors have an average day flow capacity of about 1,451 m^3/d limited by the HRT.

The Region's WWTMP (Earthtech, 2007) indicates that the C of A reported oxygen transfer rate of 1,286.4 kg O_2/day may be overstated. Based on historical influent monthly average $cBOD_5$ and TKN concentrations, at an ADF of 1,451 m^3/d determined above, the required oxygen transfer rate is 760 kg O_2/day; this is within the capacity of the available rotors as stated in the C of A. Based on historic effluent $cBOD_5$ and TAN concentrations, it would appear that the aerators are providing sufficient air to meet the C of A effluent objectives.

Although the aerators are sufficiently sized to meet current average concentration, based on the MOE Design Guidelines (MOE, 2008), the aerators should be designed based on average day $cBOD_5$ and maximum month TKN loadings. Based on the historical average day $cBOD_5$ and maximum month TKN, it would appear that the current aerators with an oxygen transfer rate of 1,286.4 kg O_2/day is limited to an ADF capacity of about 1,054 m^3/d. Based on the aeration system, the ADF capacity of the plant is limited to 1,054 m^3/d.

7.3 Secondary Clarifiers

The preliminary capacity assessment of the existing secondary clarifiers and RAS pumping is presented in Table 7.3.

Table 7.3 Secondary Clarifiers – Preliminary Capacity Assessment

Limiting Parameter (1)	Peak Flow Capacity
Peak Hourly SOR < 37 $m^3/m^2/d$	7,686 m^3/d
Peak Daily SLR < 170 $kg/m^2/d$	7,990 m^3/d (2)
Estimated PHF Capacity	**7,686 m^3/d**

Notes:
1. MOE Design Guidelines (2008) for extended aeration activated sludge process with chemical addition for phosphorus removal.
2. Based on assumed MLSS concentration of 3,500 mg/L and RAS:ADF ratio of 1.0.

Based on the preliminary assessment shown in Table 7.3, the existing secondary clarifiers have a PHF capacity of 7,686 m^3/d and PDF capacity of 7,990 m^3/d, limited based on surface overflow rate (SOR).

7.4 Tertiary Treatment

Tertiary treatment at the St. Jacobs WWTP is currently provided by three continuous backwash sand filters. The filters have a total surface area of 13.9 m^2. Based on the St. Jacobs WWTP Preliminary Design Report (Stanley, 1998), the tertiary filters were designed based on a filtration rate of 3 L/s·m^2 provided by Parkson Corporation for the DynaSand® filter. Based on the filtration rate of 3 L/s·m^2, it appears that the tertiary filters have a total PHF capacity of 41.7 L/s (3,603 m^3/d).

7.5 Disinfection

Disinfection at the St. Jacobs WWTP is provided by an open channel gravity flow UV disinfection system with a capacity of 3,625 m^3/d (Stanley, 1998). For the purpose of this capacity assessment, the PHF capacity of the disinfection system is 3,625 m^3/d.

7.6 Sludge Handling

Sludge handling at the St. Jacobs WWTP is provided by two aerated biosolids holding tanks, one with a capacity of 123 m^3 and the second one with a capacity of 40 m^3. The total combined storage volume is 163 m^3.

Based on the historic liquid sludge generation rate of 7.4 L/m^3 and providing six days liquid sludge storage (Stanley, 1998), the equivalent ADF capacity as determined by the sludge holding tanks is 3,671 m^3/d.

Biosolids produced at the St. Jacobs WWTP are transported another Regional WWTP for digestion and final disposal.

8. SUMMARY

Historically, both the Elmira and St. Jacobs WWTPs have produced good quality effluent that has met the C of A effluent limits for the majority of the historic review period; however, there had been a few occasions where the effluent monthly average concentration exceeded the C of A non-compliance limits.

Table 8.1 summarizes the results of the preliminary capacity assessment for the Elmira WWTP.

Table 8.1 Elmira - Preliminary Capacity Assessment Summary

Treatment Unit	Preliminary Capacity Assessment		
	ADF	PDF	PHF
Preliminary Treatment	n/a	n/a	19,500 m^3/d
Primary Clarification	9,360 m^3/d	18,720 m^3/d	n/a
Bioreactor / Aeration	3,847 m^3/d	n/a	n/a
Secondary Clarification	n/a	29,770 m^3/d	32,708 m^3/d
Tertiary Treatment	n/a	n/a	24,821 m^3/d
Disinfection	n/a	n/a	19,500 m^3/d
Sludge Dewatering	9,230 m^3/d	n/a	n/a
Overall Capacity	**3,847 m^3/d**	**18,720 m^3/d**	**19,500 m^3/d**
C of A Rated Capacity	**7,800 m^3/d**	**19,500 m^3/d (1)**	

Notes:
n/a – not applicable
1. C of A provides peak flow capacity.

Overall the Elmira WWTP has an estimated ADF capacity of 3,847 m^3/d, PDF capacity of 18,720 m^3/d, and PHF capacity of 19,500 m^3/d. The ADF capacity is likely a conservative estimate as the plant has been treating average flows higher than this and achieving its effluent requirements the majority of the time.

Due to historically high influent $cBOD_5$ concentrations, the Elmira WWTP ADF capacity is limited by the bioreactors. As the plant was designed for lower influent $cBOD_5$ concentrations, the plant C of A ADF capacity may be met by further reducing influent $cBOD_5$ concentrations or upgrading the individual unit process capacities.

The Elmira WWTP has historically experienced problems with the operation of the RAS pumps resulting in redirection of flows through the equalization tanks. Although this approach has resulted in reduced peak flows through the plant and allowed the plant to meet effluent limits with only one secondary clarifier in operation, it is taking up valuable equalization tank. Replacement of the RAS pumps with appropriately sized pumps and correction of the secondary clarifier draw down

issues is currently being addressed through the final design being done by Cole Engineering.

Table 8.2 summarizes the results of the preliminary capacity assessment for the St. Jacobs WWTP.

Table 8.2 St. Jacobs - Preliminary Capacity Assessment Summary

Treatment Unit	Preliminary Capacity Assessment		
	ADF	PDF	PHF
Preliminary Treatment	n/a	n/a	5,184 m^3/d
Bioreactor / Aeration	1,451 m^3/d	n/a	n/a
Secondary Clarification	n/a	7,990 m^3/d	7,686 m^3/d
Tertiary Treatment	n/a	n/a	3,603 m^3/d
Disinfection	n/a	n/a	3,625 m^3/d
Sludge Storage	1,476 m^3/d	n/a	n/a
Overall Capacity	**1,451 m^3/d**	**3,603 m^3/d**	
C of A Rated Capacity	**1,450 m^3/d**	**n/a**	
Notes: n/a – not applicable			

Based on Table 8.2, the St. Jacobs WWTP has an ADF capacity of 1,451 m^3/d and PF capacity of 3,603 m^3/d. The ADF capacity of the St. Jacobs WWTP may actually be lower than the data suggest due to the impacts of very low temperatures (<3°C) in the oxidation ditch on winter nitrification performance.

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APPENDIX G
ALTERNATIVE SOLUTIONS

XCG CONSULTANTS LTD.
T 905 829 8880 F 905 829 8890 | toronto@xcg.com
2620 Bristol Circle, Suite 300, Oakville, Ontario, Canada L6H 6Z7

XCG File No.: 3-035-51-01
November 22, 2012

TECHNICAL MEMORANDUM NO. 7
ST. JACOBS - ELMIRA WASTEWATER TREATMENT MASTER PLAN
ALTERNATIVE SOLUTIONS

Prepared for:

REGION OF WATERLOO
150 Frederick Street, 7th Floor
Kitchener, Ontario
N2G 4J3

Attention: Pam Law, P.Eng.

Prepared by:

XCG CONSULTANTS LTD.
Suite 300, 2620 Bristol Circle
Oakville, Ontario
L6H 6Z7

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1. INTRODUCTION

1.1 Background

The Region of Waterloo (Region) is undertaking a Wastewater Treatment Master Plan (WWTMP) for both the Elmira and St. Jacobs communities concurrently, ensuring that Phases 1 and 2 of the Municipal Class Environmental Assessment (MCEA) are satisfied. This Master Plan will review wastewater treatment conditions in these communities since the completion of the 1997 Class Environmental Assessment (EA) study and the 2007 Region-wide Wastewater Treatment Master Plan (WWTMP), and recommend a wastewater treatment strategy to meet growth in the communities for the next thirty years.

The 2007 Region-wide WWTMP recommended the completion of a separate master plan for Elmira WWTP and St. Jacobs WWTP where options for servicing of both communities would be considered together. This study will provide an opportunity to consider wastewater treatment requirements for Elmira and St. Jacobs together and will also provide an opportunity to consider the feasibility of incorporating flows from the Heidelberg WWTP into an overall solution.

The St. Jacobs WWTP provides tertiary treatment for wastewater generated in the Town of St. Jacobs. The plant is operated under MOE Amended C of A No. 3-0690-99-006 issued October 21, 1999. The St. Jacobs WWTP has an average day C of A rated capacity of 1,450 m^3/d.

The Elmira Wastewater Treatment Plant (WWTP) provides tertiary treatment for wastewater generated in the Town of Elmira. The plant is operated under Ministry of the Environment (MOE) Amended Certificate of Approval (C of A) No. 2530-84BL9Q issued June 8, 2010. The Elmira WWTP has an average day C of A rated capacity of 7,800 m^3/d and a peak flow capacity of 19,500 m^3/d.

The Heidelberg WWTP provides tertiary treatment for wastewater generated in a small community of about 90 homes in the village of Heidelberg. The plant is operated under MOE Certificate of Approval No. 7707-5NSKGL issued on August 6, 2003. The Heidelberg WWTP has an average day C of A rated capacity of 130 m^3/d and a peak flow capacity of 3.2 L/s.

This Technical Memorandum (TM) identifies a long-list of possible alternative solutions for future servicing and completes a preliminary assessment of the long-list to develop a short-list for more detailed evaluation in subsequent stages of the Master Plan.

1.2 Objectives

The objectives of this TM are to:

- identify possible alternative solutions for wastewater servicing for the communities of Elmira, St. Jacobs, and Heidelberg; and
- complete a preliminary evaluation of the alternative solutions and identify a short-list of alternatives.

2. PROBLEM STATEMENTS

2.1 Study Objectives

A Class Environmental Assessment (EA) was initiated by the Region to determine the most cost-effective, environmentally sound, and sustainable approach to provide wastewater servicing to prepare for the long-term future growth in the Communities of Elmira, St. Jacobs, and Heidelberg.

2.2 Justification and Need for the Project

Table 2.1 presents the future wastewater flows for the Communities of Elmira, St Jacobs, and Heidelberg as presented in Technical Memorandum No. 2 (XCG, 2011).

Table 2.1 Summary of 2041 Flow Projections

Year	Projected Total Flows – St. Jacobs WWTP (m^3/d)	Projected Total Flows – Elmira WWTP (m^3/d)	Projected Total Flows – Heidelberg WWTP (m^3/d)	Projected Total Flows – Wastewater Treatment Service Area (m^3/d)
Current (2005 - 2009)	1,050	4,024	51	5,125
2011	1,115	4,410	51	5,576
2016	1,278	4,991	51	6,320
2021	1,441	5,668	51	7,160
2026	1,604	6,345	51	8,000
2029	1,702	6,751	51	8,504
2031	1,767	7,022	51	8,840
2041	2,093	8,376	51	10,520
C of A Rated Capacity	**1,450**	**7,800**	**130**	**9,380**

As shown in Table 2.1, the projected 2041 average wastewater flows for the communities of Elmira and St. Jacobs exceed the existing C of A ADF capacities of the individual WWTPs. As a result, additional wastewater servicing capacity must be provided to accommodate planned growth in these communities. Although average wastewater flows for Heidelberg are within the Heidelberg WWTP C of A capacity, it was identified in TM No 1B that the Heidelberg WWTP is a complex WWTP that is expensive to operate due to the small size of the facility and the need for considerable operator attention (XCG, 2011). Therefore, the feasibility of incorporating the flows from Heidelberg WWTP into the overall solution will be evaluated as part of this Master Plan.

3. DEVELOPMENT OF ALTERNATIVE SOLUTIONS

A number of planning alternatives exist to address the wastewater servicing needs for the communities of Elmira, St. Jacobs, and Heidelberg. A description of the servicing alternatives for each community is provided in the subsequent sub-sections of this TM.

Servicing for the Community of Elmira

There are a number of alternatives for the servicing of Elmira that involves expansion of the existing facility or construction of a new facility to provide for servicing for expected growth; however, preliminary evaluation of the on-going I/I reduction initiatives and the impacts on the projected flows for Elmira suggests that the 2041 projected flows for Elmira can be met at the existing C of A rated design capacity when combined with continued I/I reduction and continued implementation of water efficiency programs. Although the Elmira WWTP does not need to be expanded hydraulically, there may be a need to upgrade the works to address known performance or capacity limitations and/or to upgrade to meeting future regulatory requirements, particularly with respect to denitrification. Providing that Elmira does not receive wastewater from other communities, this indicates that an expansion of the Elmira WWTP will not be needed within the planning period of this Master Plan. Therefore, the alternatives that involve significant capital expenditures such as expansion of the existing facility or construction of a new facility are not considered further. This leaves only two possible alternatives for the servicing of Elmira. The possible alternatives for servicing growth in Elmira include:

- Alternative 1A - "Do nothing"; and
- Alternative 1B - Continue to reduce I/I and to implement water efficiency programs.

Servicing for the Community of St. Jacobs

The possible alternatives for servicing St. Jacobs include:

- Alternative 2A – "Do nothing";
- Alternative 2B – Continue to reduce I/I and to implement water efficiency programs;
- Alternative 2C – Upgrade and expand the St. Jacobs WWTP;
- Alternative 2D – Decommission the St. Jacobs WWTP and construct a new WWTP;
- Alternative 2E – Upgrade the existing plant and construct a new plant for flows beyond the existing capacity of the St Jacobs WWTP;
- Alternative 2F – Decommission the St. Jacobs WWTP and transfer flows to the Elmira WWTP;
- Alternative 2G – Upgrade the existing plant and transfer flows beyond the existing capacity of the St Jacobs WWTP to the Elmira WWTP;

- Alternative 2H – Decommission the St. Jacobs WWTP and transfer flows to the Waterloo WWTP; and,
- Alternative 2I – Upgrade the existing plant and transfer flows beyond the existing capacity of the St Jacobs WWTP to the Waterloo WWTP.

Servicing for the Community of Heidelberg

As no growth is expected for the Community of Heidelberg, no expansion to the existing Heidelberg WWTP is required. Three possible alternatives exist for servicing the Community of Heidelberg, this includes:

- Alternative 3A – Maintain existing Heidelberg WWTP;
- Alternative 3B – Decommission the Heidelberg WWTP and transfer flows to the St. Jacobs WWTP; and,
- Alternative 3C – Decommission the Heidelberg WWTP and transfer flows to the Waterloo WWTP.

3.1 Servicing for the Community of Elmira

3.1.1 Alternative 1A - "Do Nothing"

The “Do Nothing” alternative would not provide any expansion or upgrades to the existing wastewater treatment system. No servicing would be available for the planned future development.

As identified in Section 2, there is planned growth in the Town of Elmira; therefore, this alternative would not satisfy the study objective and is not considered further.

3.1.2 Alternative 1B - Continue to Reduce I/I and to Implement Water Efficiency Programs

This alternative would include the continued implementation of programs to reduce wastewater flows through water efficiency and I/I reduction.

The Region of Waterloo is considered a leader in Canada with respect to water efficiency. The Region is committed to reducing per capita water demands across the Region. A Water Efficiency Master Plan (United Utilities, 2006) has been completed, and the Region actively investigates potential water efficiency measures. As identified in the Water Efficiency Master Plan, these water efficiency programs will continue in all communities in the Region, including Elmira.

Extraneous flow includes the following components:

- Groundwater infiltration through cracked sewer pipes;
- Rainfall-derived inflow through foundation drain connections, roof leader connections, manhole lids, etc;
- Rainfall-derived infiltration through cracked sewer pipes and manholes.

The Elmira WWTP is not expected to exceed the existing C of A rated capacity of 7,800 m^3/d until about the year 2037. This provides a long timeline to offset flow increases due to growth through water efficiency programs and I/I reduction programs. Based on Technical Memorandum No. 5 - Review of Infiltration and Inflow Reduction Programs (XCG, 2011), current I/I reduction programs in Elmira have shown an I/I reduction of 25 L/cap·d. Based on 2041 population of 21,359 in Elmira, this is equivalent to a reduction of approximately 534 m^3/d. Therefore, with continuation of the I/I reduction program, the 2041 total projected flow could be reduced to about 7,842 m^3/d. Therefore, continued implementation of the water efficiency program in conjunction with I/I reduction programs will likely provide adequate reduction of the projected flows to meet 2041 projected demands with the C of A capacity of the existing WWTP.

Upgrades to the Elmira WWTP will be implemented to address the capacity limitations due to historically high BOD_5 concentrations and other process limitations. In addition, major industrial discharges are to be reduced to meet bylaw and/or agreements to reduce loading on the WWTP.

3.2 Servicing for the Community of St. Jacobs

3.2.1 Alternative 2A - "Do Nothing"

The “Do Nothing” alternative would not provide any expansion or upgrades to the existing wastewater treatment system. No servicing would be available for the planned future development.

As identified in Section 2, there is planned growth in the Community of St. Jacobs; therefore, this alternative would not satisfy the study objective and is not considered further.

3.2.2 Alternative 2B - Continue to Reduce I/I and to Implement Water Efficiency Programs

This alternative would include the continued implementation of programs to reduce wastewater flows through water efficiency and I/I reduction.

The Region of Waterloo is considered a leader in Canada with respect to water efficiency. The Region is committed to reducing per capita water demands across the Region. A Water Efficiency Master Plan (United Utilities, 2006) has been completed, and the Region actively investigates potential water-efficiency measures. As identified in the Water Efficiency Master Plan, these water efficiency programs will continue in all communities in the Region, including St. Jacobs.

Extraneous flow includes the following components:

- Groundwater infiltration through cracked sewer pipes;
- Rainfall-derived inflow through foundation drain connections, roof leader connections, manhole lids, etc; and,
- Rainfall-derived infiltration through cracked sewer pipes and manholes.

Although a reduction in wastewater flows to the St. Jacobs WWTP will be achieved through the Region's water efficiency programs and I/I reduction initiatives, the St. Jacobs WWTP is expected to exceed the existing C of A rated capacity of 1,450 m^3/d in about the year 2021. Flow reductions resulting from water efficiency and I/I reduction programs in the near term will likely be insufficient to offset the flow increase due to increased growth; therefore, other alternatives need to be considered to address the future wastewater servicing needs for St. Jacobs. Continued I/I reduction and water efficiency programs will form a part of the overall preferred solution for addressing the future wastewater needs for St. Jacobs.

3.2.3 Alternative 2C - Upgrade and Expand the St. Jacobs WWTP

This alternative would expand the existing St. Jacobs WWTP to provide capacity for the existing community and forecasted growth. The expanded plant would be sized to accommodate the increased wastewater flows associated with growth in St. Jacobs. The existing St. Jacobs WWTP would be upgraded as necessary to provide improved performance during cold temperatures.

This alternative would satisfy all of the study objectives; therefore, this alternative is considered further for detailed evaluation.

3.2.4 Alternative 2D - Decommission the St. Jacobs WWTP and Construct a New WWTP

The existing St. Jacobs WWTP would be decommissioned and a new WWTP on a new site would be constructed to service the existing community of St. Jacobs and any forecasted growth. The new WWTP would be sized to accommodate the increased wastewater flows associated with growth in St. Jacobs.

A site for the new WWTP would need to be selected based on available land, as well as based on access to the collection system infrastructure and suitable effluent discharge locations. The collection system would need to be modified to convey the wastewater to the new WWTP.

In recent years, the Region has made considerable investments in upgrades at the existing St. Jacobs WWTP. The abandoning of this investment and construction of a new WWTP is not economically responsible and would likely receive negative public comment. Therefore, this alternative is not considered further.

3.2.5 Alternative 2E - Upgrade the Existing Plant and Donstruct a New Plant for Flows beyond the Existing Capacity of the St. Jacobs WWTP

The existing St. Jacobs WWTP would remain operational and would provide wastewater treatment capacity for the existing Community of St. Jacobs. The existing St. Jacobs WWTP will be upgraded as necessary to provide improved performance during cold temperatures. Wastewater flows in excess of the existing WWTP rated capacity would be transferred to a new WWTP for treatment. A new pump station and forcemain in St. Jacobs may be required to transfer the excess flow to the new WWTP site.

A site for the new WWTP would need to be selected based on available land, as well as based on access to the collection system infrastructure and suitable effluent discharge locations.

This alternative would also involve an assessment of potential outfall locations, including utilizing and/or modifying the existing outfalls or constructing a new outfall. Utilizing the existing St. Jacobs WWTP outfall may require effluent pumping to convey the treated effluent from the new site to the existing St. Jacobs WWTP outfall.

Based on 2041 flow projections for St. Jacobs, and the existing St. Jacobs WWTP C of A rated capacity, the new WWTP would be designed to treat about 643 m^3/d. Due to the relatively low and gradual flow increase due to growth, construction of a new WWTP could encounter operating challenges due to minimum hydraulic loading requirements to sustain the biological process. In addition, this alternative would likely involve the highest capital cost and operating & maintenance cost due to the construction and operation of a new plant. Therefore, this alternative is not considered further.

3.2.6 Alternative 2F - Decommission the St. Jacobs WWTP and Transfer Flows to the Elmira WWTP

The existing St. Jacobs WWTP would be decommissioned and a new pump station and forcemain would be required to pump all wastewater flows generated in St. Jacobs to the Elmira WWTP for treatment.

Based on the analysis presented in Section 3.1.2, the existing Elmira WWTP has sufficient capacity to meet the future servicing needs for the Community of Elmira providing it does not receive wastewater from any other communities. If the Elmira WWTP is to treat wastewater for both the Communities of Elmira and St. Jacobs, and expansion to the Elmira WWTP would be required.

In recent years, the Region has made considerable investments in upgrades at the existing St. Jacobs WWTP. The abandoning of this investment and construction of a pump station and expanding the Elmira WWTP is not economically responsible and would likely receive negative public comment. Furthermore, based on TM No. 3 (XCG, 2011), the assimilative capacity of Canagagigue Creek is limited and the MOE is unlikely to grant large flow increases into this receiver. Therefore, this alternative is not considered further.

3.2.7 Alternative 2G – Upgrade the Existing Plant and Transfer Flows beyond the Existing Capacity of the St. Jacobs WWTP to the Elmira WWTP

The existing St. Jacobs WWTP would remain operational and would provide wastewater treatment capacity for the Community of St. Jacobs. The existing St. Jacobs WWTP will be upgraded as necessary to provide improved performance during cold temperatures. Wastewater flows in excess of the St. Jacobs WWTP rated capacity would be pumped to the Elmira WWTP for treatment. A new pump station

and forcemain in St. Jacobs would be required to transfer the excess flow to the Elmira WWTP.

Based on the analysis presented in Section 3.1.2, the existing Elmira WWTP has sufficient capacity to meet the future servicing needs for the Community of Elmira providing it does not receive wastewater from any other communities. If the Elmira WWTP is to treat wastewater for both the Communities of Elmira and St. Jacobs, and expansion to the Elmira WWTP would be required.

Based on TM No. 3 (XCG, 2011), the assimilative capacity of Canagagigue Creek is limited and the MOE is unlikely to grant large flow increases to this receiver. Therefore, this alternative is not considered further.

3.2.8 Alternative 2H - Decommission the St. Jacobs WWTP and Transfer Flows to the Waterloo WWTP

The existing St. Jacobs WWTP would be decommissioned and a new pump station and forcemain would likely be required to transfer all wastewater flows generated in St. Jacobs to the Waterloo WWTP for treatment.

Based on the 2012 Water and Wastewater Monitoring Report, the Waterloo WPCP has a C of A maximum hydraulic capacity of 72,730 m^3/d. The plant is currently undergoing upgrades to allow the plant to meet the enhanced effluent requirements; however, due to the assimilative capacity of the effluent receiver, the C of A is expected to be amended with a revised capacity of 57,500 m^3/d (Region of Waterloo, 2012).

The 2007 to 2011 average flow for the City of Waterloo was 45,867 m^3/d and the currently committed capacity from new growth in the City is 5,510 m^3/d; therefore, there will be 4,673 m^3/d of uncommitted capacity at the Waterloo WPCP once upgrades are complete. Therefore, there is likely sufficient capacity at the Waterloo WPCP to accept flows from the existing Community of St. Jacobs. However, it should be noted that the committed capacity in Waterloo only accounts for new greenfield applications and does not include intensification projects, which do not require Regional approval. Therefore, more of the capacity could be allocated than listed above, which would affect the timing of the next expansion.

Based on the five year historic average per capita flow of 0.3592 m^3/cap·d (Region of Waterloo, 2012), flow projections for the City of Waterloo provided by the Region, and treating only flows from the City of Waterloo, the Waterloo WWTP is expected to exceed the expected C of A rated capacity of 57,500 m^3/d about the year 2024. Therefore, an expansion of the Waterloo WWTP would be completed by the year 2024.

Based on the historic per capita flow of 572 L/cap.d for the existing population in St. Jacobs and a per capita flow of 468 L/cap.d for new growth, assuming continued I/I reduction, the CofA rated capacity of the St. Jacobs WWTP would not be exceeded until 2024. Therefore, the existing St. Jacobs WWTP would be operated until the year 2024, and then decommissioned and all flows transferred to the expanded Waterloo WWTP.

This alternative would satisfy all of the study objectives; therefore, this alternative is considered further for detailed evaluation.

3.2.9 Alternative 2I – Upgrade the Existing Plant and Transfer Flows beyond the Existing Capacity of the St. Jacobs WWTP to the Waterloo WWTP

The existing St. Jacobs WWTP would remain operational and would provide wastewater treatment capacity for the Community of St. Jacobs. The existing St. Jacobs WWTP will be upgraded as necessary to provide improved performance during cold temperatures. Wastewater flows in excess of the St. Jacobs WWTP rated capacity would be transferred to the Waterloo WWTP for treatment. A new pump station and forcemain would likely be required.

Based on the 2012 Water and Wastewater Monitoring Report, the Waterloo WWTP has a C of A maximum hydraulic capacity of 72,730 m^3/d. The plant is currently undergoing upgrades to allow the plant to meet the enhanced effluent requirements; however, due to the assimilative capacity of the effluent receiver, the C of A is expected to be amended with a revised capacity of 57,500 m^3/d (Region of Waterloo, 2012).

Based on the five year historic average per capita flow of 0.3592 m^3/cap·d (Region of Waterloo, 2012), flow projections for the City of Waterloo provided by the Region, and treating only flows from the City of Waterloo, the Waterloo WWTP is expected to exceed the expected C of A rated capacity of 57,500 m^3/d about the year 2024. Therefore, an expansion of the Waterloo WWTP would be completed by the year 2024.

Based on the historic per capita flow of 572 L/cap.d for the existing population in St. Jacobs and a per capita flow of 468 L/cap.d for new growth, assuming continued I/I reduction, the CofA rated capacity of the St. Jacobs WWTP would not be exceeded until 2024. Therefore, the existing St. Jacobs WWTP would be operated until the year 2024, and then flows beyond the existing capacity of the St. Jacobs WWTP would be transferred to the expanded Waterloo WWTP.

This alternative would satisfy all of the study objectives; therefore, this alternative is considered further for detailed evaluation.

3.3 Servicing for the Community of Heidelberg

3.3.1 Alternative 3A - Maintain Existing Heidelberg WWTP

No growth is expected for the service area of the Heidelberg WWTP; therefore, no expansion to the existing WWTP is required. The Heidelberg WWTP would be upgraded as required to provide treatment for the existing service area. This alternative would involve continued operation of the Heidelberg WWTP as its own independent system.

3.3.2 Alternative 3B - Decommission the Heidelberg WWTP and Transfer Flows to the St. Jacobs WWTP

The Heidelberg WWTP would be decommissioned and a new pumping station would be constructed to pump all flows to the St. Jacobs WWTP for treatment. The combined Heidelberg and St. Jacobs sewage flows would be treated at the St. Jacobs WWTP. Any of the alternatives considered for the St. Jacobs WWTP in Section 3.2 could be applied to treat the additional flow resulting from the transfer of wastewater from Heidelberg to the St. Jacobs WWTP.

3.3.3 Alternative 3C - Decommission the Heidelberg WWTP and Transfer Flows to the Waterloo WWTP

The Heidelberg WWTP would be decommissioned and existing flow would be transferred to the Waterloo WWTP for treatment. A new pumping station and forcemain would likely be required.

Based on the 2012 Water and Wastewater Monitoring Report, the Waterloo WWTP has a C of A maximum hydraulic capacity of 72,730 m^3/d. The plant is currently undergoing upgrades to allow the plant to meet the enhanced effluent requirements; however, due to the assimilative capacity of the effluent receiver, the C of A is expected to be amended with a revised capacity of 57,500 m^3/d (Region of Waterloo, 2012).

The 2007 to 2011 average flow for the City of Waterloo was 45,867 m^3/d and the current committed capacity is 5,510 m^3/d; therefore, there will be 4,673 m^3/d of uncommitted capacity at the Waterloo WPCP once upgrades are complete. Therefore, there is likely sufficient capacity at the Waterloo WPCP to accept flows from the existing Community of Heidelberg. However, it should be noted that the committed capacity in Waterloo only accounts for new greenfield applications and does not include intensification projects, which do not require Regional approval. Therefore, more of the capacity could be allocated than listed above.

Based on the five year historic average per capita flow of 0.3592 m^3/cap·d (Region of Waterloo, 2012), flow projections for the City of Waterloo provided by the Region, and treating only flows from the City of Waterloo, the Waterloo WWTP is expected to exceed the expected C of A rated capacity of 57,500 m^3/d about the year 2024. Therefore, an expansion of the Waterloo WWTP would be completed by the year 2024. The existing Heidelberg WWTP would be operated until the year 2024, and then decommissioned and all flows transferred to the expanded Waterloo WWTP.

4. FEASIBILITY OF ALTERNATIVE SOLUTIONS

4.1 Preliminary Evaluation

Table 4.1 and Table 4.2 presents a summary of the preliminary evaluation of alternative solutions for Elmira, and St. Jacobs, respectively, based on the evaluation of each alternative as presented in Section 3. Only those alternatives that satisfy the project objectives were considered for further evaluation.

The alternatives for the servicing the Community of Heidelberg will not be evaluated as a part of the preliminary evaluation. Instead the alternatives for servicing Heidelberg will be evaluated separately and form an integral part of the preferred alternative.

Table 4.1 Preliminary Evaluation of Alternative Solutions for Elmira

Alternative	Will Alternative Satisfy All Project Objectives?	
	Yes	No
Alternative 1A - "Do nothing"		X
Alternative 1B - Continue to reduce I/I and to implement water efficiency programs	X	

Table 4.2 Preliminary Evaluation of Alternative Solutions for St. Jacobs

Alternative	Will Alternative Satisfy All Project Objectives?		Could Alternative be Part of Solution?
	Yes	No	
Alternative 2A - "Do nothing"		X	
Alternative 2B - Continue to reduce I/I and to implement water efficiency programs		X	X
Alternative 2C - Upgrade and expand the St. Jacobs WWTP	X		
Alternative 2D - Decommission the St. Jacobs WWTP and construct a new WWTP		X	
Alternative 2E - Upgrade the existing plant and construct a new plant for flows beyond the existing capacity of the St Jacobs WWTP		X	
Alternative 2F - Decommission the St. Jacobs WWTP and transfer flows to the Elmira WWTP		X	
Alternative 2G – Upgrade the existing plant and transfer flows beyond the existing capacity of the St Jacobs WWTP to the Elmira WWTP		X	
Alternative 2H - Decommission the St. Jacobs WWTP and transfer flows to the Waterloo WWTP	X		
Alternative 2I – Upgrade the existing plant and transfer flows beyond the existing capacity of the St Jacobs WWTP to the Waterloo WWTP	X		

4.2 Short List of Alternative Solutions

Table 4.3 presents a summary of the short-listed alternative solutions.

Based on the evaluation criteria identified in TM No. 8, the short-list of alternatives will be evaluated in further detail in TM No 9 and the combined servicing options for all communities will be evaluated.

Table 4.3 Summary of Short-Listed Alternatives

Community	Alternative
Elmira Wastewater Servicing	Alternative 1B - Continue to reduce I/I and to implement water efficiency programs
St. Jacobs Wastewater Servicing	Alternative 2C - Upgrade and expand the St. Jacobs WWTP
	Alternative 2H - Decommission the St. Jacobs WWTP and transfer flows to the Waterloo WWTP
	Alternative 2I – Upgrade the existing plant and transfer flows beyond the existing capacity of the St Jacobs WWTP to the Waterloo WWTP
Heidelberg Wastewater Servicing	Alternative 3A - Maintain existing Heidelberg WWTP
	Alternative 3B - Decommission the Heidelberg WWTP and transfer flows to the St. Jacobs WWTP
	Alternative 3C - Decommission the Heidelberg WWTP and transfer flows to the Waterloo WWTP

5. REFERENCES

Region of Waterloo (2012). Water and Wastewater Monitoring Report. May 2012.

United Utilities (2006). Region of Waterloo - Water Efficiency Master Plan Update. May 2006.

XCG (2011). Technical Memorandum No. 1B - St. Jacobs - Elmira Wastewater Treatment Master Plan - Existing Conditions.

XCG (2011). Technical Memorandum No. 2 - St. Jacobs - Elmira Wastewater Treatment Master Plan - Future Flow Projections.

XCG (2011). Technical Memorandum No. 3 - St. Jacobs - Elmira Wastewater Treatment Master Plan - Determination of the Effluent Requirements for the Elmira and St. Jacobs Wastewater Treatment Plants.

XCG (2011). Technical Memorandum No. 5 - St. Jacobs - Elmira Wastewater Treatment Master Plan - Review of Infiltration and Inflow Reduction Programs.

XCG (2011). Technical Memorandum No. 6 - St. Jacobs - Elmira Wastewater Treatment Master Plan - Capacity and Needs Assessment.

APPENDIX H
EVALUATION PROCESS

XCG CONSULTANTS LTD.
T 905 829 8880 F 905 829 8890 | toronto@xcg.com
2620 Bristol Circle, Suite 300, Oakville, Ontario, Canada L6H 6Z7

XCG File No.: 3-035-51-01
November 22, 2012

TECHNICAL MEMORANDUM NO. 8
ST. JACOBS - ELMIRA WASTEWATER TREATMENT MASTER PLAN
EVALUATION PROCESS

Prepared for:

REGION OF WATERLOO
150 Frederick Street, 7th Floor
Kitchener, Ontario
N2G 4J3

Attention: Pam Law, P.Eng.

Prepared by:

XCG CONSULTANTS LTD.
Suite 300, 2620 Bristol Circle
Oakville, Ontario
L6H 6Z7

TABLE OF CONTENTS

1. INTRODUCTION 1
1.1 Objective 1

2. EVALUATION PROCESS 2

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Table 2.1 Summary of Short-Listed Alternatives 2
Table 2.2 Evaluation Criteria 3
Table 2.3 Evaluation Matrix 5

1. INTRODUCTION

The Region of Waterloo (Region) is undertaking a Wastewater Treatment Master Plan (WWTMP) for both the Elmira and St. Jacobs communities concurrently, ensuring that Phases 1 and 2 of the Municipal Class Environmental Assessment (MCEA) are satisfied. This WWTMP will review wastewater treatment conditions in these communities since the completion of the 1997 Class Environmental Assessment (EA) study and the 2007 Region-wide WWTMP, and recommend a wastewater treatment strategy to meet growth in the communities for the next 30 years.

The 2007 Region-wide WWTMP recommended the completion of a separate master plan for the Elmira Wastewater Treatment Plant (WWTP) and St. Jacobs WWTP where options for servicing of both communities would be considered together. This study will provide an opportunity to consider wastewater treatment requirements for Elmira and St. Jacobs together and will also provide an opportunity to consider the feasibility of incorporating flows from the Heidelberg WWTP into an overall solution.

The St. Jacobs WWTP provides tertiary treatment for wastewater generated in the Town of St. Jacobs. The plant is operated under MOE Amended C of A No. 3-0690-99-006 issued October 21, 1999. The St. Jacobs WWTP has an average day C of A rated capacity of 1,450 m^3/d.

The Elmira WWTP provides tertiary treatment for wastewater generated in the Town of Elmira. The plant is operated under Ministry of the Environment (MOE) Amended Certificate of Approval (C of A) No. 2530-84-BL9Q issued June 8, 2010. The Elmira WWTP has an average day C of A rated capacity of 7,800 m^3/d and a peak flow capacity of 19,500 m^3/d.

The Heidelberg WWTP provides tertiary treatment for wastewater generated in a small community of about 90 homes in the Village of Heidelberg. The plant is operated under MOE Certificate of Approval No. 7707-5NSKGL issued on August 6, 2003. The Heidelberg WWTP has an average day C of A rated capacity of 130 m^3/d and a peak flow capacity of 3.2 L/s.

1.1 Objective

The objective of this Technical Memorandum (TM) is to summarize the process that will be used and the criteria by which the Elmira and St. Jacobs Wastewater Servicing Alternative Solutions will be evaluated.

2. EVALUATION PROCESS

TM No. 7 provides a short list of alternatives to address the wastewater servicing needs of the Communities of Elmira, St. Jacobs, and Heidelberg. These alternatives are summarized in Table 2.1.

Table 2.1 Summary of Short-Listed Alternatives

Community	Alternative
Elmira Wastewater Servicing	Alternative 1B - Continue to reduce I/I and to implement water efficiency programs
St. Jacobs Wastewater Servicing	Alternative 2C - Upgrade and expand the St. Jacobs WWTP
	Alternative 2H - Decommission the St. Jacobs WWTP and transfer flows to the Waterloo WWTP
	Alternative 2I – Upgrade the existing plant and transfer flows beyond the existing capacity of the St Jacobs WWTP to the Waterloo WWTP
Heidelberg Wastewater Servicing	Alternative 3A - Maintain existing Heidelberg WWTP
	Alternative 3B - Decommission the Heidelberg WWTP and transfer flows to the St. Jacobs WWTP
	Alternative 3C - Decommission the Heidelberg WWTP and transfer flows to the Waterloo WWTP

Since the preferred alternative for the servicing of the Community of Elmira is already selected, this alternative will not be evaluated further. Each alternative identified in the short-list of alternatives for the servicing of St. Jacobs will be evaluated in combination with alternatives for the servicing of Heidelberg. The evaluation will be conducted to determine the Preferred Feasible Combination of Alternatives (Option) for the servicing of St. Jacobs and Heidelberg.

This TM establishes the evaluation criteria which will be used to form the foundation for evaluating the servicing options. The evaluation criteria are presented in Table 2.2.

Although the "satisfaction of objectives" evaluation criterion was used in TM No 7 to eliminate the long list of alternatives and to develop the short-list, this evaluation criterion has been listed again to evaluate each option in detail for its ability to meet this criterion.

Table 2.2 Evaluation Criteria

EA Category	Criteria	Description
Technical	Satisfaction of objectives	• Degree to which option addresses wastewater servicing needs for the Communities of Elmira, St. Jacobs, and Heidelberg to 2041 and does not restrict planned growth.
	Consistent with regulatory requirements, policies, guidelines and standards	• Degree to which the option complies with Federal, and Provincial regulatory requirements, and Regional policies, guidelines and standards for planning and construction, including sustainability policy.
	Technical feasibility	• Ease of implementation. • Constructability. • Operational capability. • Potential for phased construction. • Ability to meet projected future effluent limits.
	System complexity	• Number of facilities to be managed. • Operational requirements for facilities.
Environmental	Surface water impacts	• Potential impacts on surface water resources.
	Groundwater impacts	• Potential impacts on groundwater quality and quantity.
	Land requirement	• Land requirement for construction. • Land recovered due to decommissioning.
	Impacts on Natural Environment During Construction	• Impact of construction on core environmental features.
Social	Socio-economic impacts	• Potential noise, dust, odour, traffic, etc. impacts on adjacent land owners during construction. • Potential noise, dust, odour, traffic, etc. impacts on adjacent land owners during operation.
	Impacts on Archaeological and Heritage Resources	• Impacts on archaeological and heritage resources, including First Nations impacts.
Economical	Capital, operating and maintenance, and life cycle costs	• Capital costs. • Land acquisition costs. • Operating and maintenance costs. • Net present value life cycle costs. • Impact on investments in upgrades already made.

The options will be evaluated against each criterion using the following general methodology:

1. For each criterion, options will be evaluated as:
   - ○ No impact
   - ◔ Negligible impact
   - ◑ Minor impact
   - ◕ Moderate impact
   - ● High impact
2. Each EA Category (Technical, Environmental, Social and Economical) are considered to have equal weight.
3. Based on the results of the evaluation, options will be ranked from most preferred to least preferred.

Table 2.3 presents an evaluation matrix that will be used to evaluate the options and rank each option to determine the least and most preferred option. The servicing options will be evaluated and Table 2.3 will be completed during the Alternatives Comparison Workshop.

Table 2.3 Evaluation Matrix

Options	Technical					Environmental					Social			Economical		Overall Ranking (Score)
	Satisfaction of objectives	Consistent with regulatory requirements, policies, guidelines and standards	Technical feasibility	System complexity	Average Score	Surface water impacts	Ground-water impacts	Land require-ment	Impacts on Natural Environment During Construction	Average Score	Socio-economic impacts	Impacts on Archae-logical and Heritage Resources	Average Score	Capital, operating and maintenance, and life cycle costs	Average Score	
Option 1 - Upgrade and expand the St. Jacobs WWTP. Maintain existing Heidelberg WWTP																
Option 2 - Upgrade and expand the St. Jacobs WWTP. Decommission the Heidelberg WWTP and transfer flows to the St. Jacobs WWTP																
Option 3 - Upgrade and expand the St. Jacobs WWTP. Decommission the Heidelberg WWTP and transfer flows to the Waterloo WWTP																
Option 4 - Decommission the St. Jacobs WWTP and transfer flows to the Waterloo WWTP. Maintain existing Heidelberg WWTP																
Option 5 - Decommission the St. Jacobs WWTP and transfer flows to the Waterloo WWTP. Decommission the Heidelberg WWTP and transfer flows to the Waterloo WWTP																
Option 6 - Upgrade the existing plant and transfer flows beyond the existing capacity of the St Jacobs WWTP to the Waterloo WWTP. Maintain existing Heidelberg WWTP																
Option 7 - Upgrade the existing plant and transfer flows beyond the existing capacity of the St Jacobs WWTP to the Waterloo WWTP. Decommission the Heidelberg WWTP and transfer flows to the St. Jacobs WWTP																
Option 8 - Upgrade the existing plant and transfer flows beyond the existing capacity of the St Jacobs WWTP to the Waterloo WWTP. Decommission the Heidelberg WWTP and transfer flows to the Waterloo WWTP																

Notes:



APPENDIX I
PUBLIC, AGENCY, STAKEHOLDER AND ABORIGINAL CONSULTATION

APPENDIX I
PUBLIC, AGENCY, STAKEHOLDER AND ABORIGINAL CONSULTATION

I-1. STEERING COMMITTEE MEETINGS

I-2. PROJECT MAILING LIST

I-3. NOTICE OF COMMENCEMENT

- *NEWSPAPER AD*
- *EXAMPLE LETTERS*

I-4. PUBLIC INFORMATION CENTRE

- *NEWSPAPER AD*
- *EXAMPLE LETTERS*
- *ATTENDANCE RECORD*
- *COMMENT SHEET*
- *DISPLAY BOARDS*
- *HANDOUT*
- *COMMENTS RECEIVED AND RESPONSES*

I-5. AGENCY AND STAKEHOLDER CONSULTATION

- *CORRESPONDENCE AND RESPONSES TO CORRESPONDENCE*

I-6. ABORIGINAL CONSULTATION

- *NOTICE OF COMMENCEMENT LETTERS*
- *NOTICE OF PUBLIC INFORMATION CENTRE LETTERS*
- *NOTICE OF COMPLETION LETTERS*

I-7. NOTICE OF COMPLETION

- *NEWSPAPER AD*
- *EXAMPLE LETTERS*

I-1

STEERING COMMITTEE MEETINGS

STEERING COMMITTEE MEETING #1
- ***AGENDA***
- ***PRESENTATION MATERIAL***
- ***MEETING NOTES***

STEERING COMMITTEE MEETING #2
- ***AGENDA***
- ***PRESENTATION MATERIALS***
- ***MEETING NOTES***

STEERING COMMITTEE MEETING #3
- ***AGENDA***
- ***PRESENTATION MATERIAL***
- ***MEETING NOTES***

STEERING COMMITTEE MEETING #1

JUNE 3, 2011

- ***AGENDA***
- ***PRESENTATION MATERIAL***
- ***MEETING NOTES***

ST. JACOBS – ELMIRA
WASTEWATER TREATMENT MASTER PLAN

Project Steering Committee Meeting No. 1

June 3, 2011; 9:00 – 11:00 AM

Regional Headquarters, Room 217

AGENDA

1. Welcome and Introduction
2. Role of the Project Steering Committee
3. Purpose and Background to the Study
4. Overview of the Project Work Plan and Project Schedule
5. Consultation Strategy
6. Overview of Work Completed to Date
   - Existing Conditions
   - Future Populations and Future Flows
   - Review of Extraneous Flow Reduction Programs
   - Assimilative Capacity Review
7. Next Steps and Timing
8. Next Meeting

Region of Waterloo

St. Jacobs – Elmira Wastewater Treatment Master Plan

Project Steering Committee Meeting No. 1
June 3, 2011

XCG Hatch Mott MacDonald



Meeting Agenda

- Welcome and Introduction
- Role of the Project Steering Committee
- Purpose and Background to the Study
- Overview of the Project Work Plan and Project Schedule
- Consultation Strategy
- Overview of Work Completed to Date
  - Existing Conditions
  - Future Populations and Future Flows
  - Review of Extraneous Flow Reduction Programs
  - Assimilative Capacity Review
- Next Steps and Timing





Role of the Project Steering Committee

XCG Hatch Mott MacDonald



Project Organization

Steering Committee

Township Councillor
Mark Bauman (St. Jacobs)
Allan Poffenroth (Elmira)

Township Staff
Dan Kennaley

Region Staff
Nancy Kodousek
Jorge Cavalcante

Regional Councillor
Todd Cowan (Mayor of Woolwich)

GRCA
Mark Anderson

City of Waterloo Staff
Denise McGoldrick

Project Team

Region Staff
Pam Law
Hennie Fourie
Khalid Mehmood
Nancy Kodousek
Jorge Calvacante

Township Staff
Dan Kennaley

Consultants
Stephen Nutt (XCG)
Christine Hill (XCG)
Janet Noyes (XCG)
Mark Stimup (HMM)
Dianne Damman (D.C. Damman)

Role of the Project Steering Committee

The role of the Project Steering Committee is to provide advice to the Project Team during the course of the project.



Purpose and Background to the Study

XCG Hatch Mott MacDonald

Study Objective

- The Region of Waterloo is undertaking a Wastewater Treatment Master Plan (WWTMP) for both the Elmira and St. Jacobs communities concurrently.
- The Master Plan will review wastewater treatment conditions in these communities and recommend a wastewater treatment strategy to meet growth in the communities for the next 30 years
- The study will consider wastewater treatment requirements for Elmira and St. Jacobs and will also consider the feasibility of incorporating flows from the Heidelberg WWTP into an overall solution.

Background to the Study

- St. Jacobs and Elmira WWTP discharge to the Conestogo River and Canagagigue Creek, respectively, and are both situated within the Grand River watershed.
- In 2007, the Region carried out a Region-wide WWTMP. This identified that both the Conestogo River and the Canagagigue Creek are MOE Policy 2 receivers for total phosphorus and Policy 1 receivers for Unionized Ammonia.

Background to the Study

- The 2007 WWTMP highlighted the need for further investigation of infiltration and inflow (I/I) within both systems.
- A number of studies have been completed:
  - Elmira and St. Jacobs Wastewater Treatment Project – 1997 ESR
  - Water Quality in the Grand River: A summary of current conditions (2000-2004) and Long Term Trends (2006)
  - Wastewater Treatment Master Plan (2007)
  - Water and Wastewater Monitoring Report (2010)
  - Infiltration and Inflow Review (1997)



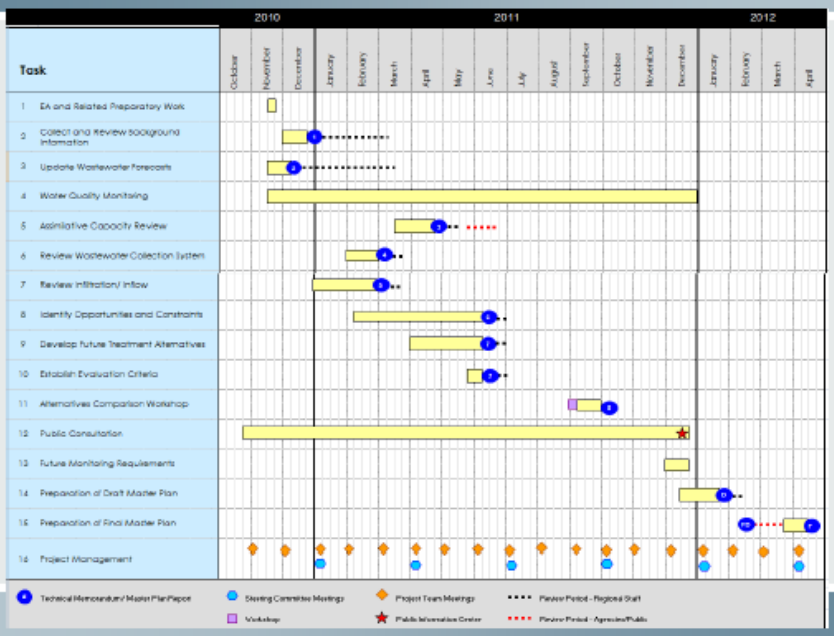
Overview of the Project Work Plan and Project Schedule

XCG Hatch Mott MacDonald

Project Work Plan

Step 1 Master Plan Framework Preparation	• Task 1 – EA and Related Preparatory Work • Task 2 – Collect and Review Background Information • Task 3 – Update Wastewater Forecasts
Step 2 Assimilative Capacity Review	• Task 4 – Water Quality Monitoring Program • Task 5 – Assimilative Capacity Analysis
Step 3 Needs Assessment	• Task 6 – Review Wastewater Collection System • Task 7 – Review I/I • Task 8 – Identify Opportunities and Constraints at WWTPs
Step 4 Identify Alternatives to Satisfy Needs	• Task 9 – Develop Future Wastewater Treatment Alternatives
Step 5 Select Preferred Alternative	• Task 10 – Establish Evaluation Criteria • Task 11 – Alternatives Comparison Workshop • Task 12 – Public Consultation • Task 13 – Recommend Future Monitoring • Task 14 – Preparation of Draft Master Plan
Step 6 Other Related Topics and Final Report	• Task 15 – Preparation of Final Master Plan Report • Task 16 – Project Management

Project Schedule





Public and Agency Consultation Program

XCG Hatch Mott MacDonald



Public and Agency Consultation

- Agency and Stakeholder Contact List
- Public Notices – Commencement, PIC, Completion
- Public Information Centre (December 2011)
- Region of Waterloo Web Site

Agency and Stakeholder Contact List

- Provincial Agencies (MOE, MNR, OMAFRA, MAA, ORC, MTC, MTO, MMAH, GRCA)
- Federal Agencies (INAC)
- Municipal Contacts

Agency and Stakeholder Contact List

- Utilities
- First Nations
- Special Interest Groups
- Stakeholders

Responses to Date

- Interest in study from developers and consultants (e.g., Valley View Heights Ltd.)
- Request for Region to examine feasibility of diverting some or all of the sanitary flows from the St. Jacobs WWTP to the City of Waterloo WWTP (Meritech Engineering on behalf of Valley View Heights)
- Requests for on-going notifications and project information to be provided to agencies



Existing Conditions

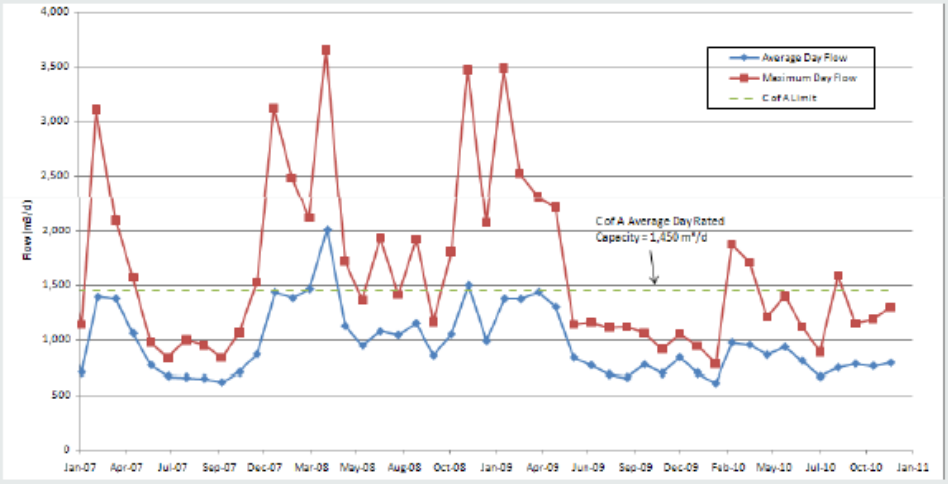
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Objectives

- Summarize historical flows and loadings for the three WWTPs;
- Summarize and compare historical effluent quality to C of A requirements for the three WWTPs; and
- Summarize any known process or hydraulic limitations at the three WWTPs.

St. Jacobs WWTP

St. Jacobs WWTP Flow (2007 – 2010)



St. Jacobs WWTP

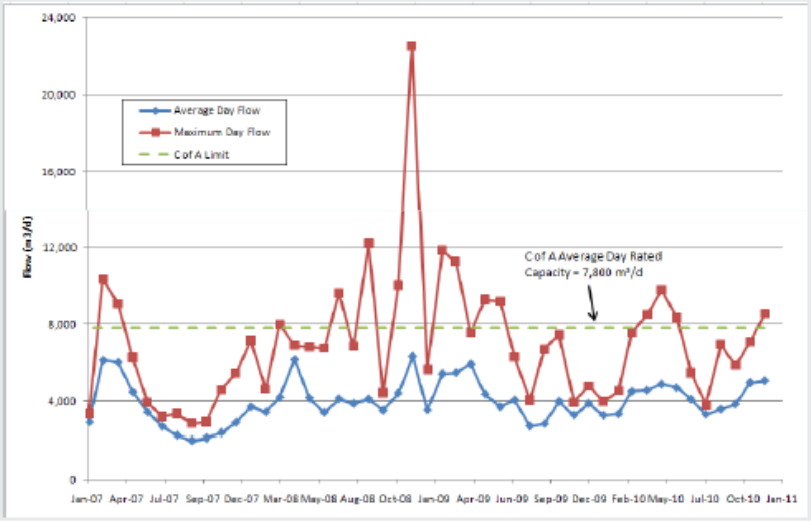
Historical Effluent Wastewater Concentrations (2007 – 2010)

Year	Average Concentration (mg/L)				
	$cBOD_5$	TSS	TP	TAN (May-Oct)	TAN (Nov-Apr)
2007	3.2 (12.5)	7.9 (39.9)	0.29 (1.54)	0.22 (0.64)	0.38 (1.04)
2008	2.0 (2.1)	3.2 (5.3)	0.18 (0.80)	0.30 (0.68)	0.35 (1.25)
2009	2.1 (2.9)	4.4 (10.6)	0.13 (0.24)	0.21 (0.52)	0.32 (0.72)
2010	2.0 (2.3)	3.3 (8.0)	0.13 (0.24)	0.13 (0.26)	0.28 (0.67)
C of A Objective	5	5	0.2	0.7	1.0
C of A Non-Compliance Limit (1)	*10*	*10*	*0.3*	*1.0*	*2.0*

Notes:
Values in parenthesis represent maximum monthly average concentrations.
1. Based on monthly average concentrations.

Elmira WWTP

Elmira WWTP Flow (2007 – 2010)



Elmira WWTP

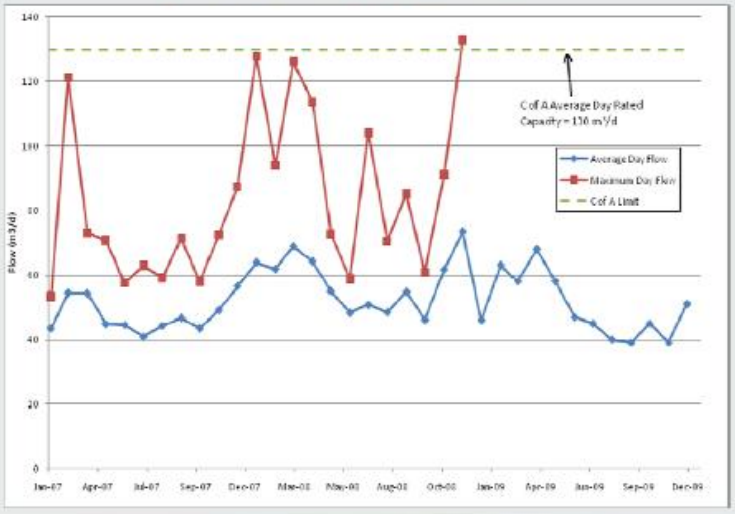
Historical Effluent Wastewater Concentrations (2007 – 2010)

Year	Average Concentration (mg/L)				
	$cBOD_5$	TSS	TP	TAN (May-Oct)	TAN (Nov-Apr)
2007	2.3 (3.0)	4.9 (9.2)	0.40 (1.44)	0.35 (0.68)	0.10 (0.10)
2008	3.4 (9.0)	6.6 (27.9)	0.18 (0.48)	4.01 (12.67)	2.44 (8.83)
2009	2.3 (3.9)	2.8 (4.5)	0.08 (0.11)	0.11 (0.17)	5.66 (11.50)
2010	2.3 (3.1)	2.8 (3.7)	0.14 (0.31)	0.11 (0.16)	0.63 (1.96)
C of A Objective	5	5	0.2	0.4	1.0
C of A Non-Compliance Limit (1)	*10*	*10*	*0.5*	*0.7*	*2.0*

Notes:
Values in parenthesis represent maximum monthly average concentrations.
1. Based on monthly average concentrations.

Heidelberg WWTP

Heidelberg WWTP Flow (2007 – 2009)



Heidelberg WWTP

Historical Effluent Wastewater Concentrations (2007 – 2009)

Year	Average Concentration (mg/L)				
	$cBOD_5$	TSS	TP	TAN (May-Oct)	TAN (Nov-Apr)
2007	2.0 (2.0)	2.5 (4.9)	0.18 (0.80)	0.37 (1.44)	0.15 (0.41)
2008	2.1 (2.6)	3.7 (5.8)	0.13 (0.25)	0.13 (0.27)	0.17 (0.41)
2009	2.0 (2.0)	3.8 (6.4)	0.10 (0.17)	0.14 (0.23)	0.20 (0.62)
C of A Objective	5	5	0.2	0.4	1.0
C of A Non-Compliance Limit (1)	*10*	*10*	*0.5*	*0.7*	*2.0*

Notes:
Values in parenthesis represent maximum monthly average concentrations.
1. Based on monthly average concentrations.





Future Populations and Future Flows

XCG Hatch Mott MacDonald



Objectives

- Summarize current wastewater flows (total and per capita) for the three WWTPs; and
- Calculate wastewater ADF flow projections for the study area to the year 2041.

Assumptions - Population

- A projected population of 3,660 was used as the basis for the WWTMP for St. Jacobs, as it represents a population reasonably consistent with full build-out of the land within the Countryside Line.

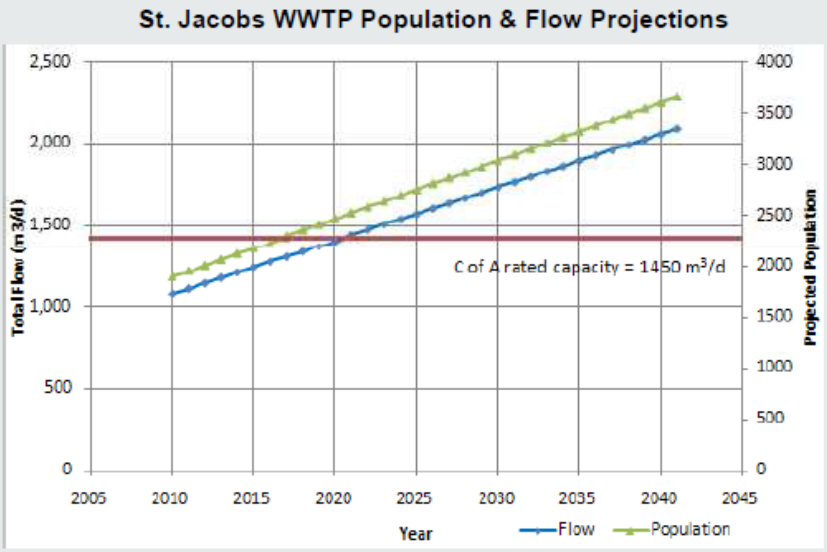
	2010	2011	2016	2021	2026	2031	2036	2041
St. Jacobs	1,893	1,950	2,235	2,520	2,805	3,090	3,375	3,660
Elmira	10,325	10,639	12,209	14,039	15,869	17,699	19,529	21,359

- The populations of 3,660 for St. Jacobs and 21,359 for Elmira in 2041, were agreed upon between the Township and Region's Planning Departments, and while used for the purposes of the St. Jacobs – Elmira WWTMP, are adopted by the Region for this purpose only.

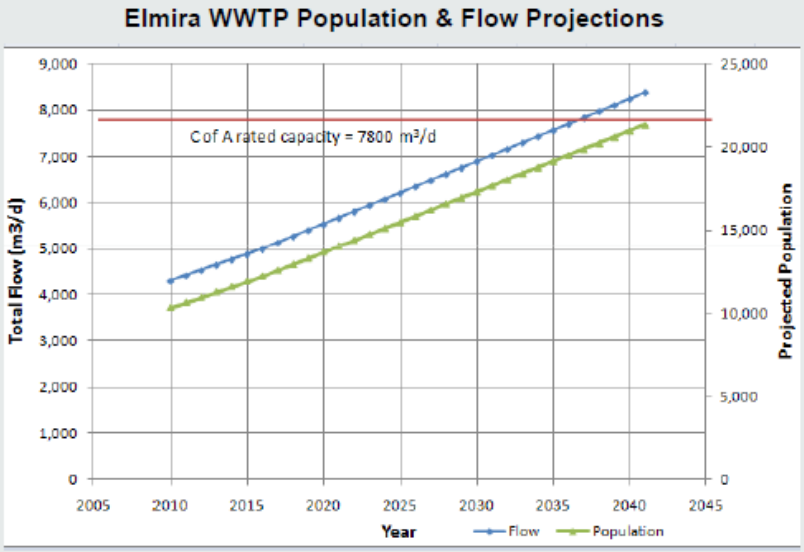
Assumptions – Per Capita

- The historic 2005 to 2009 average per capita flow for each plant is based on the average day flow (ADF) from 2005 to 2009 and the 2009 service population.
- This historic average per capita flow, inclusive of extraneous flow, is multiplied by the updated population growth projections to project flows for future growth up to 2041.

St. Jacobs WWTP



Elmira WWTP



Summary of 2041 Flow Projections

Year	Projected Total Flows – St. Jacobs WWTP (m³/d)	Projected Total Flows – Elmira WWTP (m³/d)	Projected Total Flows – Heidelberg WWTP (m³/d)	Projected Total Flows – Wastewater Treatment Service Area (m³/d)
Current (2005 - 2009)	1,050	4,024	51	5,125
2011	1,115	4,410	51	5,576
2016	1,278	4,991	51	6,320
2021	1,441	5,668	51	7,160
2026	1,604	6,345	51	8,000
2029	1,702	6,751	51	8,504
2031	1,767	7,022	51	8,840
2041	2,093	8,376	51	10,520
C of A Rated Capacity	**1,450**	**7,800**	**130**	**9,380**





Review of Extraneous Flow Reduction Programs

XCG Hatch Mott MacDonald



I/I in St. Jacobs & Elmira

- Both systems experience significant I/I, which takes up valuable conveyance and treatment capacity.
- 1997 Wastewater Treatment Class EA set peak flow reduction targets (to be met by 2008), including:
  - 205 L/s or 39% reduction for Elmira
  - 39 L/s or 62% reduction for St. Jacobs
- Over past 10+ yrs, Township has completed numerous I/I reconstruction/rehab projects to achieve these targets.

St. Jacobs I/I Problem

- Excessive I/I is indicated by:
  - Sewage flows always > water demand, even during drier periods;
  - Sewage flows highest in Spring and remain high for several months;
  - Sewage flows often during Fall, Winter and Spring > capacity of St Jacobs WWTP (1,450 m^3)
- I/I is endemic throughout the system.
- Remaining I/I sources include gravity sewer connections of foundation drains and sewer lateral deficiencies.

Elmira I/I Problem

- Excessive I/I is indicated by:
  - Sewage flows highest in Spring and remain high for several months;
  - Sewage flows often during Fall, Winter and Spring > capacity of Elmira WWTP (7,800 m^3/d)
- Primary source of I/I is private side direct connections, exacerbated by high groundwater levels.

Conclusions – St. Jacobs

- Township has undertaken a comprehensive and systematic approach to identifying and quantifying I/I.
- On-going rehab program to fix 61 manholes.
- Public side rehabilitation work has not reduced I/I to extent expected.
- Flow data shows generally downward trend but benefits difficult to quantify.



Conclusions – St. Jacobs

- Private side I/I works are required to achieve targets.
- Township proceeding to investigate and evaluate options to address foundation drains and deficient sewer laterals.
- Detailed cost-effect analysis is being completed to establish costs of 3rd pipe or sump pump solution.
- Township should continue to implement MH rehab program and consider reprioritizing minor deficiencies on public and private side.

Conclusions – Elmira

- Township has completed extensive work to address I/I, including 5 areas found to contribute most excessive I/I.
- New sanitary sewers and 3rd pipes were installed and monitoring concluded they had achieved:
  - 34% of target I/I reduction based on monthly peak flow
  - 25% of target I/I reduction based on average day flow
- Township has completed several sewer reconstruction projects to repair deficiencies in public system.

Conclusions – Elmira

- Township evaluated 3rd pipe and sump pump solutions for Birdland area but found both to be cost prohibitive.
- Ongoing efforts include inspection of sewer laterals, relining of deficient laterals, flow monitoring in new subdivisions, and spot repairs in sewers.
- In the long term, Township intends to continue to evaluate alternative approaches to I/I reduction.





River Monitoring Program and Assimilative Capacity Review

XCG Hatch Mott MacDonald



River Monitoring Program

- Monitoring Program started in December 2010 and will continue until November 2011
- Sampling twice per month for a period of 12 months total
- Sampling protocol set up to closely reflect the Surface Quality Monitoring Program – Standard Operating Procedures

Sampling Locations – St. Jacobs WWTP



Sampling Locations – Elmira WWTP



Water Quality Parameters of Interest

Parameter	PWQMN Code	Rationale
Required In-Stream Sampling Parameters		
Field Temperature	FWTEMP	Necessary to determine un-ionized ammonia.
Field pH	FWPH	Necessary to determine un-ionized ammonia.
Dissolved Oxygen	DO	Necessary for defining Policy conditions of receiver.
Conductivity	CONDAM	For consistency with other Region of Waterloo stations.
Required Laboratory Sampling Parameters		
5-day Biological oxygen demand	BOD5	Necessary for defining ambient conditions.
Total suspended solids	TSS	Necessary for defining ambient conditions.
Total phosphorus	PPUT	Necessary for defining Policy conditions of receiver.
Total ammonia	NNHTUR	Necessary to determine un-ionized ammonia.
E. coli	EC	Necessary for defining Policy conditions of receiver.
Nitrate	NN03UR	Currently not necessary. Likely to have a PWQO in the near future.
Nitrite	NNO2UR	For consistency with other Region of Waterloo stations.
Total Kjeldahl Nitrogen	NNTKUR	For consistency with other Region of Waterloo stations.
Chloride	CLIDUR	For consistency with other Region of Waterloo stations.
Orthophosphate	PPO4FR	For consistency with other Region of Waterloo stations.

Assimilative Capacity Review

- Using standard MOE procedures and historic water quality and flow information to establish effluent limits
- Draft Technical Memorandum summarizes the outcome, and this document has been prepared and submitted for review by the Region
- Following review by the Region, the document will be submitted to the MOE





Next Steps and Timing

XCG Hatch Mott MacDonald



STEERING COMMITTEE MEETING No. 1
MEETING NOTES

XCG File No.: 3-035-51-01

Meeting Date:	June 3, 2011; 9:00 AM
Location:	Regional Headquarters
Attendees:	Pam Law (PL), RMOW Nancy Kodousek (NK), RMOW Jorge Calvacante (JC), RMOW Todd Cowan (TC) Woolwich Twp. Dan Kennaley (DK), Woolwich Twp. Denise McGoldrick (DM), City of Waterloo Mark Anderson (MA), GRCA Stephen Nutt (SN), XCG Consultants Christine Hill (CH), XCG Consultants Mark Stirrup (MS), Hatch Mott MacDonald Dianne Damman (DD), D.C. Damman and Associates
Regrets:	Mark Bauman, Woolwich Twp. Allan Poffenroth, Woolwich Twp.
Re:	**St. Jacobs – Elmira Wastewater Master Plan**

Item	Action
1. Welcome and Introductions • PL welcomed everyone to the first meeting of the Steering Committee. She noted that she will meet with Councillors Bauman and Poffenroth to provide them with an update as they could not attend this meeting.	PL
2. Role of the Project Steering Committee • PL reviewed the project organization and the role of the Project Steering Committee. The role of the Project Steering Committee is to provide advice to the Project Team during the course of the project.	

Item	Action

3. Purpose and Background to the Study

- SN outlined the purpose and background to the study. He noted that the objective of the Master Plan was to review wastewater treatment conditions in St. Jacobs and Elmira, and to recommend a wastewater treatment strategy to meet growth in these communities for the next 30 years.

4. Overview of the Project Work Plan and Project Schedule

- SN provided an overview of the project work plan and project schedule. He noted the current project status relative to the overall work plan and schedule.
- Further details on the project work plan and schedule are provided in the meeting presentation materials, included with these meeting notes.

5. Consultation Strategy

- DD provided an overview of the public and agency consultation program. She noted that the main public and agency consultation tools included: an agency and stakeholder contact list; public notices; a public information centre; and postings on the Region of Waterloo web site.
- It was noted that the Notice of Study Commencement was published in local papers and sent to those on the contact list in November 2010.
- DD noted that, to date, the responses received on the study have been fairly standard, advising of agency expectations and policy and regulatory requirements that should be considered in the study. She noted that there has been interest from developers and consultants. For example, Meritech Engineering, on behalf of Valley View Heights, requested that the Region examine the feasibility of diverting some or all of the sanitary flows from the St. Jacobs wastewater treatment plant (WWTP) to the Waterloo WWTP.
- MA asked whether the Six Nations and City of Brantford had been notified of the study. DD advised that the Six Nations have been notified (no response to date) and that the City of Brantford had not been contacted to date.

Item	Action

6. Overview of Work Completed to Date

Existing Conditions

- SN provided the following information for the St. Jacobs, Elmira and Heidelberg WWTPs: historical flows and loadings; historical effluent quality relative to Certificate of Approval (C of A) requirements; and any known process or hydraulic limitations.
- SN noted that data are to be obtained for April to May 2011 for the St. Jacobs WWTP. It is expected that the data will show that flows were up significantly during this time period due to high levels of precipitation.
- SN noted that the overall performance for the St. Jacobs WWTP was good but close to the limits of what can be achieved at the plant.
- NK noted that the monthly data trends for 2011 are showing that flows in Woolwich increased more than any other area in the Region during the wet weather period in April and May 2011.
- MA noted that he can provide rainfall data. It was also noted that this information may be available on the GRCA web site. — MA
- SN noted that the Elmira WWTP has similar effluent limits as the St. Jacobs WWTP (i.e. stringent). He noted that this plant is more sophisticated than the St. Jacobs WWTP since it has biological nitrogen removal. He noted that the WWTP was close to the effluent limits for phosphorus and nitrogen.
- In reference to the Heidelberg WWTP, SN noted that the plant does not have the same level of extraneous flow problems as the St. Jacobs and Elmira WWTPs. He noted that there is still available capacity at this plant. The plant generally performs well; however, it also has very stringent effluent limits and is expensive to operate.

Future Populations and Future Flows

- SN noted that populations of 3,660 for St. Jacobs and 21,359 for Elmira in 2041 were agreed upon between the Township and Region's Planning Departments, and while these figures are being used for purposes of this Master Plan, they are adopted by the Region for this purpose only.

Item	Action

- SN noted that future flows were determined for future growth to 2041.
- SN noted that, based on the population and flow projections, the St. Jacobs WWTP will reach its capacity around 2020.
- For the Elmira WWTP, current Industrial, Commercial and Institutional (ICI) flows other than the five main industrial contributors were included in the per capita flows. The projections were based on the assumption that future ICI growth will be consistent with the current proportion of ICI in the community. Flows from the five main industrial wastewater contributors were added to the residential flow projections that incorporate the general ICI contributions.
- SN noted that, based on the population and flow projections, the Elmira WWTP will reach its capacity around 2036, assuming that the plant can continue to handle flows at its current rated capacity. He noted that at times flows are either too diluted or at a high concentration. He noted that there are currently four equalization tanks (wet weather storage tanks) to address peak flows. NK noted that two additional equalization tanks will be commissioned at the Elmira WWTP in June.
- SN noted that, of the St. Jacobs and Elmira WWTPs, the St. Jacobs WWTP is more critical in terms of timing as flows are projected to increase to the approved ADF level in the nearer term.
- NK noted that the current upgrades to the Waterloo WWTP involve using the existing structures for secondary treatment and optimizing the infrastructure at the facility. These upgrades are being undertaken to meet the requirements for the City of Waterloo over the next 20 years (i.e. 57 ML/ day). In examining the possibility of diverting flows to the Waterloo WWTP, the implications for the City of Waterloo will have to be examined.

Item	Action

- JC noted that the next upgrade of the Waterloo WWTP is expected to occur at some point in the mid-2020s. It is likely that both additional capacity and additional treatment will be required at this time. He noted that the current Master Plan study may show that the transfer of flows from St. Jacobs may be feasible; however, it will be important to ensure that this potential transfer of flows does not "trigger" the need for capacity and treatment upgrades at the Waterloo WWTP in advance of the current anticipated timeline. It will be important to consider this issue in the Master Plan study since an earlier "trigger" of upgrades at the Waterloo WWTP could have significant financial impacts.
- DM noted that a core growth study has been undertaken for the City of Waterloo. NK noted that if population projections have been updated, particularly for the core area of the City of Waterloo, the Region needs to be aware of these changes. PL to obtain a copy of the core growth study. — PL

Review of Extraneous Flow Reduction Programs

- MS provided an overview of the work completed to date on Infiltration/Inflow (I/I) reduction programs. A detailed review of the previous work undertaken by the Township, and recommendations from previous studies, has been undertaken. MS noted that a Technical Memo (TM) has been prepared, which provides more detailed information on the I/I reduction programs.
- NK noted that the biological treatment technology is very sophisticated at the WWTPs. She noted that this treatment technology and high I/I flows do not work well together. The biological treatment process is sensitive to peak flows.
- DM questioned whether there have been any cost estimates for private I/I measures. DK noted that this has been addressed in a preliminary manner only. Some work has been done examining the costs versus benefits of these measures, with the focus on a limited geographic area in Elmira.

Item	Action
• SN noted that at a Master Plan level of detail, the study will be able to indicate whether I/I can be reduced in order to avoid expansion of the WWTP. However, additional work beyond the Master Plan would be required to provide recommendations on how this can be achieved and managed.	
River Monitoring Program and Assimilative Capacity Review	
• SN noted that the river monitoring work, which was initiated in December 2010 and which will continue until November 2011, will not be used as part of the Master Plan assimilative capacity study, but will support future assimilative capacity work. He noted that the monitoring being undertaken as part of the Master Plan will continue after this study is completed as part of the Region's on-going river monitoring program.	
• In response to a query from MA regarding sampling locations, SN noted that the GIS coordinates for the sampling locations will be provided to the GRCA.	SN
• MA noted that for the Elmira WWTP, the upstream flows were controlled by the discharge from the Woolwich Reservoir. MA to check to see if there is a Permit to Take Water (PTTW) for the Woolwich Reservoir. If there is, he will provide a copy to XCG for their consideration in the assimilative capacity work.	MA
• It was also noted that flows on the Conestogo River are controlled by the dam at Conestoga Lake. MA will check to see if there is a PTTW for Conestoga Lake. If there is, he will provide a copy to XCG for their consideration in the assimilative capacity work.	MA
• In response to a question from MA regarding whether the monitoring for DO was continuous, SN noted that it was a "grab" sampling for DO.	
• SN noted that a "desk top" assimilative capacity has been completed and a draft TM documenting this work is being reviewed by the Region. It can be made available to Project Steering Committee members when it is finalized.	
• JC noted that a more detailed assimilative capacity study will likely be required subsequent to the Master Plan study if a plant expansion is the preferred alternative.	

Item	Action

- SN noted that, as part of the assimilative capacity work, there will likely be a meeting with MOE to discuss future treatment requirements for the WWTPs under consideration in this study.

Next Steps and Timing

- SN noted that the focus on the work moving forward will be on the finalization of TMs dealing with assimilative capacity, opportunities and constraints at the WWTPs, developing future wastewater treatment alternatives and establishing the criteria and methods for evaluating these alternatives (i.e. Tasks 8, 9, and 10 of the work plan). After the completion of these tasks, there will be an alternatives comparison workshop to review and evaluate the alternatives. He noted that this workshop is scheduled to be held in early fall.
- PL suggested that Project Steering Committee members should contact her to request copies of any of the following TMs produced to date: — All
  - TM 1A – Background Information;
  - TM 1B – Existing Conditions;
  - TM 2 – Future Flow Projections; and
  - TM 3 – Review of Infiltration and Inflow Reduction Programs.

7. **Next Meeting**
   - It was noted that the next Project Steering Committee meeting will be scheduled this fall, subsequent to the alternatives comparison workshop. PL will be in touch with Project Steering Committee members to schedule this meeting. — PL

Meeting Notes prepared by Dianne Damman, D.C. Damman and Associates.
June 13, 2011
Any errors, omissions, or discrepancies should be reported to author.

STEERING COMMITTEE MEETING #2

APRIL 18, 2012

- ***AGENDA***
- ***PRESENTATION MATERIAL***
- ***MEETING NOTES***

ST. JACOBS – ELMIRA
WASTEWATER TREATMENT MASTER PLAN

Project Steering Committee Meeting No. 2

April 18, 2012; 9:00 – 11:00 AM

Regional Headquarters, Room 217

AGENDA

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1. Welcome and Introduction
2. Project Objectives
3. Future Growth and Flow Projections
4. Long List of Alternatives for Servicing Elmira, St. Jacobs and Heidelberg
5. Short-Listed Alternatives
6. Evaluation Criteria and Methodology
7. Evaluation of Short-Listed Alternatives
8. Preferred Alternative for Servicing Elmira, St. Jacobs and Heidelberg
9. Next Steps

Region of Waterloo

St. Jacobs – Elmira Wastewater Treatment Master Plan

Project Steering Committee Meeting No. 2
April 18, 2012

XCG Hatch Mott MacDonald



Meeting Agenda

- Welcome and Introductions
- Project Objectives
- Future Growth and Flow Projections
- Long-List of Alternatives for Servicing Elmira, St. Jacobs and Heidelberg
- Short-Listed Alternatives
- Evaluation Criteria and Methodology
- Evaluation of Short-Listed Alternatives
- Preferred Alternative for Servicing Elmira, St. Jacobs and Heidelberg
- Next Steps



Region of Waterloo

Project Objectives

XCG Hatch Mott MacDonald



Project Objectives

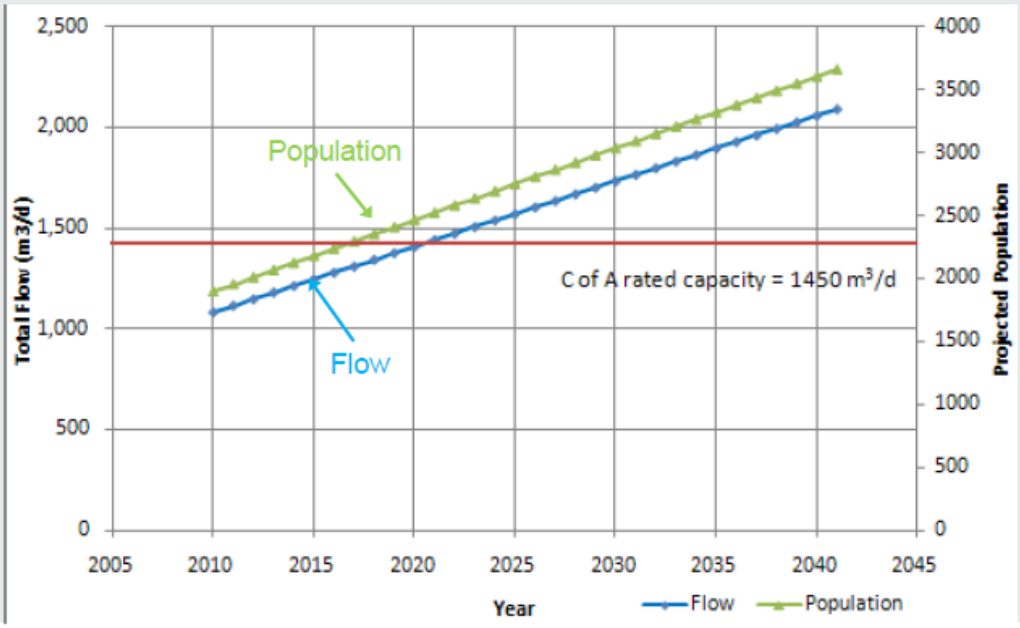
- The Region of Waterloo is undertaking a Wastewater Treatment Master Plan (WWTMP) for both the Elmira and St. Jacobs communities concurrently.
- The Master Plan will review wastewater treatment conditions in these communities and recommend a wastewater treatment strategy to meet growth in the communities for the next 30 years.
- The study will consider wastewater treatment requirements for Elmira and St. Jacobs and will also consider the feasibility of incorporating flows from the Heidelberg WWTP into an overall solution.



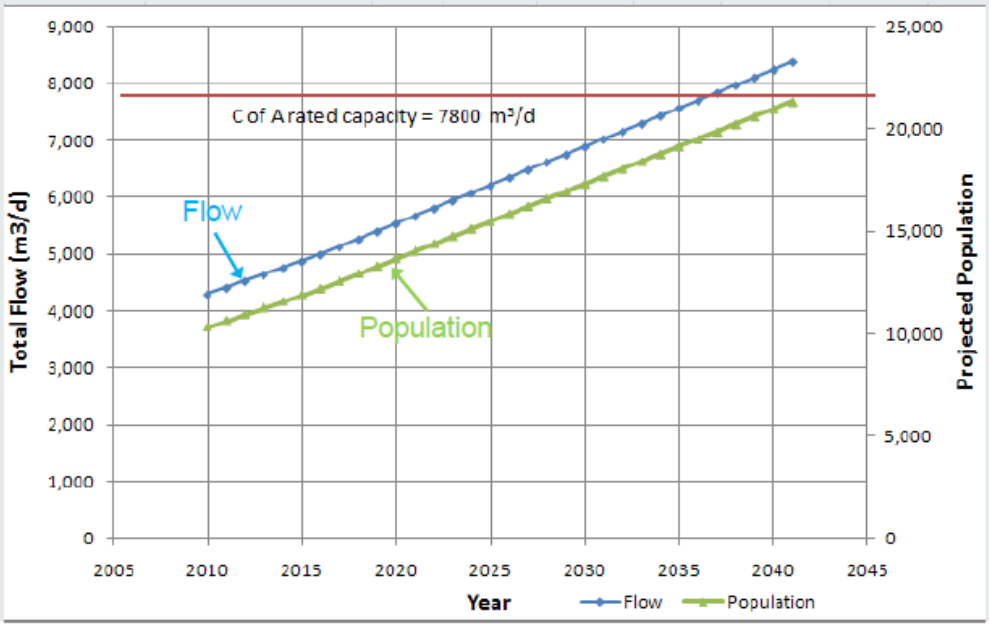
Future Growth and Flow Projections



St. Jacobs Population & Flow Projections



Elmira Population & Flow Projections





Region of Waterloo

Long-List of Alternatives

XCG Hatch Mott MacDonald

Servicing for the Community of Elmira

- Alternative 1A - "Do nothing"
- Alternative 1B - Continue to reduce I/I and to implement water efficiency programs

Servicing for the Community of Elmira

Alternative	Will Alternative Satisfy All Project Objectives?	
	Yes	No
Alternative 1A - "Do nothing"		X
Alternative 1B - Continue to reduce I/I and to implement water efficiency programs	X	

Servicing for the Community of St. Jacobs

- Alternative 2A - "Do nothing"
- Alternative 2B - Continue to reduce I/I and to implement water efficiency programs
- Alternative 2C - Upgrade and expand the St. Jacobs WWTP
- Alternative 2D - Decommission the St. Jacobs WWTP and construct a new WWTP
- Alternative 2E - Upgrade the existing plant and construct a new plant for flows beyond the existing capacity of the St Jacobs WWTP

Servicing for the Community of St. Jacobs

- Alternative 2F - Decommission the St. Jacobs WWTP and transfer flows to the Elmira WWTP
- Alternative 2G - Upgrade the existing plant and transfer flows beyond the existing capacity of the St Jacobs WWTP to the Elmira WWTP
- Alternative 2H - Decommission the St. Jacobs WWTP and transfer flows to the Waterloo WWTP
- Alternative 2I - Upgrade the existing plant and transfer flows beyond the existing capacity of the St Jacobs WWTP to the Waterloo WWTP

Servicing for the Community of St. Jacobs

Alternative	Will Alternative Satisfy All Project Objectives?		Could Alternative be Part of Solution?
	Yes	No	
Alternative 2A - "Do nothing"		X	
Alternative 2B - Continue to reduce I/I and to implement water efficiency programs		X	X
Alternative 2C - Upgrade and expand the St. Jacobs WWTP	X		
Alternative 2D - Decommission the St. Jacobs WWTP and construct a new WWTP		X	
Alternative 2E - Upgrade the existing plant and construct a new plant for flows beyond the existing capacity of the St Jacobs WWTP		X	
Alternative 2F - Decommission the St. Jacobs WWTP and transfer flows to the Elmira WWTP		X	
Alternative 2G – Upgrade the existing plant and transfer flows beyond the existing capacity of the St Jacobs WWTP to the Elmira WWTP		X	
Alternative 2H - Decommission the St. Jacobs WWTP and transfer flows to the Waterloo WWTP	X		
Alternative 2I – Upgrade the existing plant and transfer flows beyond the existing capacity of the St Jacobs WWTP to the Waterloo WWTP	X		

Servicing for the Community of Heidelberg

- Alternative 3A - Maintain existing Heidelberg WWTP
- Alternative 3B - Decommission the Heidelberg WWTP and transfer flows to the St. Jacobs WWTP
- Alternative 3C - Decommission the Heidelberg WWTP and transfer flows to the Waterloo WWTP



Short-Listed Alternatives

Short-Listed Alternatives

Community	Alternative
Elmira Wastewater Servicing	Continue to reduce I/I and to implement water efficiency programs. Optimize and/or upgrade to address limitations
St Jacobs Wastewater Servicing	Upgrade and expand the St. Jacobs WWTP
	Decommission the St. Jacobs WWTP and transfer flows to the Waterloo WWTP
	Upgrade the existing plant and transfer flows beyond the existing capacity of the St. Jacobs WWTP to the Waterloo WWTP
Heidelberg Wastewater Servicing	Maintain existing Heidelberg WWTP
	Decommission the Heidelberg WWTP and transfer flows to the St. Jacobs WWTP
	Decommission the Heidelberg WWTP and transfer flows to the Waterloo WWTP

Servicing of Elmira

- Preferred alternative for servicing the Community of Elmira is “continue to reduce I/I and to implement water efficiency programs”.
- Elmira WWTP will require further investigations to determine if industrial load reductions and optimization can address the capacity limitations that have been identified.

Feasible Options for Servicing St. Jacobs and Heidelberg

Option	St. Jacobs Servicing Component	Heidelberg Servicing Component
1	Upgrade and expand the St. Jacobs WWTP	Maintain existing Heidelberg WWTP
2		Decommission the Heidelberg WWTP and transfer flows to the St. Jacobs WWTP
3		Decommission the Heidelberg WWTP and transfer flows to the Waterloo WWTP
4	Decommission the St. Jacobs WWTP and transfer flows to the Waterloo WWTP	Maintain existing Heidelberg WWTP
5		Decommission the Heidelberg WWTP and transfer flows to the Waterloo WWTP
6	Upgrade the existing plant and transfer flows beyond the existing capacity of the St. Jacobs WWTP to the Waterloo WWTP	Maintain existing Heidelberg WWTP
7		Decommission the Heidelberg WWTP and transfer flows to the St. Jacobs WWTP
8		Decommission the Heidelberg WWTP and transfer flows to the Waterloo WWTP

Option 1

- Upgrade and expand the St. Jacobs WWTP
  - Expand ADF Capacity from 1,450 m^3/d to 2,093 m^3/d
  - Expand PIF Capacity from 3,603 m^3/d to 9,248 m^3/d
- Maintain existing Heidelberg WWTP
  - No upgrade requirements

Option 2

- Upgrade and expand the St. Jacobs WWTP
  - Expand ADF Capacity from 1,450 m^3/d to 2,144 m^3/d
  - Expand PIF Capacity from 3,603 m^3/d to 9,524 m^3/d
- Decommission the Heidelberg WWTP and transfer flows to the St. Jacobs WWTP
  - New SPS at existing WWTP site rated for a PIF of 276 m^3/d and 9.3 km 4" diameter forcemain to transfer flows to St. Jacobs WWTP

Option 3

- Upgrade and expand the St. Jacobs WWTP
  - Expand ADF Capacity from 1,450 m^3/d to 2,093 m^3/d
  - Expand PIF Capacity from 3,603 m^3/d to 9,248 m^3/d
- Decommission the Heidelberg WWTP and transfer flows to the Waterloo WWTP
  - New SPS at existing WWTP site rated for a PIF of 276 m^3/d and 7.8 km 4" diameter forcemain to transfer flows to Waterloo (Connect to Manhole at Weber St. N and Conrad Pl.)

Option 4

- Decommission the St. Jacobs WWTP and transfer flows to the Waterloo WWTP
  - Convert existing secondary clarifiers to equalization basins (Will assume no reduction in PIF)
  - New SPS at the existing WWTP site for a PIF of 10,599 m^3/d and 4.8 km 12" diameter forcemain to transfer flows to Waterloo
- Maintain existing Heidelberg WWTP
  - No upgrade requirements

Option 5

- Decommission the St. Jacobs WWTP and transfer flows to the Waterloo WWTP
  - Convert existing secondary clarifiers to equalization basins (Will assume no reduction in PIF)
  - New SPS at the existing WWTP site for a PIF of 10,599 m^3/d and 4.8 km 12" diameter forcemain to transfer flows to Waterloo
- Decommission the Heidelberg WWTP and transfer flows to the Waterloo WWTP
  - New SPS at existing WWTP site rated for a PIF of 276 m^3/d and 8.5 km 4" diameter forcemain to transfer flows to Waterloo

Option 6

- Upgrade the existing plant and transfer flows beyond the existing capacity of the St. Jacobs WWTP to the Waterloo WWTP
  - Upgrade St. Jacobs WWTP
  - New SPS at the existing WWTP site for a PIF of 6,996 m^3/d and 4.8 km 10" diameter forcemain to transfer flows to Waterloo
- Maintain existing Heidelberg WWTP
  - No upgrade requirements

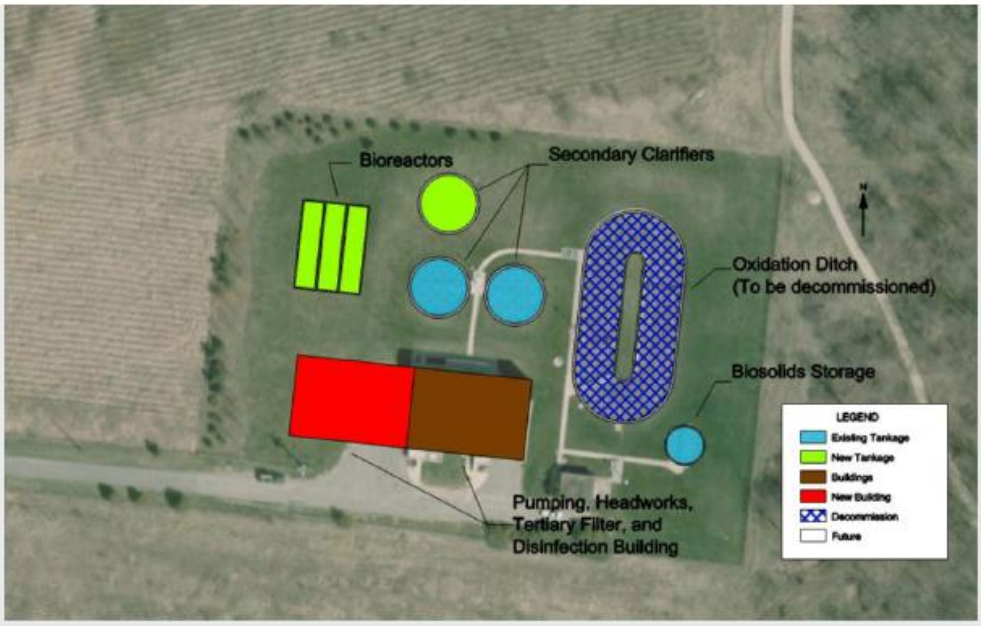
Option 7

- Upgrade the existing plant and transfer flows beyond the existing capacity of the St. Jacobs WWTP to the Waterloo WWTP
  - Upgrade St. Jacobs WWTP
  - New SPS at the existing WWTP site for a PIF of 7,272 m^3/d and 4.8 km 10" diameter forcemain to transfer flows to Waterloo
- Decommission the Heidelberg WWTP and transfer flows to the St. Jacobs WWTP
  - New SPS at existing WWTP site rated for a PIF of 276 m^3/d and 9.3 km 4" diameter forcemain to transfer flows to St. Jacobs WWTP

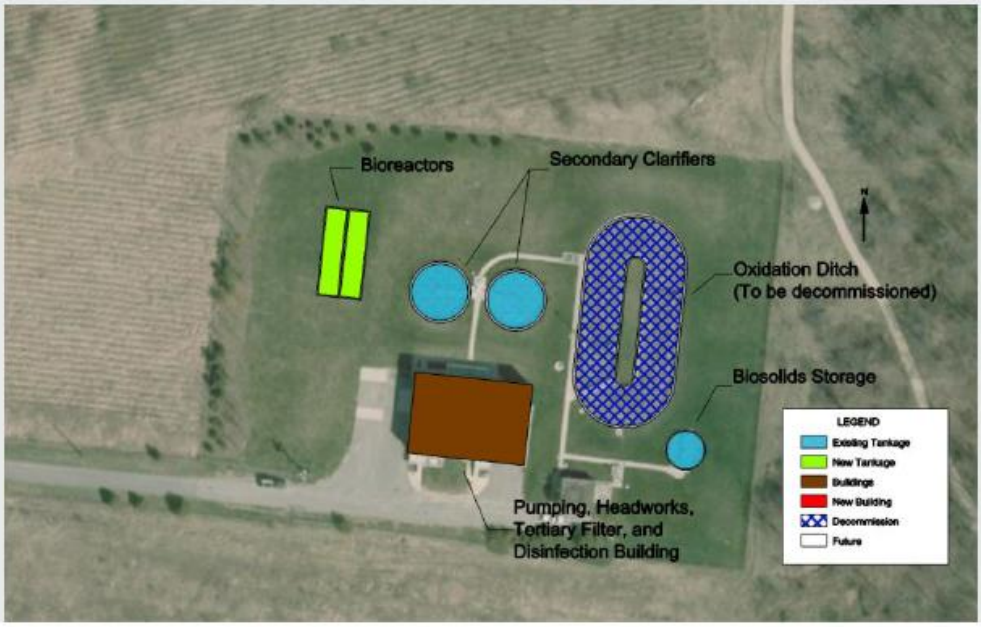
Option 8

- Upgrade the existing plant and transfer flows beyond the existing capacity of the St. Jacobs WWTP to the Waterloo WWTP
  - Upgrade St. Jacobs WWTP
  - New SPS at the existing WWTP site for a PIF of 6,996 m^3/d and 4.8 km 10" diameter forcemain to transfer flows to Waterloo
- Decommission the Heidelberg WWTP and transfer flows to the Waterloo WWTP
  - New SPS at existing WWTP site rated for a PIF of 276 m^3/d and 8.5 km 4" diameter forcemain to transfer flows to Waterloo

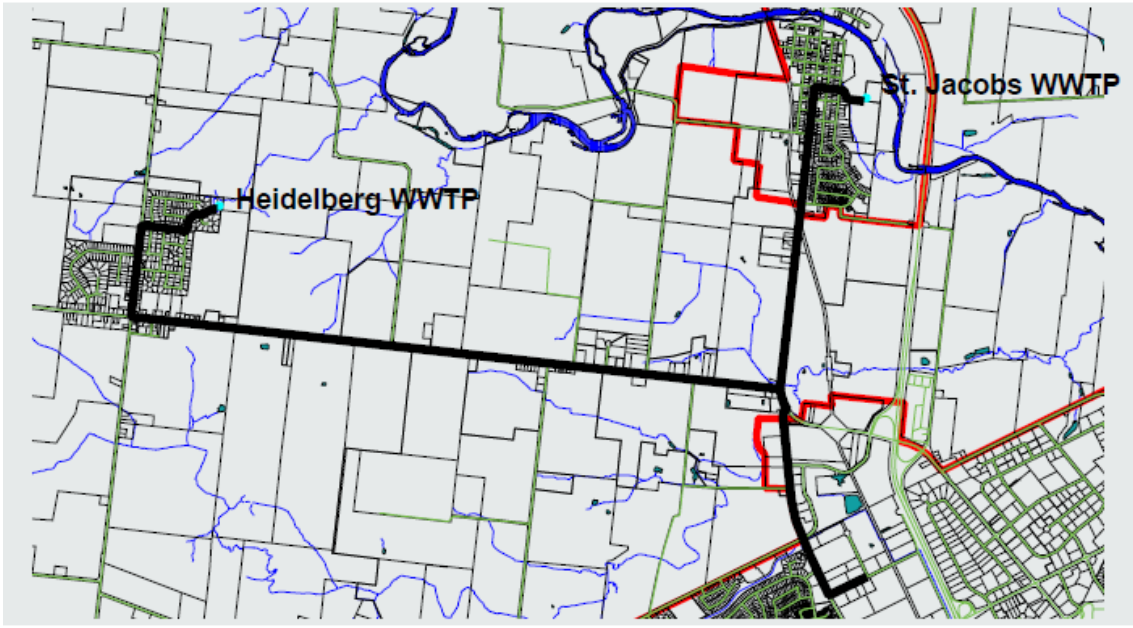
St. Jacobs WWTP Expansion (Option 1, 2, 3) Conceptual Level Site Layout



St. Jacobs WWTP Upgrades (Option 6, 7, 8) Conceptual Level Site Layout



Forcemain Route (Option 2, 3, 4, 5, 6, 7, 8)





Region of Waterloo

Evaluation Criteria & Methodology

XCG Hatch Mott MacDonald

Evaluation Criteria

Criteria	Description
EA Category - Technical	
Satisfaction of objectives	• Degree to which option addresses wastewater servicing needs for the Communities of Elmira, St. Jacobs, and Heidelberg to 2041 and does not restrict planned growth.
Consistent with regulatory requirements, policies, guidelines and standards	• Degree to which the option complies with Federal, and Provincial regulatory requirements, and Regional policies, guidelines and standards for planning and construction, including sustainability policy.
Technical feasibility	• Ease of implementation. • Constructability. • Operational capability. • Potential for phased construction. • Ability to meet projected future effluent limits.
System complexity	• Number of facilities to be managed. • Operational requirements for facilities.

Evaluation Criteria

Criteria	Description
EA Category - Environmental	
Surface water impacts	• Potential impacts on surface water resources.
Groundwater impacts	• Potential impacts on groundwater quality and quantity.
Land requirement	• Land requirement for construction. • Land recovered due to decommissioning.
Impacts on Natural Environment During Construction	• Impact of construction on core environmental features.

Evaluation Criteria

Criteria	Description
EA Category - Social	
Socio-economic impacts	• Potential noise, dust, odour, traffic, etc impacts on adjacent land owners during construction. • Potential noise, dust, odour, traffic, etc impacts on adjacent land owners during operation.
Impacts on Archaeological and Heritage Resources	• Impacts on archeological and heritage resources, including First Nations impacts.
EA Category - Economical	
Capital, operating and maintenance, and life cycle costs	• Capital costs. • Land acquisition costs. • Operating and maintenance costs. • Net present value life cycle costs. • Impact on investments in upgrades already made.

Evaluation Methodology

- For each criterion, options were evaluated as:
  - ○ - No impact
  - ◔ - Negligible impact
  - ◑ - Minor impact
  - ◕ - Moderate impact
  - ● - High impact
- Each EA Category (Technical, Environmental, Social and Economical) was considered to have equal weight.
- Based on the results of the evaluation, options were ranked from most preferred to least preferred.



Evaluation of Short-Listed Alternatives

Satisfaction of Objectives

- All options meet criteria.

Consistent with Regulatory Requirements, Policies, Guidelines and Standards

- All options are consistent with Region's policies, guidelines, and standards, including the sustainability policy
- Options that involve pumping of St Jacobs flows through a forcemain to Waterloo have higher energy consumption and hence higher greenhouse gas (GHG) emissions
- Options that involve pumping of Heidelberg flows through a forcemain do not significantly increase energy use or GHG emissions due to the very low flows involved.

Technical Feasibility

- Pumping stations are easier to operate than WWTPs.
- If St Jacobs is upgraded or expanded, this will involve the largest amount of construction.
- All options are expected to meet projected effluent limits.
- Conversion of WWTPs to pumping stations will result in less impact on operations during construction than expansion or upgrading of the WWTP.
- None of the options provide for significant phasing opportunities.

Technical Feasibility (Continued)

- Additional studies may be required to assess the twinning of the trunk sewers in the City of Waterloo and to select the route.
- No capacity at Waterloo until it is expanded (currently 2030), all capacity before that time has been allocated for the City of Waterloo.

System Complexity

- The decommissioning of both St. Jacobs and Heidelberg WWTPs, and transferring all flows to the Waterloo WWTP, results in the lowest system complexity as only one WWTP will need to be operated.
- Maintaining one of the two plants introduces an increased degree of complexity to the system.
- Maintaining both St. Jacobs and Heidelberg WWTPs results in the highest degree of complexity.

Surface Water Impacts

- Removal of effluent discharge from the St. Jacobs WWTP to the Conestogo River by diverting flow to the Waterloo WWTP and discharging to the Grand River results in a lower impact due to the higher assimilative capacity of the Grand River.
- Since St Jacobs WWTP is located within the regulated area of the floodplain, upgrades or expansions to the plant will require building in the floodplain.
- The decommissioning of the Heidelberg WWTP will have no impact on surface water resources.

Groundwater Impacts

- Pumping flows from Heidelberg will require the construction of a forcemain in a Wellhead Protection Area (WPSA-4 & WPSA-5) and in a Regional Recharge Area, as designated in the Region's Official Plan. However, negligible impacts are expected during construction. Appropriate mitigation measures will be implemented during the construction of the forcemain to minimize impacts.

Note: Regional policy requires that a study be completed for development applications within a Source Water Protection Area to demonstrate that the proposed use will not negatively impact the quantity and/or quality of drinking water resources.

Groundwater Impacts (Continued)

- A forcemain from St. Jacobs to Waterloo will not pass through any Wellhead Protection Areas or Regional Recharge Areas. Therefore, no impact on groundwater is expected.
- The Heidelberg WWTP is located approximately 450 metres from the existing municipal well.

Land Requirement

- Land recovered from decommissioning St. Jacobs WWTP has negligible benefit because it is located in the flood plain and would have very limited development potential for other uses.
- All forcemains will be constructed within existing road allowances; therefore no land acquisition is expected.

Impacts on Natural Environment During Construction

- The St. Jacobs WWTP is located within a Significant Valley Feature, as designated in the Region's Official Plan. Therefore, any option that requires construction at the St. Jacobs WWTP or a forcemain to or from St. Jacobs cross this designated feature.
- The construction of a forcemain from Heidelberg to Waterloo will not impact any Core Environmental Features, as designated in the Region's Official Plan.

Impacts on Natural Environment During Construction (Continued)

- Forcemain routes from St. Jacobs to Waterloo will involve 3 stream crossings.
- Forcemain routes from Heidelberg to St. Jacobs will involve 3 stream crossings.
- Forcemain routes from Heidelberg to Waterloo will involve 2 stream crossings.

Socio-economic Impacts

- Those options that involve construction of forcemains within existing road allowances will cause short term disruption of traffic and property access.
- The expansion of the St. Jacobs WWTP has the lowest impact during construction; impact is primarily associated with truck traffic in and out of the plant during construction on the existing site.
- During the operations phase, long forcemains have the potential for odour problems; however, appropriate measures can be implemented to mitigate these potential impacts.

Socio-economic Impacts (Continued)

- Odours are not expected to be a problem during operation of the WWTPs since appropriate design and mitigation measures will be implemented.
- The duration of construction of the forcemains and upgrade or expansion of the St. Jacobs WWTP is approximately the same.

Impacts on Archaeological and Heritage Resources

- It is not expected that WWTP upgrades and expansion and the construction of forcemains will impact archaeological resources or heritage sites.
- Upgrades to the St. Jacobs WWTP will be on an existing disturbed site, therefore, it is not expected that there will be an impact. In the event that archaeological resources are uncovered during construction, appropriate measures would be undertaken, in accordance with the Ontario Heritage Act.

Capital, operating and maintenance, and life cycle costs

- Options are ranked relative to other options based on life cycle costs.
- Capital and life cycle costs of options that transfer flow to the Waterloo WWTP include the estimated costs of the bringing the Waterloo WWTP expansion forward in time due to the additional flows to be treated.

Life Cycle Cost Summary

Feasible Combination of Alternatives	Capital Cost	Annual O&M Cost	30-Year NPV O&M Cost	30-Year LCC
Option 1	$9,500,000	$192,647	$7,800,000	$17,300,000
Option 2	$15,000,000	$139,862	$5,300,000	$20,300,000
Option 3	$14,100,000	$139,324	$5,300,000	$19,400,000
Option 4	$16,800,000	$181,105	$7,400,000	$24,200,000
Option 5	$21,400,000	$127,782	$4,900,000	$26,300,000
Option 6	$11,500,000	$195,775	$8,000,000	$19,500,000
Option 7	$17,000,000	$142,776	$5,500,000	$22,500,000
Option 8	$16,100,000	$142,452	$5,400,000	$21,500,000

1. Based on the an inflation rate of 3%, interest rate of 3%, and hydro cost of 10 cents/kWh

Evaluation Matrix

Options	Technical					Environmental					Social			Economical		Overall Ranking (Score)
	Satisfact-ion of objectives	Consistent with regulatory require-ments, policies, guidelines and standards	Technical feasibility	System complexity	Average Score	Surface water impacts	Ground-water impacts	Land require-ment	Impacts on Natural Environ-ment During Construct-ion	Average Score	Socio-economic Impacts	Impacts on Archae-logical and Heritage Resources	Average Score	Capital, O&M, and LCC	Average Score	
Option 1	○	○	◔	◑	◔	◑	○	○	◔	◔	◔	○	◔	◔	◔	1 ($\frac{12}{16}$)
Option 2	○	○	◔	◔	◔	◑	◔	○	◑	◔	◑	○	◔	◑	◑	2 ($\frac{19}{16}$)
Option 3	○	○	◑	◔	◔	◑	◔	○	◑	◔	◑	○	◔	◑	◑	3 ($\frac{20}{16}$)
Option 4	○	◔	◔	◔	◔	◔	○	○	◑	◔	◑	○	◔	●	●	6 ($\frac{26}{16}$)
Option 5	○	◔	◔	○	◔	◔	◔	○	◑	◔	◑	○	◔	●	●	6 ($\frac{26}{16}$)
Option 6	○	◔	◑	◑	◔	◑	○	○	◑	◔	◑	○	◔	◑	◑	4 ($\frac{21}{16}$)
Option 7	○	◔	◑	◔	◔	◑	◔	○	◑	◔	◑	○	◔	◕	◕	5 ($\frac{25}{16}$)
Option 8	○	◔	◑	◔	◔	◑	◔	○	◑	◔	◑	○	◔	◕	◕	5 ($\frac{25}{16}$)

Notes:





Preferred Alternative

Preferred Alternative for Servicing Elmira, Heidelberg and St. Jacobs

- Elmira
  - Continue to reduce I/I and to implement water efficiency
  - Optimize or upgrade to address current capacity limitations
- Heidelberg
  - Continue to operate existing facility
  - Review alternatives at the time that the existing works need to be replaced
- St. Jacobs
  - Continue to reduce I/I and to implement water efficiency
  - Upgrade and expand the existing St. Jacobs WWTP on the current site



Region of Waterloo

Next Steps

XCG Hatch Mott MacDonald



Next Steps

- Public Information Centre
- Prepare Master Plan Report
- Issue Notice of Completion and place Report on the Public Record for 30-day review

XCG File No.: 3-035-51-01

Meeting Date:	April 18, 2012; 9:00 AM
Location:	Room 217, Regional Headquarters
Attendees:	Pam Law (PL), RMOW Nancy Kodousek (NK), RMOW Kaoru Yajima (KY), RMOW Todd Cowan (TC) Woolwich Twp. Mark Bauman (MB), Woolwich Twp. Allan Poffenroth (AP), Woolwich Twp. Dan Kennaley (DK), Woolwich Twp. Mark Anderson (MA), GRCA Stephen Nutt (SN), XCG Consultants Mark Stirrup (MS), Hatch Mott MacDonald Dianne Damman (DD), D.C. Damman and Associates
Regrets:	Jorge Calvacante, RMOW Denise McGoldrick, City of Waterloo Christine Hill, XCG Consultants
Re:	**St. Jacobs – Elmira Wastewater Master Plan**

Item	Action

1. **Welcome and Introductions**
   - PL welcomed everyone to the second meeting of the Steering Committee.
2. **Project Objectives**
   - DD reviewed the project objectives, as follows:
     - The Region of Waterloo is undertaking a Wastewater Treatment Master Plan (WWTMP) for both the Elmira and St. Jacobs communities concurrently;
     - The Master Plan will review wastewater treatment conditions in these communities and recommend a wastewater treatment strategy to meet growth in the communities for the next 30 years; and

Item	Action

– The study will consider wastewater treatment requirements for Elmira and St. Jacobs and will also consider the feasibility of incorporating flows from the Heidelberg WWTP into an overall solution.

3. Future Growth and Flow Projections

- SN reviewed the future growth and flow projections for St. Jacobs and Elmira. It was noted that the flow projections are based on current per capita flows. The intention is to continue with I/I reduction and water efficiency programs. Hence, the flow projections are considered to be conservative. Effective I/I reduction will reduce the rate of flow increases and defer capital expenditures related to expansion of the wastewater treatment infrastructure.

4. Long List of Alternatives for Servicing Elmira, St. Jacobs, and Heidelberg

- SN reviewed the servicing alternatives for Elmira which include "do nothing" and continue to reduce I/I and implement water efficiency programs. He noted that the "do nothing" alternative does not satisfy the project objectives.
- The servicing alternatives for St. Jacobs and Heidelberg were discussed.
- There was a question as to whether the Waterloo wastewater treatment plant (WWTP) has capacity to handle the flows for some of the alternatives. It was noted that there is a planned upgrade/expansion for the Waterloo WWTP in 2027. Transferring flows to the Waterloo WWTP from St. Jacobs or Heidelberg would shorten the timeline for the upgrade/expansion of the Waterloo WWTP.
- There was a question as to why the Heidelberg WWTP was so expensive to operate. It was noted that this is a very small plant with a complicated treatment process. By comparison, the Waterloo WWTP is the least costly to operate because of its size and design.
- SN noted that the Master Plan study did not examine the Heidelberg WWTP in detail. This WWTP will have to be examined in greater detail at a future date when the existing works need to be replaced.

Item	Action

5. Short-Listed Alternatives

- SN noted that the preferred alternative for Elmira is to continue to reduce I/I and implement water efficiency programs. Further investigations to determine if industrial load reductions and optimization can address the capacity limitations that have been identified will be needed during the planning period.
- SN reviewed the short listed alternatives and explained how the alternatives were combined to produce eight feasible options for servicing St. Jacobs and Heidelberg.

6. Evaluation Criteria and Methodology

- SN explained the qualitative evaluation which examined the relative differences between options. Each category (i.e. technical, environmental, social, economical) was assigned an equal weight. This removed any bias where there are more than one criteria in a category (e.g. only one criteria under Economical but four criteria under Technical). An average score for each category was developed and these scores were added together to determine the overall ranking of options.

7. Evaluation of Options

- SN reviewed the basis for the scoring of each option under each criteria.
- DK confirmed that there are no local natural environmental features of concern, beyond those designated in the Regional Official Plan.
- The issue of I/I reduction in St. Jacobs was discussed. It was noted that the Township has been working on the issue of I/I reduction and is continuing to examine options for I/I reduction. DK noted that Stantec has just submitted a final report addressing I/I in St. Jacobs (report to go to Township Council within the next few months). He noted that I/I problems are also being addressed as part of road re-construction projects.
- NK asked DK whether I/I problems from new development have been resolved. DK noted that new development is monitored before the Township assumes the services. If I/I levels are higher than they should be, the Township does not assume the services until I/I is reduced to an acceptable level.

Item	Action

- SN noted that the Master Plan has not taken into account any specific I/I reductions in considering the size and timing for the expansion of the St. Jacobs WWTP. SN noted that the Master Plan will recommend that a comprehensive plan for I/I reduction be developed and undertaken.
- SN noted that the Region will have to undertake a Schedule C project under the Municipal Class Environmental Assessment (EA) for the expansion of the St. Jacobs WWTP if this is determined to be the preferred alternative. This Schedule C Class EA will provide a potential opportunity to examine the I/I program in greater detail.
- MB asked whether the construction to expand the St. Jacobs WWTP will involve dewatering. He noted that decreased inflow rates were noted previously when dewatering had been undertaken on the site. SN confirmed that dewatering would be required.
- DK asked about the approximate timing for replacement of the Heidelberg WWTP. SN noted that it may be within the next ten years. PL noted that the Region will be considering this issue as part of their asset management plan.
- It was noted that, generally, the Grand River has greater assimilative capacity than the Conestogo River or other watercourses such as Canagagigue Creek. SN noted that there have been preliminary discussions with the MOE regarding assimilative capacity. MOE have indicated that an expanded St. Jacobs WWTP will have more stringent effluent limits than the existing plant. This issue will have to be further addressed in the Schedule C Class EA for the St. Jacobs WWTP.

8. Preferred Alternative for Servicing Elmira, St. Jacobs and Heidelberg

- SN noted that, based on the evaluation methodology used, the preferred alternative includes the following:
  - Elmira
    - Continue to reduce I/I and to implement water efficiency; and
    - Optimize or upgrade to address current capacity limitations.

Item	Action

  - Heidelberg
    - Continue to operate existing facility; and
    - Review alternatives at the time that the existing works need to be replaced.
  - St. Jacobs
    - Continue to reduce I/I and to implement water efficiency; and
    - Upgrade and expand the existing St. Jacobs WWTP on the current site.
- SN noted that the project team also undertook the evaluation without the cost information and the results were the same relative to the preferred alternative.
- KY noted that if there were a successful reduction in I/I then there may be some potential to delay the expansion of the proposed infrastructure.
- PL noted that if the I/I in St. Jacobs were reduced to the point that per capita flows were at the Regional average, the expansion of the WWTP could potentially be deferred by about ten years – the expansion would still have to occur before 2041.

9. Next Steps

- It was noted that a Public Information Centre (PIC) is planned to be held before the end of June. The PIC will be held in St. Jacobs at a location to be determined. PL will advise the Steering Committee of the date and location of the PIC when this information is available. — PL
- MB asked whether the results of the Stantec I/I Report could also be presented at the PIC. This suggestion was noted; however, the timing of the PIC may not allow for Township Council's consideration of the Stantec report.
- The Master Plan will be filed for public review and comment this fall.

These Meeting Notes were prepared by Dianne Damman, D.C. Damman and Associates. Any errors, omissions, or discrepancies should be reported to the author.

STEERING COMMITTEE MEETING #3

NOVEMBER 1, 2012

- ***AGENDA***
- ***PRESENTATION MATERIAL***
- ***MEETING NOTES***

ST. JACOBS – ELMIRA

WASTEWATER TREATMENT MASTER PLAN

Steering Committee Meeting No. 3

November 1, 2012; 1:00 PM

Regional Headquarters, Room 218

AGENDA

1. Introductions

2. Project and Meeting Objectives

3. Outcome of Preliminary Evaluation of Alternatives
   - Alternatives Evaluated
   - Evaluation Methodology
   - Preliminary Preferred Alternative

4. Updated City of Waterloo Growth and Flow Projections

5. Impact on Preliminary Evaluation of Alternatives
   - Cost Implications
   - Revised Evaluation Matrix
   - Preferred Alternative

6. Next Steps
   - Public Information Centre (PIC)
   - Master Plan Report

7. Other Business

Region of Waterloo

St. Jacobs – Elmira Wastewater Treatment Master Plan

Project Steering Committee Meeting No. 3
November 1, 2012

XCG Hatch Mott MacDonald



Meeting Agenda

- Project and Meeting Objectives
- Outcome of Preliminary Evaluation of Alternatives
  - Alternatives Evaluated
  - Evaluation Methodology
  - Preliminary Preferred Alternative
- Updated City of Waterloo Growth and Flow Projections
- Impact on Preliminary Evaluation of Alternatives
  - Cost Implications
  - Revised Evaluation Matrix
  - Preferred Alternative
- Next Steps



Project and Meeting Objectives

Project and Meeting Objectives

- The Region of Waterloo is undertaking a Wastewater Treatment Master Plan (WWTMP) for both the Elmira and St. Jacobs communities concurrently.
- The Master Plan will review wastewater treatment conditions in these communities and recommend a wastewater treatment strategy to meet growth in the communities for the next 30 years.
- The study will consider wastewater treatment requirements for Elmira and St. Jacobs and will also consider the feasibility of incorporating flows from the Heidelberg WWTP into an overall solution.
- This meeting will focus specifically on the preferred alternative to service St. Jacobs and Heidelberg.



Region of Waterloo

Short-Listed Alternatives for Servicing St. Jacobs & Heidelberg

XCG Hatch Mott MacDonald



Options for Servicing St. Jacobs and Heidelberg

Option	St. Jacobs Servicing Component	Heidelberg Servicing Component
1	Upgrade and expand the St. Jacobs WWTP	Maintain existing Heidelberg WWTP
2		Decommission the Heidelberg WWTP and transfer flows to the St. Jacobs WWTP
3		Decommission the Heidelberg WWTP and transfer flows to the Waterloo WWTP
4	Decommission the St. Jacobs WWTP and transfer flows to the Waterloo WWTP	Maintain existing Heidelberg WWTP
5		Decommission the Heidelberg WWTP and transfer flows to the Waterloo WWTP
6	Upgrade the existing plant and transfer flows beyond the existing capacity of the St. Jacobs WWTP to the Waterloo WWTP	Maintain existing Heidelberg WWTP
7		Decommission the Heidelberg WWTP and transfer flows to the St. Jacobs WWTP
8		Decommission the Heidelberg WWTP and transfer flows to the Waterloo WWTP



Evaluation Criteria & Methodology

Evaluation Criteria

Criteria	Description
EA Category - Technical	
Satisfaction of objectives	• Degree to which option addresses wastewater servicing needs for the Communities of Elmira, St. Jacobs, and Heidelberg to 2041 and does not restrict planned growth.
Consistent with regulatory requirements, policies, guidelines and standards	• Degree to which the option complies with Federal, and Provincial regulatory requirements, and Regional policies, guidelines and standards for planning and construction, including sustainability policy.
Technical feasibility	• Ease of implementation. • Constructability. • Operational capability. • Potential for phased construction. • Ability to meet projected future effluent limits.
System complexity	• Number of facilities to be managed. • Operational requirements for facilities.

Evaluation Criteria

Criteria	Description
EA Category - Environmental	
Surface water impacts	• Potential impacts on surface water resources.
Groundwater impacts	• Potential impacts on groundwater quality and quantity.
Land requirement	• Land requirement for construction. • Land recovered due to decommissioning.
Impacts on Natural Environment During Construction	• Impact of construction on core environmental features.

Evaluation Criteria

Criteria	Description
EA Category - Social	
Socio-economic impacts	• Potential noise, dust, odour, traffic, etc impacts on adjacent land owners during construction. • Potential noise, dust, odour, traffic, etc impacts on adjacent land owners during operation.
Impacts on Archaeological and Heritage Resources	• Impacts on archeological and heritage resources, including First Nations impacts.
EA Category - Economical	
Capital, operating and maintenance, and life cycle costs	• Capital costs. • Land acquisition costs. • Operating and maintenance costs. • Net present value life cycle costs. • Impact on investments in upgrades already made.

Evaluation Methodology

- For each criterion, options were evaluated as:
  - ○ - No impact
  - ◔ - Negligible impact
  - ◑ - Minor impact
  - ◕ - Moderate impact
  - ● - High impact
- Each EA Category (Technical, Environmental, Social and Economical) was considered to have equal weight.
- Based on the results of the evaluation, options were ranked from most preferred to least preferred.



Region of Waterloo

Preliminary Evaluation of Short-Listed Alternatives

XCG Hatch Mott MacDonald

Evaluation Matrix

Options	Technical					Environmental					Social			Economical		Overall Ranking (Score)
	Satisfaction of objectives	Consistent with regulatory requirements, policies, guidelines and standards	Technical feasibility	System complexity	Average Score	Surface water impacts	Groundwater impacts	Land requirement	Impacts on Natural Environment During Construction	Average Score	Socio-economic impacts	Impacts on Archaeological and Heritage Resources	Average Score	Capital, O&M, and LCC	Average Score	
Option 1	○	○	◔	◑	◔	◑	○	○	◔	◔	◔	○	◔	◔	◔	1 ($\frac{12}{16}$)
Option 2	○	○	◔	◔	◔	◑	◔	○	◑	◔	◑	○	◔	◑	◑	2 ($\frac{19}{16}$)
Option 3	○	○	◑	◔	◔	◑	◔	○	◑	◔	◑	○	◔	◑	◑	3 ($\frac{20}{16}$)
Option 4	○	◔	◔	◔	◔	◔	○	○	◑	◔	◑	○	◔	●	●	6 ($\frac{26}{16}$)
Option 5	○	◔	◔	○	◔	◔	◔	○	◑	◔	◑	○	◔	●	●	6 ($\frac{26}{16}$)
Option 6	○	◔	◑	◑	◔	◑	○	○	◑	◔	◑	○	◔	◑	◑	4 ($\frac{21}{16}$)
Option 7	○	◔	◑	◔	◔	◑	◔	○	◑	◔	◑	○	◔	◕	◕	5 ($\frac{25}{16}$)
Option 8	○	◔	◑	◔	◔	◑	◔	○	◑	◔	◑	○	◔	◕	◕	5 ($\frac{25}{16}$)

Notes:

○ ◔ ◔ ◔ ◔ ◔ ◔ ◑ ◑ ◑ ◑ ◕ ◕ ◕ ● ●

No Impact → High Impact

Life Cycle Cost Summary

Feasible Combination of Alternatives	Capital Cost	Annual O&M Cost	30-Year NPV O&M Cost	30-Year LCC
Option 1	$9,500,000	$192,647	$7,800,000	$17,300,000
Option 2	$15,000,000	$139,862	$5,300,000	$20,300,000
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Option 8	$16,100,000	$142,452	$5,400,000	$21,500,000

1. Based on the an inflation rate of 3%, interest rate of 3%, and hydro cost of 10 cents/kWh

Preliminary Preferred Alternative for Servicing Elmira, Heidelberg and St. Jacobs

- Elmira
  - Continue to reduce I/I and to implement water efficiency
  - Optimize or upgrade to address current capacity limitations
- Heidelberg
  - Continue to operate existing facility
  - Review alternatives at the time that the existing works need to be replaced
- St. Jacobs
  - Continue to reduce I/I and to implement water efficiency
  - Upgrade and expand the existing St. Jacobs WWTP on the current site

Preliminary Preferred Alternative for Servicing Elmira, Heidelberg and St. Jacobs

- A key driver for the selection of the preferred alternative was the cost implications to the Region of an early expansion of the Waterloo WWTP
- Original population and flow projections for the City of Waterloo indicated that the Waterloo WWTP would need to be expanded in 2029
- Transferring flow from St. Jacobs to Waterloo would require expansion of the Waterloo WWTP in 2026
  - Cost impact of early expansion of the Waterloo WWTP was estimated at $9.6M



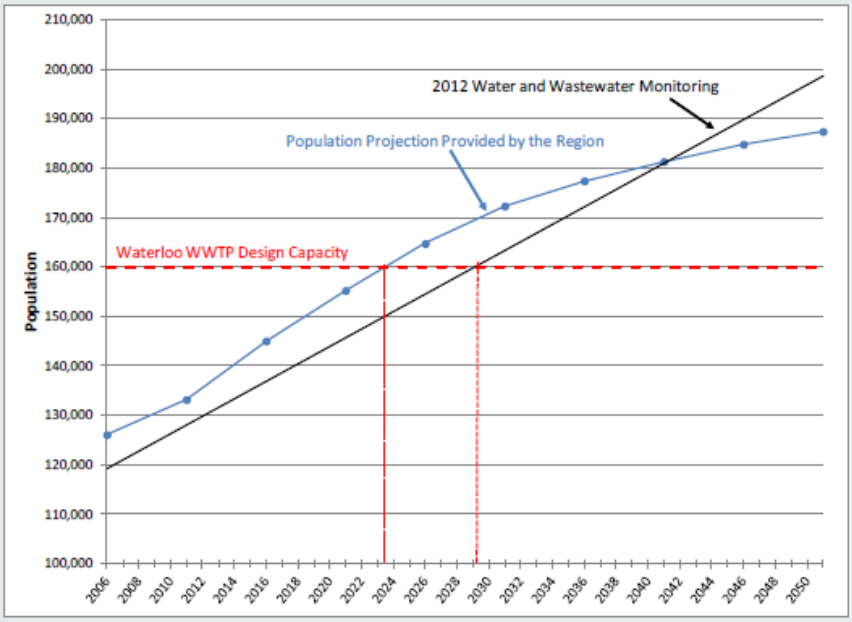
Region of Waterloo

Updated City of Waterloo Growth and Flow Projections

XCG Hatch Mott MacDonald



City of Waterloo Population & Flow Projections





Region of Waterloo

Revised Evaluation

XCG Hatch Mott MacDonald



Life Cycle Cost Summary

Feasible Combination of Alternatives	Capital Cost	Annual O&M Cost	30-Year NPV O&M Cost	30-Year LCC
Option 1	$9,500,000	$192,647	$7,800,000	$17,300,000
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1. Based on the an inflation rate of 3%, interest rate of 3%, and hydro cost of 10 cents/kWh

Evaluation Matrix

Options	Technical					Environmental					Social			Economical		Overall Ranking (Score)
	Satisfact-ion of objectives	Consistent with regulatory require-ments, policies, guidelines and standards	Technical feasibility	System complexity	Average Score	Surface water impacts	Ground-water impacts	Land require-ment	Impacts on Natural Environ-ment During Construct-ion	Average Score	Socio-economic Impacts	Impacts on Archae-logical and Heritage Resources	Average Score	Capital, O&M, and LCC	Average Score	
Option 1	○	○	◔	◑	◔	◑	○	○	◔	◔	◔	○	◔	◑	◑	2 ($\frac{16}{16}$)
Option 2	○	○	◔	◔	◔	◑	◔	○	◑	◔	◑	○	◔	●	●	6 ($\frac{27}{16}$)
Option 3	○	○	◑	◔	◔	◑	◔	○	◑	◔	◑	○	◔	●	●	7 ($\frac{28}{16}$)
Option 4	○	◔	◔	◔	◔	◔	○	○	◑	◔	◑	○	◔	◔	◔	1 ($\frac{14}{16}$)
Option 5	○	◔	◔	○	◔	◔	◔	○	◑	◔	◑	○	◔	◑	◑	3 ($\frac{18}{16}$)
Option 6	○	◔	◑	◑	◔	◑	○	○	◑	◔	◑	○	◔	◑	◑	4 ($\frac{21}{16}$)
Option 7	○	◔	◑	◔	◔	◑	◔	○	◑	◔	◑	○	◔	●	●	8 ($\frac{29}{16}$)
Option 8	○	◔	◑	◔	◔	◑	◔	○	◑	◔	◑	○	◔	◕	◕	5 ($\frac{25}{16}$)

Notes:

○ ◔ ◔ ◔ ◔ ◔ ◔ ◑ ◑ ◑ ◕ ◕ ● ● ● ● ●

No Impact → High Impact

Revised Preferred Alternative for Servicing Elmira, Heidelberg and St. Jacobs

- Elmira
  - Continue to reduce I/I and to implement water efficiency
  - Optimize or upgrade to address current capacity limitations
- Heidelberg
  - Continue to operate existing facility
  - Review alternatives at the time that the existing works need to be replaced
- St. Jacobs
  - Continue to reduce I/I and to implement water efficiency
  - Decommission the St. Jacobs WWTP and transfer flows to the Waterloo WWTP



Region of Waterloo

Next Steps

XCG Hatch Mott MacDonald



Next Steps

- Public Information Centre (PIC)
- Prepare Master Plan Report
- Issue Notice of Completion and place Report on the Public Record for 30-day review

XCG File No.: 3-035-51-01

Meeting Date:	November 1, 2012; 1:00 PM
Location:	Room 218, Regional Headquarters
Attendees:	Pam Law (PL), RMOW Nancy Kodousek (NK), RMOW Jorge Calvacante, RMOW Kaoru Yajima (KY), RMOW Allan Poffenroth (AP), Woolwich Twp. (part) Dan Kennaley (DK), Woolwich Twp. Mark Anderson (MA), GRCA Stephen Nutt (SN), XCG Consultants Dianne Damman (DD), D.C. Damman and Associates
Regrets:	Todd Cowan (TC) Woolwich Twp. Mark Bauman (MB), Woolwich Twp.
Re:	**St. Jacobs – Elmira Wastewater Master Plan**

Item	Action

1. Introductions

- PL welcomed everyone to the third meeting of the Steering Committee.
- Since Councillor Poffenroth was only able to attend the first part of the meeting, SN provided an overview of the revised analysis and conclusions at the outset. The balance of the meeting was then conducted in accordance with the agenda.
- There were no outstanding items from the previous Steering Committee meeting except for the establishment of a date for the PIC. The PIC has been scheduled for Tuesday, December 4 at the St. Jacobs Community Centre.

2. Project and Meeting Objectives

- DD reviewed the objectives, as follows:
  - The Region of Waterloo is undertaking a Wastewater Treatment Master Plan (WWTMP) for both the Elmira and St. Jacobs communities concurrently;

Item	Action

- The Master Plan will review wastewater treatment conditions in these communities and recommend a wastewater treatment strategy to meet growth in the communities for the next 30 years;
- The study will consider wastewater treatment requirements for Elmira and St. Jacobs and will also consider the feasibility of incorporating flows from the Heidelberg WWTP into an overall solution; and
- This meeting will focus specifically on the preferred alternative to service St. Jacobs and Heidelberg.

3. Outcome of Preliminary Evaluation of Alternatives

- SN reviewed the eight (8) options for servicing St. Jacobs and Heidelberg. The St. Jacobs servicing component consists of: upgrading and expanding the St. Jacobs WWTP; decommissioning the St. Jacobs WWTP and transferring flows to the Waterloo WWTP; or upgrading the existing plant and transferring flows beyond the existing capacity of the St. Jacobs WWTP to the Waterloo WWTP. The Heidelberg servicing component consists of maintaining the existing WWTP or decommissioning the plant and sending flows to either the St. Jacobs WWTP or the Waterloo WWTP.
- SN noted that the preferred alternative for Elmira is to continue to reduce I/I and implement water efficiency programs. Further investigations to determine if industrial load reductions and optimization can address the capacity limitations that have been identified will be needed during the planning period.
- SN reviewed the criteria that were used in the preliminary evaluation of alternatives, as well as the evaluation methodology.
- SN reviewed the criteria that were used in the preliminary evaluation of alternatives, as well as the evaluation methodology.

Item	Action

- SN outlined the results of the preliminary evaluation, including the life cycle cost summary. He noted that Option 1 (upgrade and expand the St. Jacobs WWTP and continue to operate the existing Heidelberg WWTP) was the preferred alternative. The continued implementation of water efficiency and the reduction of I/I were also components of the preferred alternative.
- A key driver for the selection of the preferred alternative was the cost implications to the Region of an early expansion of the Waterloo WWTP (required for those options where flows were directed to the Waterloo WWTP). The original population and flow projections for the City of Waterloo indicated that the Waterloo WWTP would need to be expanded in 2029. Transferring flows from St. Jacobs to Waterloo would require the expansion of the Waterloo WWTP in 2026. The cost impact of an early expansion of the Waterloo WWTP was estimated at $9.6 million.

4. Updated City of Waterloo Growth and Flow Projections

- SN explained that subsequent to the last Steering Committee meeting, revised population projection information was provided by the Region's Planning Department for the Region's assimilative capacity study for the Waterloo WWTP. The revised information and the implications for the preferred alternative were presented.
- SN noted that the key contributors to these revised population projections include intensification and an increased student population. After reviewing the revised population and flow projections, the Region has determined that the Waterloo WWTP would meet its design capacity in approximately 2024.
- NK suggested that the population projection information be referenced with a date of receipt.

5. Impact on Preliminary Evaluation of Alternatives

- SN presented a revised evaluation of alternatives, assuming an expansion of the Waterloo WWTP in 2024. He reviewed the Life Cycle Cost Summary and the Evaluation Matrix. He noted that with an expansion of the Waterloo WWTP in 2024, the cost impact of $9.6 million for early expansion of the plant is no longer a factor.

Item	Action

- SN indicated that with the revised evaluation, the preferred alternative differed from that presented to the Steering Committee in April. The difference is based solely on cost considerations – the evaluation for technical, environmental and social criteria did not change.
- SN noted that the revised preferred alternative was to continue to operate the Heidelberg facility and to decommission the St. Jacobs WWTP and transfer flows to the Waterloo WWTP.
- SN noted that the dates for required additional capacity at the St. Jacobs WWTP and expansion of the Waterloo WWTP do not line up exactly. However, a reduction in I/I and average per capita flows will defer the St. Jacobs WWTP expansion to line up with the time line for the 2024 Waterloo WWTP expansion.
- DK asked whether a route for the forcemain had been identified. It was noted that a preliminary route, within existing rights-of-way, had been identified for purposes of the Master Plan. However, a further Class EA will be required (subsequent to the Master Plan) to examine the forcemain routing. A separate assignment would also examine required upgrades to the Heidelberg WWTP to address current concerns about this plant.
- DK questioned whether the costs for I/I reduction and water efficiency measures have been included in the cost information. SN replied that these costs have not been factored in since these costs would be the same for all alternatives.
- SN noted that the capital costs for Option 4 include costs for the pump station and forcemain. He noted that lower peak wet weather flows could potentially reduce the size and costs of the pump station. SN also explained that the constraints associated with the City of Waterloo's sewer system were included in the capital costs for Option 4.
- PL advised that the City of Waterloo is planning to initiate the preparation of a Master Plan for their collection system next year.

Item	Action

- DK asked for clarification on the timing for the Waterloo WWTP upgrades. SN noted that additional capacity would be required in 2024. JC advised that considerable work would be required in advance of these upgrades. For example, an assimilative capacity study is currently being undertaken and a Class EA would likely be started in 2015.
- It was noted that the St. Jacobs WWTP would be decommissioned when the expanded Waterloo WWTP was in operation.
- DK questioned whether the Region would own the forcemain. He also questioned whether a cross border servicing agreement would be required with the City of Waterloo.
- NK indicated that the Region does not currently own any sanitary sewers and that it is not Regional policy to assume ownership of sanitary sewers. She noted that this issue would be examined as part of the Class EA for the forcemain.
- PL advised that the City of Waterloo attended the August project team meeting and, at that time, they did not express any issues or concerns relative to the forcemain which would bring flows to the Waterloo WWTP.
- There was some further discussion of I/I reduction. DK noted that his view was that the preliminary evaluation of alternatives did not anticipate any I/I reduction. He noted that the Township would be concerned about potential costs if I/I reduction is now part of the preferred alternative.
- DK indicated that if there are specific expectations for I/I reduction, these expectations must be justified on a cost/benefit basis. For example, he noted that some programs that were evaluated by Stantec (e.g., sump pump program) were shown not to be practical from an economic standpoint.
- NK noted that I/I reduction has always been part of the solution and is a requirement that needs to be implemented.
- SN noted that the Master Plan is at a broad level of detail and that it will not identify specific I/I reduction measures. The Master Plan will, however, recommend the continuation of I/I reduction programs.

Item	Action

- SN noted that it is also important to ensure that new development reduces per capita flow rates. JC reiterated that the gains made in new development relative to reduced flow rates must be sustained.
- DK noted that the Township remains committed to I/I reduction. It was agreed that the Region and the Township would continue to work together to address the I/I reduction issue.
- SN noted that a reduction to 470 l/day per capita flows for new development is very achievable. This per capita flow will allow the connection of the St. Jacobs plant to the Waterloo plant by 2024, without impacting development in the area. NK also indicated that it is a reasonable expectation to reduce per capita flows from new development.

6. Next Steps

- The following next steps were noted:
  - Public Information Centre (PIC) — December 4, 2012
  - Draft Master Plan Report Submitted to Region for Review — December 31, 2012
  - Final Master Plan Report — January 31, 2013
  - 30 Day Public Review Period — February 2013
- PL noted that the Master Plan must go to Regional Council before it is posted for public review.
- DK noted that he also envisions taking the Master Plan report to Township Council for comment. DK indicated that there should be adequate time to bring the matter before Township Council during the 30-day posting of the Master Plan.
- JC suggested that the agency and stakeholder notification letters be sent a few days in advance of the posting of the Master Plan report.
- PL noted that the Master Plan would be available for public review in the Regional Clerk's office, the Township office and on the Region's web site.

These Meeting Notes were prepared by Dianne Damman, D.C. Damman and Associates. Any errors, omissions, or discrepancies should be reported to the author.

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PROJECT MAILING LIST

Region of Waterloo
St. Jacobs – Elmira Wastewater Treatment Master Plan
Agency and Stakeholder Contact List

Agency/Organization	Contact	Contact Information	Phone/Fax/E-Mail
Federal			
Aboriginal Affairs and Northern Development Canada	Ms. Allison Berman Regional Subject Expert for Ontario Consultation and Accommodation Unit	300 Sparks Street, Room 205 Ottawa, ON K1A 0H4	Phone: 613-943-5488 E-mail: Allison.Berman@aandc.gc.ca
Provincial			
Ministry of Aboriginal Affairs	Mr. Martin Rukavina Senior Policy Advisor Aboriginal and Ministry Relationships Branch	160 Bloor St. E., 9th Floor Toronto, ON M7A 2E6	Phone: 416-327-9594 E-mail: martin.rukavina@ontario.ca
Ministry of the Environment West Central Region	Ms. Barb Slattery EA and Planning Coordinator	12th Floor 119 King Street West Hamilton, ON L8P 4Y7	Phone: 905-521-7864 E-mail: barbara.slattery@ontario.ca
Ministry of the Environment West Central Region	Mr. Paul Odom Surface Water Group	12th Floor 119 King Street West Hamilton, ON L8P 4Y7	Phone: 905-521-7674 E-mail: paul.odom@ontario.ca
Ministry of the Environment Guelph District Office	Ms. Greta Najcler Supervisor	4th Floor 1 Stone Road West Guelph, ON N1G 4Y2	Phone: 519-826-4260 E-mail: greta.najcler@ontario.ca
Ministry of the Environment Guelph District Office	Ms. Jane Glassco District Manager	4th Floor 1 Stone Road West Guelph, ON N1G 4Y2	Phone: 519-826-4258 E-mail: jane.glassco@ontario.ca
Ministry of Agriculture, Food and Rural Affairs	Ms. Carol Neumann Rural Planner	Elora Resource Centre Unit 10 6484 Wellington Road 7 Elora, ON N0B 1S0	Phone: 519-846-3393 E-mail: carol.neumann@ontario.ca
Ministry of Tourism and Culture	Mr. Chris Stack Regional Manager	14th Floor, Suite 405 30 Duke Street West Kitchener, ON N2H 3W5	Phone: 519-571-6050 E-mail: chris.stack@ontario.ca
Ministry of Municipal Affairs and Housing	Mr. Dwayne Evans Planner	2nd Floor, 659 Exeter Road London, ON N6E 1L3	Phone: 519-873-4020 E-mail: dwayne.evans@ontario.ca

Agency/Organization	Contact	Contact Information	Phone/Fax/E-Mail
Ministry of Natural Resources	Mr. Ken Cornelisse Water Resources Coordinator	Guelph District Office 1 Stone Road West Guelph, ON N1G 4Y2	Phone: 519-826-6849 E-mail: ken.cornelisse@ontario.ca
Ministry of Natural Resources	Mr. Mike Stone District Planner	Guelph District Office 1 Stone Road West Guelph, ON N1G 4Y2	Phone: 519-826-4912 E-mail: mike.stone@ontario.ca
Ministry of Transportation	Ms. Ann Baldwin Regional Director, Southwestern Region	659 Exeter Road, 4th Floor London, ON N6E 1L3	Phone: 519-873-4333 E-mail: ann.baldwin@ontario.ca
Infrastructure Ontario	Mr. Anton Pojasok General Manager, Environment and Cultural Heritage	11th Floor, Ferguson Block 77 Wellesley Street West Toronto, ON M7A 2G3	Phone: 416-212-5175 E-mail: anton.pojasok@infrastructure ontario.ca
Infrastructure Ontario	Ms. Lisa Myslicki Environmental Coordinator	1 Dundas Street West, Suite 2000 Toronto, ON M5G 2L5	Phone: 416-212-3768 E-mail: lisa.myslicki@infrastructure ontario.ca
Grand River Conservation Authority	Mr. Joe Farwell Chief Administrative Officer	400 Clyde Road P.O. Box 729 Cambridge, ON N1R 5W6	Phone: 519-621-2763, ext. 2221 Fax: 519-621-3529 E-mail: jfarwell@grandriver.ca
Grand River Conservation Authority	Ms. Barb Brown Supervisor of Resources Planning	400 Clyde Road P.O. Box 729 Cambridge, ON N1R 5W6	Phone: 519-621-2763, ext. 2307 Fax: 519-621-4945 E-mail: bbrown@grandriver.ca
Grand River Conservation Authority	Ms. Sandra Cooke Senior Water Quality Supervisor	400 Clyde Road P.O. Box 729 Cambridge, ON N1R 5W6	Phone: 519-621-2763, ext. 2224 Fax: 519-621-4945 E-mail: scooke@grandriver.ca
Grand River Conservation Authority	Mr. Mark Anderson Water Quality Engineer	400 Clyde Road P.O. Box 729 Cambridge, ON N1R 5W6	Phone: 519-621-2763, ext. 2226 Fax: 519-621-4945 E-mail: manderson@grandriver.ca
Grand River Conservation Authority	Mr. Andrew Herreman Resource Planner	400 Clyde Road P.O. Box 729 Cambridge, ON N1R 5W6	Phone: 519-621-2763, ext. 2319 Fax: 519-621-4945 E-mail: aherreman@grandriver.ca
Municipal			
Township of Woolwich	Mr. Dan Kennaley Director of Engineering and Planning Services	24 Church Street West P.O. Box 158 Elmira, ON N3B 2Z6	Phone: 519-669-1647 Fax: 519-669-4669 E-mail: dkennaley@woolwich.ca
Township of Woolwich	Mr. David Brenneman Chief Administrative Officer	24 Church Street West P.O. Box 158 Elmira, ON N3B 2Z6	Phone: 519-669-6002 Fax: 519-669-1820 E-mail: dbrenneman@woolwich.ca

Agency/Organization	Contact	Contact Information	Phone/Fax/E-Mail
City of Waterloo	Mr. Bill Garibaldi General Manager, Public Works Services	265 Lexington Court Waterloo, ON N2J 4A8	Phone: 519-747-8605 Fax: 519-886-5788 E-mail: bill.garibaldi@waterloo.ca
City of Waterloo	Mr. Scott Amos Director, Development Services	100 Regina Street South Waterloo, ON N2J 4A8	Phone: 519-747-8758 Fax: 519-747-8523 E-mail: scott.amos@waterloo.ca
City of Waterloo	Mr. Tim Anderson Chief Administrative Officer	100 Regina Street South Waterloo, ON N2J 4A8	Phone: 519-747-8702 Fax: 519-747-8500 E-mail: tim.anderson@waterloo.ca
City of Brantford	Ms. Selvi Kongara Engineering Department	100 Wellington Square P.O. Box 818 Brantford, ON N3T 5R7	Phone: 519-759-1350, ext. 2365 E-mail: skongara@brantford.ca
Utilities			
Hydro One Networks	Mr. Charles S. Esendal, P.Eng., MBA Sustainment Manager	483 Bay Street TCT 15-A11, North Tower Toronto, ON M5G 2P5	
Waterloo North Hydro	Mr. Joe Gennaro Engineering Technician	300 Northfield Drive East Waterloo, ON N2J 4A3	Phone: 519-886-5090
Rogers Cable	Mr. Ted Hancocks	85 Grand Crest Place P.O. Box 488 Kitchener, ON N2G 4A8	
Bell Canada	Ms. Gayle Widmeyer Manager Access Network Department	575 Riverbend Drive, 2nd Floor Kitchener, ON N2K 3S3	
Canadian Pacific Railway	Mr. Craig Fisher Wastewater Treatment Specialist	401 9th Avenue SW, Suite 700 Calgary, AB T2P 4Z4	
CN Great Lakes	Mr. John MacTaggart Engineering Services	4 Welding Way P.O. Box 1000 Concord, ON L4K 1B9	Phone: 905-669-3373
Union Gas	Mr. Kevin Schimus Construction and Growth Project Manager, Waterloo District	603 Kumpf Drive Waterloo, ON N2V 1K3	Phone: 519-885-7400
Enbridge Gas Distribution Inc.	Mr. Russell McLean	P.O. Box 650 Scarborough, ON M1K 5E3	Phone: 416-447-4911
Ontario Power Generation Inc.	Ms. Cara Clairman Vice President Sustainable Development	700 University Avenue Toronto, ON L5G 1X6	

Agency/Organization	Contact	Contact Information	Phone/Fax/E-Mail
First Nations			
Mississaugas of the New Credit First Nation	Margaret Sault	RR #6, 468 New Credit Road Hagersville, ON N0A 1H0	Phone: 905-768-0100 Fax: 905-768-1225
Six Nations of the Grand River	Lonny Bomberry, Director	Land and Resources Department P.O. Box 5000 2498 Chiefswood Road Ohsweken, ON N0A 1M0	
Six Nations of the Grand River	Mr. Paul General, Eco-Centre Manager	Lands and Resources Department Six Nations Council 2676 Fourth Line Road P.O. Box 5000 Ohsweken, ON N0A 1M0	Phone: 519-445-0330 Fax: 519-445-0242 E-mail: pgeneral@sixnations.ca
Six Nations Haudenosaunee Confederacy Council	Mr. Leroy Hill Secretary	Haudenosaunee Resource Centre 2634 6th Line RR # 2 Ohsweken, ON N0A 1M0	Phone: 905-765-1749 Fax: 905-765-9193
Special Interest Groups			
Region of Waterloo Ecological and Environmental Advisory Committee	Mr. Chris Gosselin Manager, Environmental Planning	Region of Waterloo 150 Frederick Street Kitchener, ON N2G 4J3	
City of Waterloo Environmental Advisory Committee	Mr. Ron Ormson Environmental Coordinator	100 Regina Street South Waterloo, ON N2J 4A8	Phone: 519-886-1550 E-mail: rormson@city.waterloo.on.ca
Waterloo Federation of Agriculture	Mr. Ken Hunsberger President	2417 Erbs Road RR # 2 Baden, ON N3A 3M3	Phone: 519-634-9762
The Waterloo Stewardship Network	Mr. Stephen May Stewardship Coordinator	c/o Ministry of Natural Resources Guelph District Office 1 Stone Road West Guelph, ON N1G 4Y2	Phone: 519-826-4920 E-mail: Stephen.may@ontario.ca
Stakeholders			
Veolia Water Solutions & Technologies Canada	Ms. Sangeeta Chopra, M.Eng., P.Eng. Regional Manager – Ontario	2000 Argentia Road Plaza IV, Suite 430 Mississauga, ON L5N 1W1	Phone: 905-286-4846 E-mail: Sangeeta.Chopra@veoliawaer.com
MHBC Planning	Mr. Nicholas P. Bogaert, BES Senior Planner	540 Bingemans Centre Drive Suite 200 Kitchener, ON N2B 3X9	Phone: 519-576-3650, ext. 719 Fax: 519-576-0121 E-mail: nbogaert@mhbcplan.com

Agency/Organization	Contact	Contact Information	Phone/Fax/E-Mail
MHBC Planning	Mr. Pierre Chauvin, MA, MCIP, RPP Associate	540 Bingemans Centre Drive Suite 200 Kitchener, ON N2B 3X9	Phone: 519-576-3650, ext. 701 Fax: 519-576-0121 E-mail: pchauvin@mhbcplan.com
Meritech Engineering	Mr. Ian S. Robertson, P.Eng. Director of Engineering	1315 Bishop Street North Suite 202 Cambridge, ON N1R 6Z2	Phone: 519-623-1140
Meritech Engineering	Ms. Amanda J. Froese Project Manager/Engineer	1315 Bishop Street North Suite 202 Cambridge, ON N1R 6Z2	Phone: 519-623-1140, ext. 215 E-mail: amandaf@meritech.ca
Activa Group	Mr. Jason Malfara, B.E.S. Development Planner	735 Bridge Street West Waterloo, ON N2V 2H1	Phone: 519-886-9400, ext. 126 Fax: 519-886-8955 E-mail: jmalfara@activagroup.ca
Activa Group	Mr. Larry Masseo, MCIP, RPP Vice President, Planning and Development Services	735 Bridge Street West Waterloo, ON N2V 2H1	Phone: 519-886-9400, ext. 116 Fax: 519-886-8955 E-mail: lmasseo@activagroup.ca
Activa Group	Ms. Valerie Schmidt, MCIP, RPP Development Planner	735 Bridge Street West Waterloo, ON N2V 2H1	Phone: 519-886-9400, ext. 112 Fax: 519-886-8955 E-mail: vschmidt@activagroup.ca
	Mr. Joel Cotter, MCIP, RPP	43 Treeview Drive St. Jacobs, Ontario N0B 2N0	Phone: 519-747-8543 E-mail: joel.cotter@waterloo.ca
Gamsby and Mannerow Limited	Mr. Dave Hicknell, CET Branch Manager	975 Wallace Avenue North Listowel, ON N4W 1M6	Phone: 519-291-9339 E-mail: dhicknell@gamsby.com
Valley View Heights (St. Jacobs) Ltd.	Ms. Jennifer Passy, BES, MCIP, RPP Director of Development	169 Lexington Court, Unit B-1 Waterloo, ON N2J 4R3	Phone: 519-746-6244, ext. 35 E-mail: JPassy@cookhomes.ca
Dryden, Smith & Head Planning Consultants Ltd.	Mr. Sam Head President	54 Cedar Street N. Kitchener, ON N2H 2X1	Phone: 519-745-3540 E-mail: samh@dsh.ca
Dryden, Smith & Head Planning Consultants Ltd.	Mr. Andrew Head	54 Cedar Street N. Kitchener, ON N2H 2X1	Phone: 519-745-3540 E-mail: home@dsh.ca
Waterloo Regional Office Ontario Clean Water Agency	Mr. Marc Ethier, C.E.T. Regional Manager	490 Dutton Drive, Suite B3 Waterloo, ON N2L 6H7	Phone: 519-885-7022, ext. 222 Fax: 519-885-8192 E-mail: MEthier@ocwa.com
CH2M Hill	Mr. Ryan Connor	72 Victoria Street South Suite 300 Kitchener, ON N2G 4Y9	E-mail: ryan.connor@ch2m.com
Reed Construction Data Canada	Ms. Monique Conley Pre-Bid Reporter	500 Hood Road, 4th Floor Markham, ON L3R 9Z3	Phone: 905-752-5523 Fax: 905-752-5431 E-mail:

Agency/Organization	Contact	Contact Information	Phone/Fax/E-Mail
			Monique.Conley@reedbusiness.com
Triton Engineering Services Ltd.	Ms. Christine Furlong	14-105 Queen Street West Fergus, ON N1M 1S6	Phone: 519-843-3920 Fax: 519-843-1943 E-mail: cfurlong@trintoneng.on.ca
GSP Group Inc.	Mr. Hugh Handy Associate	72 Victoria Street South, Suite 201 Kitchener, ON N2G 4Y9	Phone: 519-569-8883, ext. 222 Fax: 519-569-8643 E-mail: hhandy@gspgroup.ca

Notice of Completion Only:	
Ministry of the Environment, Environmental Assessment and Approvals Branch	MEA.NOTICES.EAAB@Ontario.ca Copy to Ms. Barb Slattery, West Central Region

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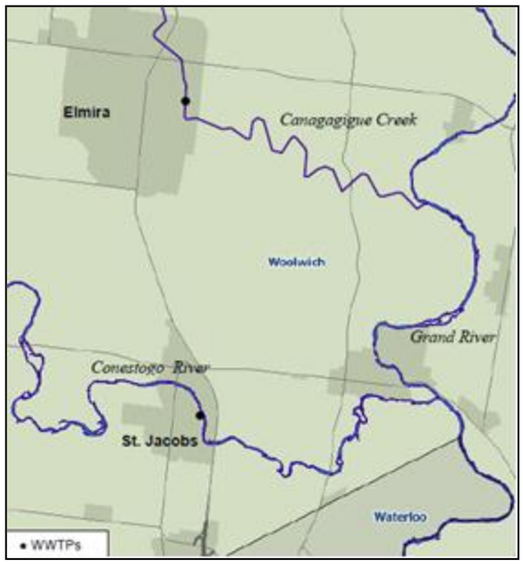
NOTICE OF COMMENCEMENT

- *NEWSPAPER AD*
- *EXAMPLE LETTERS*

Notice of Study Commencement

St. Jacobs – Elmira Wastewater Treatment Master Plan

The Regional Municipality of Waterloo (Region) is undertaking a Wastewater Treatment Master Plan for the communities of St. Jacobs and Elmira in the Township of Woolwich (Township). The wastewater systems in both communities are operated as a 2-tier system with the Township responsible for wastewater collection and general pumping, and the Region responsible for wastewater treatment and biosolids management. The Region owns the two wastewater treatment plants located in St. Jacobs and Elmira.



In 1997, a Class Environmental Assessment (EA) study examined alternatives to providing adequate wastewater treatment capacity to St. Jacobs and Elmira to the year 2021. In addition, a Region-wide Wastewater Treatment Master Plan (WWTMP) was completed in 2007, and identified the need to develop a Master Plan for St. Jacobs and Elmira which specifically examined the treatment requirements for these two communities.

This Master Plan will review wastewater treatment servicing for these two communities since the implementation of the recommendations of the 1997 Class EA study, as well as the completion of the 2007 WWTMP. The Master Plan will recommend servicing requirements to meet growth in St. Jacobs and Elmira for the next 30 years.

The study is being conducted in accordance with the requirements for Master Plans under the Municipal Class Environmental Assessment (EA) (Municipal Engineers Association, June 2000, as amended in 2007). The Master Plan will follow Phases 1 and 2 of the Municipal Class EA.

Consultation with the public, stakeholders and government review agencies is a vital component of the study. A Public Information Centre (PIC) will be scheduled during the study to provide background information, and to present the preferred wastewater treatment servicing solution and the recommended Master Plan. Details of the PIC will be published at a future date.

Information on the St. Jacobs – Elmira Wastewater Master Plan study will be posted on the Region's web site at: www.region.waterloo.on.ca/water.

Please contact either of the following project team members if you have any questions or comments, wish to obtain more information on the study, or if you would like to be added to the mailing list to receive future study notifications:

Ms. Pam Law, P.Eng.
Project Engineer
Water Services, Region of Waterloo
150 Frederick Street, 7th Floor
Kitchener, Ontario, Canada, N2G 4J3
Phone: (519) 575-4095
Fax: (519) 575-4452
E-mail: PLaw@regionofwaterloo.ca

Mr. Stephen Nutt, M. Eng., P. Eng.
Consultant Project Manager
XCG Consultants Ltd.
820 Trillium Drive
Kitchener, Ontario N2R 1K4
Phone: 519-741-5774
Fax: 519-741-5627
Email: stephen@xcg.com

All comments and information received from individuals, stakeholder groups and agencies regarding this study are being collected to assist the Region of Waterloo in making a decision. Under the *Municipal Act*, personal information such as name, address, telephone number, and property location may be included if a submission becomes part of the public record. Questions regarding the collection of this information should be forwarded to the Regional staff member indicated above.

This notice was first issued on November 19, 2010.

Published in: (1) The Record - Friday November 19, 2010
(2) Woolwich Observer - Saturday, November 20, 2010

Region of Waterloo

TRANSPORTATION AND
ENVIRONMENTAL SERVICES
Water Services

150 Frederick Street
Kitchener ON Canada N2G 4J3
Telephone: (519) 575-4426
Fax: (519) 575-4452
www.region.waterloo.on.ca

November 17, 2010

Mr. Don Boswell
Senior Claims Analyst Specific Claims Branch
Indian and Northern Affairs Canada
10 Wellington Street, Room 1310
Gatineau, Quebec K1A 0H4

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Notice of Study Commencement

Dear Mr. Boswell:

The Regional Municipality of Waterloo (Region) is undertaking a Wastewater Treatment Master Plan for the communities of St. Jacobs and Elmira in the Township of Woolwich (Township). The wastewater systems in both communities are operated as a 2-tier system with the Township responsible for wastewater collection and general pumping, and the Region responsible for wastewater treatment and biosolids management. The Region owns the two wastewater treatment plants located in St. Jacobs and Elmira.

In 1997, a Class Environmental Assessment (EA) study examined alternatives to providing adequate wastewater treatment capacity to St. Jacobs and Elmira to the year 2021. In addition, a Region-wide Wastewater Treatment Master Plan (WWTMP) was completed in 2007, and identified the need to develop a Master Plan for St. Jacobs and Elmira which specifically examined the treatment requirements for these two communities.

This Master Plan will review wastewater treatment servicing for these two communities since the implementation of the recommendations of the 1997 Class EA study, as well as the completion of the 2007 WWTMP. The Master Plan will recommend wastewater treatment requirements to meet growth in St. Jacobs and Elmira for the next 30 years.

I would appreciate your response regarding whether there are any land claims within the Region of Waterloo that may be potentially affected by projects arising from the Master Plan study. Written replies would be appreciated no later than **December 15, 2010**.

If you have any questions or would like further information about the study, please contact the undersigned by phone at 519-575-4095 or by e-mail at PLaw@regionofwaterloo.ca. Thank you very much for your interest in the study.

Sincerely,



Pam Law, P.Eng.
Project Engineer
Water Services

cc. Mr. Steve Nutt, XCG Consultants Ltd.

Region of Waterloo

TRANSPORTATION AND
ENVIRONMENTAL SERVICES
Water Services

150 Frederick Street
Kitchener ON Canada N2G 4J3
Telephone: (519) 575-4426
Fax: (519) 575-4452
www.region.waterloo.on.ca

November 17, 2010

Ms. Barb Slattery
EA and Planning Coordinator
Ministry of the Environment
West Central Region
12th Floor, 119 King Street West
Hamilton, Ontario L8P 4Y7

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Notice of Study Commencement

Dear Ms. Slattery:

The Regional Municipality of Waterloo (Region) is undertaking a Wastewater Treatment Master Plan for the communities of St. Jacobs and Elmira in the Township of Woolwich (Township). The wastewater systems in both communities are operated as a 2-tier system with the Township responsible for wastewater collection and general pumping, and the Region responsible for wastewater treatment and biosolids management. The Region owns the two wastewater treatment plants located in St. Jacobs and Elmira.

In 1997, a Class Environmental Assessment (EA) study examined alternatives to providing adequate wastewater treatment capacity to St. Jacobs and Elmira to the year 2021. In addition, a Region-wide Wastewater Treatment Master Plan (WWTMP) was completed in 2007, and identified the need to develop a Master Plan for St. Jacobs and Elmira which specifically examined the treatment requirements for these two communities.

This Master Plan will review wastewater treatment servicing for these two communities since the implementation of the recommendations of the 1997 Class EA study, as well as the completion of the 2007 WWTMP. The Master Plan will recommend wastewater treatment requirements to meet growth in St. Jacobs and Elmira for the next 30 years.

The study is being conducted in accordance with the requirements for Master Plans under the Municipal Class Environmental Assessment (EA) (Municipal Engineers Association, June 2000, as amended in 2007). The Master Plan will follow Phases 1 and 2 of the Municipal Class EA.

The purpose of this letter is to advise you of the commencement of this study. The Region of Waterloo has retained XCG Consultants Ltd. and Hatch Mott MacDonald to undertake the study. Please see attached for a copy of the Notice of Commencement that will be published in the local newspaper to advise the general public of the study. Information updates on the Master Plan will be posted on the Region of Waterloo web site at: www.region.waterloo.on.ca/water.

If your agency has any initial concerns or comments regarding this study, we would appreciate receiving your comments in writing. It is also recognized that this study may not impact your mandate and programs and that you may not want to receive further notifications. If this is the case, we would appreciate you advising us in writing. Written replies would be appreciated no later than **December 15, 2010**.

A Public Information Centre (PIC) will be scheduled during the study to provide background information, and to present the preferred wastewater treatment solution and the recommended Master Plan. Details of the PIC will be provided at a future date.

If you have any questions or would like further information about the study, please contact the undersigned by phone at 519-575-4095 or by e-mail at PLaw@regionofwaterloo.ca. Thank you very much for your interest in the study.

Sincerely,



Pam Law, P.Eng.
Project Engineer
Water Services

cc. Mr. Steve Nutt, XCG Consultants Ltd.

I-4

PUBLIC INFORMATION CENTRE

- *NEWSPAPER AD*
- *EXAMPLE LETTERS*
- *ATTENDANCE RECORD*
- *COMMENT SHEET*
- *DISPLAY BOARDS*
- *HANDOUT*
- *COMMENTS RECEIVED AND RESPONSES*



Region of Waterloo

PUBLIC NOTICE

R0011752004

PUBLIC MEETINGS ON THE 2013 REGIONAL BUDGET

Public meetings are scheduled to gather input on the 2013 Regional Budget. The meetings will be held on:

- Wednesday, November 21, 2012 at 6:00 p.m., Regional Council Chamber, 150 Frederick Street, 2nd Floor, Kitchener; and
- Wednesday, December 5, 2012 at 6:00 p.m., Regional Council Chamber, 150 Frederick Street, 2nd Floor, Kitchener.

To speak to a Finance Department staff person on the budget, please call Allan Wong at 519-575-4705 or email AWong@regionofwaterloo.ca. Please visit our website for more information on the Regional Budget (http://www.regionofwaterloo.ca/en/regionalgovernment/budget.asp).

If you wish to speak at either of the two public input meetings, make written submissions, or require accessible services to participate in the meetings, please contact Council & Administrative Services at 519-575-4420.

WE WANT TO HEAR FROM YOU ON THESE UPCOMING EVENTS HAPPENING IN YOUR AREA!

Erb Street Water Supply System Study - Public Information Centre
Wednesday, November 21st from 5pm to 7pm
Waterloo Region Emergency Services Training & Research Complex
1001 Erbs Road, Waterloo
Go here: www.regionofwaterloo.ca/en/regionalgovernment/publicnotices.asp
Contact: Pam Law 519-575-4095 plaw@regionofwaterloo.ca

St. Jacobs – Elmira Wastewater Treatment Master Plan - Public Information Centre
Tuesday, December 4th from 5pm to 7pm
St. Jacobs Community Centre, 31 Parkside Drive, St. Jacobs
Go here: www.regionofwaterloo.ca/en/regionalgovernment/publicnotices.asp
Contact: Pam Law 519-575-4095 plaw@regionofwaterloo.ca

Sawmill Road and Northfield Drive Improvements (Design Alternative)
Public Consultation Centre
Wednesday, November 28th from 5:30pm to 8pm
Conestogo Public School, 1948 Sawmill Road, Conestogo
Go here: www.regionofwaterloo.ca/en/regionalgovernment/publicnotices.asp
Contact: Jim Ellerman 519-575-4757 ext 3757 jellerman@regionofwaterloo.ca

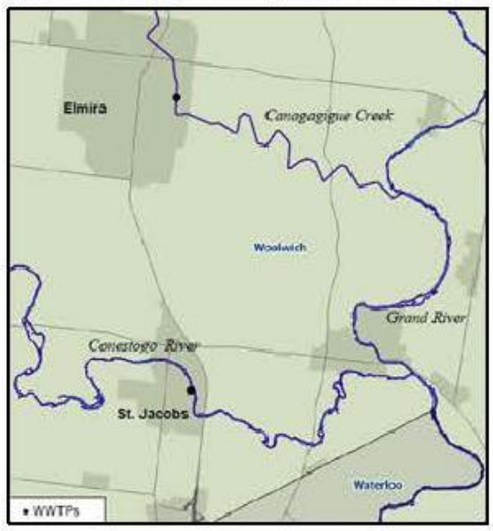
The full details of each event/project and contact information is available on our public notices webpage at www.regionofwaterloo.ca, click on the Public Notices link in the top right of the homepage. If you have any trouble viewing this information, or to obtain a full copy of any public notice, please contact the Clerk's office at 519-575-4420 or email regionalclerk@regionofwaterloo.ca.

Friday, November 16, 2012. Waterloo Region Record. Local, page B2.

NOTICE OF PUBLIC INFORMATION CENTRE

St. Jacobs – Elmira Wastewater Treatment Master Plan

The Regional Municipality of Waterloo (Region) is undertaking a Wastewater Treatment Master Plan for the communities of St. Jacobs and Elmira in the Township of Woolwich (Township). The wastewater systems in both communities are operated as a 2-tier system with the Township responsible for wastewater collection and general pumping, and the Region responsible for wastewater treatment and biosolids management.



A Region-wide Wastewater Treatment Master Plan (WWTMP) was completed in 2007, and identified the need to develop a Master Plan for St. Jacobs and Elmira which specifically examined the treatment requirements for these two communities.

This Master Plan is reviewing wastewater treatment servicing for these two and will recommend servicing requirements to meet growth in St. Jacobs and Elmira for the next 30 years.

The study is being conducted in accordance with the requirements for Master Plans under the Municipal Class EA (Municipal Engineers Association, June 2000, as amended in 2007 and 2011). The Master Plan is following Phases 1 and 2 of the Municipal Class EA.

A Public Information Centre (PIC) has been scheduled to receive input and comments from interested members of the public. The PIC will provide information on the project, including population and flow projections, the identification and evaluation of potential servicing alternatives, the evaluation of a short-list of feasible options, and the recommended preferred alternative for servicing St. Jacobs and Elmira. The PIC will be held as follows:

Tuesday, December 4, 2012
5:00 PM to 7:00 PM
St. Jacobs Community Centre, 31 Parkside Drive
St. Jacobs, Ontario

Information on the St. Jacobs – Elmira Wastewater Treatment Master Plan study is posted on the Region's web site at: www.regionofwaterloo.ca. The information presented at this PIC will be available on this web site after December 4, 2012.

Please contact either of the following project team members if you have any questions or comments, wish to obtain more information on the study, or if you would like to be added to the mailing list to receive future study notifications:

Ms. Pam Law, P.Eng.
Project Engineer
Water Services, Region of Waterloo
150 Frederick Street, 7th Floor
Kitchener, Ontario, Canada, N2G 4J3
Phone: (519) 575-4095
Fax: (519) 575-4452
E-mail: PLaw@regionofwaterloo.ca

Mr. Stephen Nutt, M. Eng., P. Eng.
Consultant Project Manager
XCG Consultants Ltd.
820 Trillium Drive
Kitchener, Ontario N2R 1K4
Phone: 519-741-5774
Fax: 519-741-5627
Email: stephen@xcg.com

Accessibility: If you require assistance to attend or participate in this PIC, please contact Ms. Pam Law (as above) at least five days prior to the PIC.

All comments and information received from individuals, stakeholder groups and agencies regarding this study are being collected to assist the Region of Waterloo in making a decision. Under the *Municipal Act*, personal information such as name, address, telephone number, and property location that may be included in a submission becomes part of the public record. Questions regarding the collection of this information should be forwarded to the Regional staff member indicated above.

This notice was first issued on November 16, 2012.

Region of Waterloo

TRANSPORTATION AND
ENVIRONMENTAL SERVICES
Water Services

150 Frederick Street
Kitchener ON Canada N2G 4J3
Telephone: (519) 575-4426
Fax: (519) 575-4452
www.region.waterloo.on.ca

November 07, 2012

Ms. Jane Glassco
District Manager,
Ministry of the Environment, Guelph District Office
4th Floor, 1 Stone Road West
Guelph, Ontario N1G 4Y2

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Notice of Public Information Centre

Dear Ms. Jane Glassco,

The Regional Municipality of Waterloo (Region) is undertaking a Wastewater Treatment Master Plan for the communities of St. Jacobs and Elmira in the Township of Woolwich (Township). The wastewater systems in both communities are operated as a 2-tier system with the Township responsible for wastewater collection and general pumping, and the Region responsible for wastewater treatment and biosolids management.

A Region-wide Wastewater Treatment Master Plan (WWTMP) was completed in 2007, and identified the need to develop a Master Plan for St. Jacobs and Elmira which specifically examined the treatment requirements for these two communities.

This Master Plan is reviewing wastewater treatment servicing for these two communities and will recommend wastewater treatment requirements to meet growth in St. Jacobs and Elmira for the next 30 years.

The study is being conducted in accordance with the requirements for Master Plans under the Municipal Class Environmental Assessment (EA) (Municipal Engineers Association, June 2000, as amended in 2007 and 2011). The Master Plan is following Phases 1 and 2 of the Municipal Class EA.

A Public Information Centre (PIC) has been scheduled to receive input and comments from interested members of the public. The PIC will provide information on the project, including population and flow projections, the identification and evaluation of potential servicing alternatives, the evaluation of a short-list of feasible options, and the recommended preferred alternative for servicing St. Jacobs and Elmira.

The PIC will be held as follows:

Tuesday, December 4, 2012
5:00 PM to 7:00 PM
St. Jacobs Community Centre, 31 Parkside Drive
St. Jacobs, Ontario

Information on the St. Jacobs – Elmira Wastewater Treatment Master Plan study is posted on the Region's web site at: www.regionofwaterloo.ca. The information presented at this PIC will be available on this web site after December 4, 2012.

If you have any questions or would like further information about the study, please contact the undersigned by phone at 519-575-4095 or by e-mail at PLaw@regionofwaterloo.ca. Thank you very much for your interest in the study.

Sincerely,



Pam Law, P.Eng.
Project Engineer
Water Services

cc. Mr. Steve Nutt, XCG Consultants Ltd.

Region of Waterloo

TRANSPORTATION AND
ENVIRONMENTAL SERVICES
Water Services

150 Frederick Street
Kitchener ON Canada N2G 4J3
Telephone: (519) 575-4426
Fax: (519) 575-4452
www.region.waterloo.on.ca

November 07, 2012

Ms. Carol Neumann
Rural Planner
Ministry of Agriculture, Food and Rural Affairs
Elora Resource Centre, Unit 10, 6484 Wellington Road 7
Elora, Ontario N0B 1S0

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Notice of Public Information Centre

Dear Ms. Carol Neumann,

The Regional Municipality of Waterloo (Region) is undertaking a Wastewater Treatment Master Plan for the communities of St. Jacobs and Elmira in the Township of Woolwich (Township). The wastewater systems in both communities are operated as a 2-tier system with the Township responsible for wastewater collection and general pumping, and the Region responsible for wastewater treatment and biosolids management.

A Region-wide Wastewater Treatment Master Plan (WWTMP) was completed in 2007, and identified the need to develop a Master Plan for St. Jacobs and Elmira which specifically examined the treatment requirements for these two communities.

This Master Plan is reviewing wastewater treatment servicing for these two communities and will recommend wastewater treatment requirements to meet growth in St. Jacobs and Elmira for the next 30 years.

The study is being conducted in accordance with the requirements for Master Plans under the Municipal Class Environmental Assessment (EA) (Municipal Engineers Association, June 2000, as amended in 2007 and 2011). The Master Plan is following Phases 1 and 2 of the Municipal Class EA.

A Public Information Centre (PIC) has been scheduled to receive input and comments from interested members of the public. The PIC will provide information on the project, including population and flow projections, the identification and evaluation of potential servicing alternatives, the evaluation of a short-list of feasible options, and the recommended preferred alternative for servicing St. Jacobs and Elmira.

The PIC will be held as follows:

Tuesday, December 4, 2012
5:00 PM to 7:00 PM
St. Jacobs Community Centre, 31 Parkside Drive
St. Jacobs, Ontario

Information on the St. Jacobs – Elmira Wastewater Treatment Master Plan study is posted on the Region's web site at: www.regionofwaterloo.ca. The information presented at this PIC will be available on this web site after December 4, 2012.

If you have any questions or would like further information about the study, please contact the undersigned by phone at 519-575-4095 or by e-mail at PLaw@regionofwaterloo.ca. Thank you very much for your interest in the study.

Sincerely,



Pam Law, P.Eng.
Project Engineer
Water Services

cc. Mr. Steve Nutt, XCG Consultants Ltd.

Region of Waterloo

ST. JACOBS – ELMIRA
WASTEWATER TREATMENT MASTER PLAN

PUBLIC INFORMATION CENTRE
December 4, 2012 – St. Jacobs Community Centre, St. Jacobs
5:00 PM to 7:00 PM

ATTENDANCE SHEET

Thank you for your interest in this project. Please print legibly.

NAME	ADDRESS	PHONE NUMBER	E-MAIL ADDRESS
MARK BAKMAN			
Ken A. Baker			
Jamie Jupp			
Dave Arsenault			

Personal Information requested on this form is collected under the authority of the Municipal Act and will be used to assist the Region of Waterloo in making a decision on this project. Any personal information such as name, address, telephone number, and property location that may be included in a submission becomes part of the public record. Questions regarding the collection of this information may be forwarded to Pam Law, Project Engineer, Water Services, Regional Municipality of Waterloo, 150 Frederick Street, 7th Floor, Kitchener, ON, Tel: 519-575-4095, Fax: 519-575-4452 or E-mail: PLaw@regionofwaterloo.ca.

Region of Waterloo

ST. JACOBS – ELMIRA
WASTEWATER TREATMENT MASTER PLAN

PUBLIC INFORMATION CENTRE
December 4, 2012 – St. Jacobs Community Centre, St. Jacobs
5:00 PM to 7:00 PM

ATTENDANCE SHEET

Thank you for your interest in this project. Please print legibly.

NAME	ADDRESS	PHONE NUMBER	E-MAIL ADDRESS
Christine Furlong			
Chuck Kuepfer			
Hugh Handy			
Mark Anderson			
Ryan Connor			

Personal Information requested on this form is collected under the authority of the Municipal Act and will be used to assist the Region of Waterloo in making a decision on this project. Any personal information such as name, address, telephone number, and property location that may be included in a submission becomes part of the public record. Questions regarding the collection of this information may be forwarded to Pam Law, Project Engineer, Water Services, Regional Municipality of Waterloo, 150 Frederick Street, 7th Floor, Kitchener, ON, Tel: 519-575-4095, Fax: 519-575-4452 or E-mail: PLaw@regionofwaterloo.ca.

Region of Waterloo

ST. JACOBS - ELMIRA
WASTEWATER TREATMENT MASTER PLAN

PUBLIC INFORMATION CENTRE
5:00 PM to 7:00 PM

December 4, 2012 –St. Jacobs Community Centre, St. Jacobs

COMMENT SHEET

Thank you for your interest in this project. You are encouraged to provide your comments on this sheet and leave it in the box provided at the Public Meeting or forward them to:

Pam Law
Project Engineer, Water Services
Regional Municipality of Waterloo
Transportation and Environmental Services
150 Frederick Street, 7th Floor
Kitchener, ON N2G 4J3
Telephone: 519-575-4095
Fax: 519- 575-4452
E-mail: PLaw@regionofwaterloo.ca

Personal Information requested on this form is collected under the authority of the Municipal Act and will be used to assist the Region of Waterloo in making a decision on this project. Any personal information such as name, address, telephone number, and property location that may be included in a submission becomes part of the public record. Questions regarding the collection of this information may be forwarded to the staff member indicated at left.

Please print legibly. Comments may be published. Please submit your comments by December 15, 2012.

Name: _____

Address: _____

Telephone: _____

Comments: _____

_____

_____

_____

XCG Environmental Engineers & Scientists

Hatch Mott MacDonald

Comments:

XCG
Environmental Engineers & Scientists

Hatch Mott MacDonald

Region of Waterloo

St. Jacobs – Elmira Wastewater Treatment Master Plan



Public Information Centre
December 4, 2012
5 – 7 pm
St. Jacobs Community Centre
31 Parkside Drive

XCG
Environmental Engineers & Scientists

Hatch Mott MacDonald

Region of Waterloo

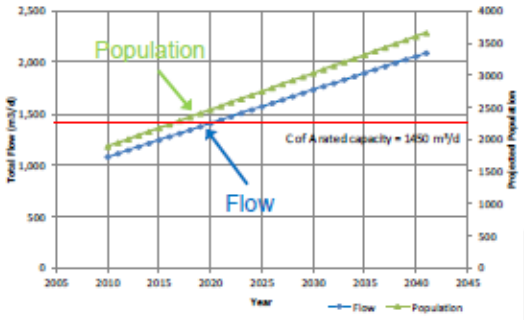
What are the Study Objectives?

- Undertake a Wastewater Treatment Master Plan (WWTMP) for Elmira and St. Jacobs, completing Phases 1 and 2 of the Municipal Class Environmental Assessment (MCEA).
- Review existing status and recommend a wastewater treatment strategy to meet growth up to 2041.
- Consider feasibility of incorporating flows from the Heidelberg wastewater treatment plant (WWTP) into an overall solution.

Projected Population and Flows

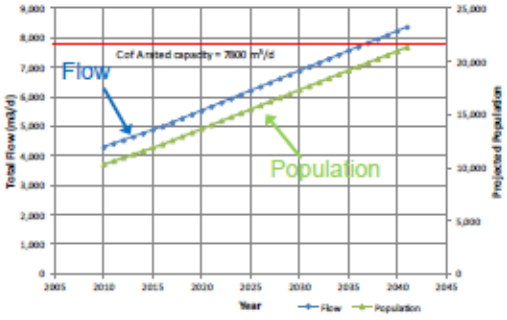
St. Jacob's WWTP

2041 Population ~ 3,660



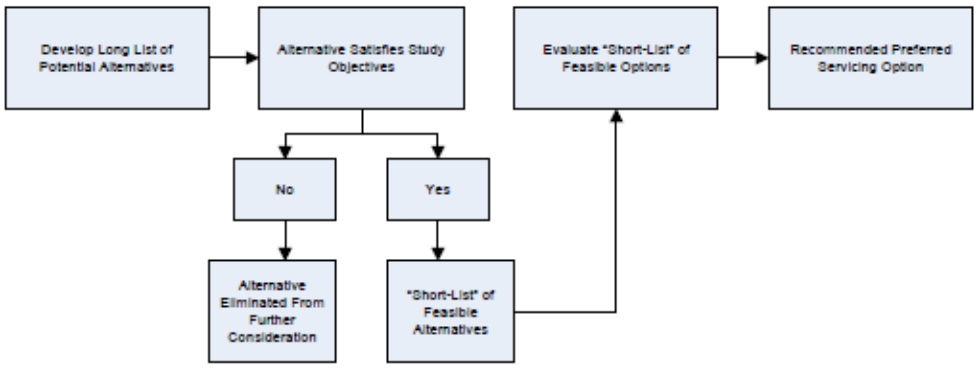
Elmira WWTP

2041 Population ~ 21,359



- Heidelberg population and flow expected to remain constant at 277 and 51 m³/d, respectively.

Evaluation Process



Wastewater Treatment Alternatives

Community	Alternative	Will Alternative Satisfy All Project Objectives? Yes (Shortlisted)	No
Elmira	Alternative 1A - "Do nothing"		X
	Alternative 1B - Reduce Inflow and Infiltration (I/I) and implement water efficiency	X	
St Jacobs	Alternative 2A - "Do nothing"		X
	Alternative 2B - Reduce I/I and implement water efficiency*		X
	Alternative 2C - Upgrade and expand St. Jacobs WWTP	X	
	Alternative 2D - Decommission St. Jacobs WWTP and construct new WWTP		X
	Alternative 2E - Upgrade existing plant and construct new plant for flows beyond existing capacity of St Jacobs WWTP		X
	Alternative 2F - Decommission St. Jacobs WWTP and transfer flows to Elmira WWTP		X
	Alternative 2G – Upgrade existing plant and transfer flows beyond existing capacity of St Jacobs WWTP to Elmira WWTP		X
	Alternative 2H - Decommission St. Jacobs WWTP and transfer flows to Waterloo WWTP (when capacity is available)	X	
	Alternative 2I – Upgrade existing plant and transfer flows beyond existing capacity of St Jacobs WWTP to Waterloo WWTP	X	
Heidelberg	Alternative 3A – Maintain existing Heidelberg WWTP	X	
	Alternative 3B – Decommission Heidelberg WWTP and transfer flows to St. Jacobs WWTP	X	
	Alternative 3C – Decommission Heidelberg WWTP and transfer flows to Waterloo WWTP	X	

* All Alternatives will include I/I reduction and water efficiency

Wastewater Servicing for Elmira

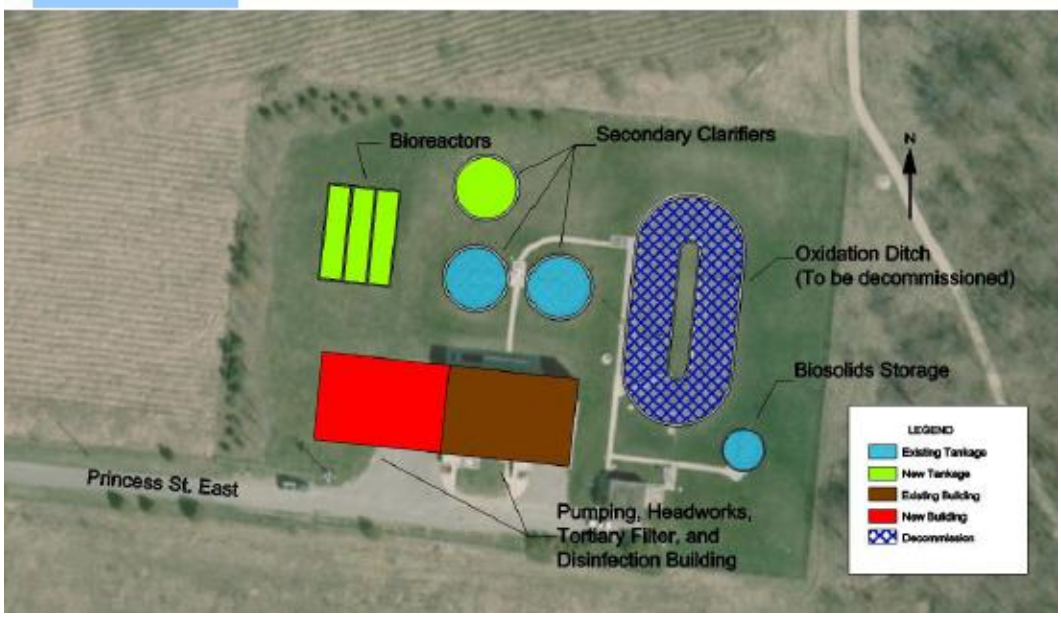
- Preferred alternative for servicing Elmira is Alternative 1B:
  - Reduce I/I and implement water efficiency
- Optimize and/or upgrade at a future date to address capacity limitations

Wastewater Servicing Options for St. Jacobs and Heidelberg

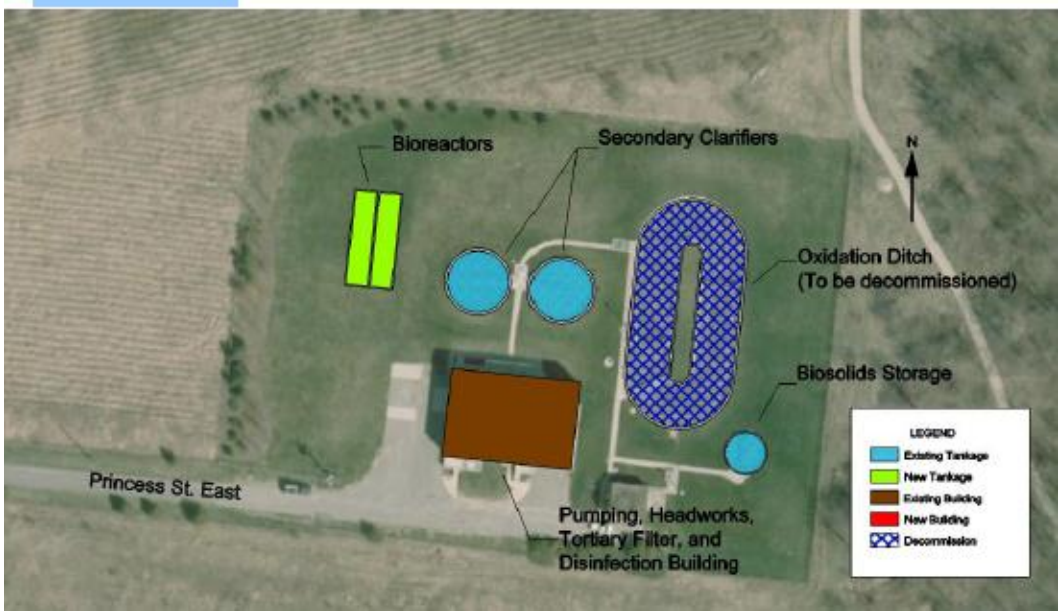
Option	St. Jacobs Servicing Component	Heidelberg Servicing Component
1	2C - Upgrade and expand St. Jacobs WWTP	3A - Maintain existing Heidelberg WWTP
2		3B – Decommission Heidelberg WWTP and transfer flows to St. Jacobs WWTP
3		3C – Decommission Heidelberg WWTP and transfer flows to Waterloo WWTP
4	2H – Decommission St. Jacobs WWTP and transfer flows to Waterloo WWTP (when capacity is available)	3A - Maintain existing Heidelberg WWTP
5		3C – Decommission Heidelberg WWTP and transfer flows to Waterloo WWTP
6	2I – Upgrade existing plant and transfer flows beyond existing capacity of St. Jacobs WWTP to Waterloo WWTP	3A - Maintain existing Heidelberg WWTP
7		3B – Decommission Heidelberg WWTP and transfer flows to St. Jacobs WWTP
8		3C – Decommission Heidelberg WWTP and transfer flows to Waterloo WWTP

* All Alternatives will include I/I reduction and water efficiency

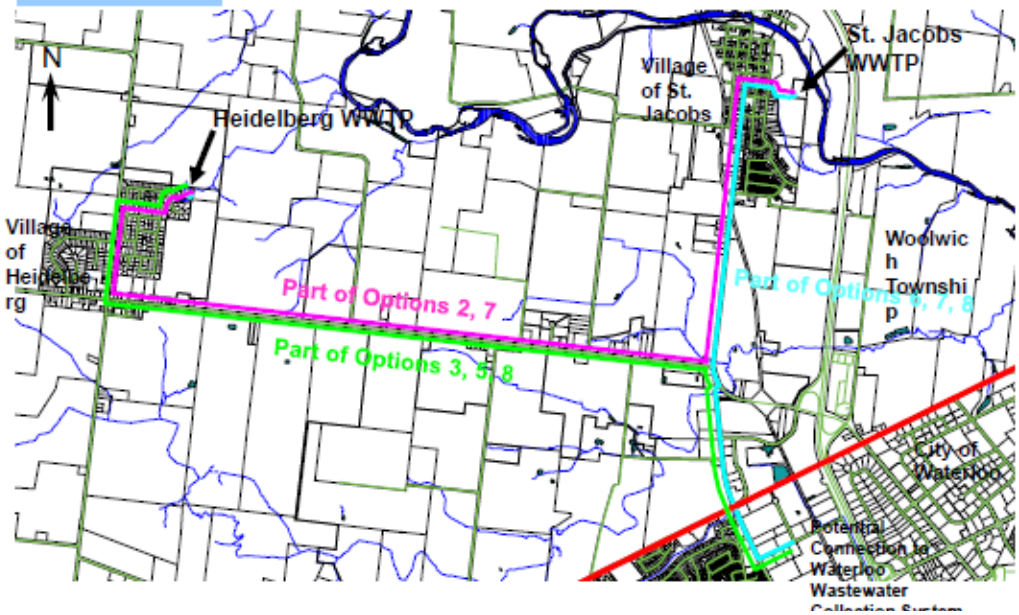
St. Jacobs WWTP Expansion
(Options 1, 2, 3) – Conceptual Layout



St. Jacobs WWTP Upgrades
(Options 6, 7, 8) – Conceptual Layout



Forcemain Routes
(Options 2, 3, 4, 5, 6, 7, 8)



Evaluation Criteria and Key Considerations

Criteria	Key Considerations
EA Category - Technical	
Meets Objectives	• all options meet objectives
Consistent with Regulatory Requirements, Policies, Guidelines and Standards	• all options consistent with Region's policies, guidelines and standards • options involving pumping of St. Jacobs flows to Waterloo have higher energy consumption and greenhouse gas emissions
Technical Feasibility	• pumping stations easier to operate than WWTPs • all options expected to meet effluent limits • conversion of WWTPs to pumping stations will result in less impact on operations during construction than WWTP upgrade or expansion • no capacity at Waterloo WWTP until it is expanded (2024)
System Complexity	• decommissioning of St. Jacobs and Heidelberg WWTPs and transfer of flows to Waterloo WWTP results in lowest complexity since only one WWTP will be operated
EA Category - Environmental	
Surface Water Impacts	• removal of effluent discharge from St. Jacobs WWTP to Conestogo River by diverting flows to Waterloo WWTP and discharging to Grand River results in lower impact • upgrade or expansion of St. Jacobs WWTP within regulated floodplain
Groundwater Impacts	• forcemain carrying flows from Heidelberg will cross a Wellhead Protection Area and Regional Recharge Area – negligible construction impacts can be mitigated • forcemain carrying flows from St. Jacobs to Waterloo does not pass through these areas

Evaluation Criteria and Key Considerations

Criteria	Key Considerations
EA Category - Environmental	
Land Requirement	• no land acquisition expected • land recovered from possible decommissioning of St. Jacobs WWTP has limited development potential
Impacts on Natural Environment During Construction	• St. Jacobs WWTP located within Significant Valley Feature • construction of forcemain from Heidelberg WWTP to Waterloo WWTP will not impact any Core Environmental Features • forcemain routes involve stream crossings – impacts will be mitigated
EA Category - Social	
Socio-economic Impacts	• construction of forcemains will cause short term disruption of traffic and property access • expansion of St. Jacobs WWTP has lowest impact during construction • long forcemains have the potential for odour problems at discharge points – mitigation measures can be implemented • odours impacts not expected with WWTP operation
Impacts on Archaeological and Heritage Resources	• no expected impacts • appropriate mitigation will be implemented, if required
EA Category - Economical	
Capital, Operating and Maintenance, and Life Cycle Costs	• options ranked based on life cycle costs

Life Cycle Cost Summary

Servicing Option	Capital Cost	Annual O&M Cost	Life Cycle Cost
Option 1 – Upgrade and expand St. Jacobs WWTP, maintain existing Heidelberg WWTP	$9.5 M	$192,647	$17.3 M
Option 2 - Upgrade and expand St. Jacobs WWTP, decommission Heidelberg WWTP and transfer flows to St. Jacobs WWTP	$15 M	$139,862	$20.3 M
Option 3 - Upgrade and expand St. Jacobs WWTP, decommission Heidelberg WWTP and transfer flows to Waterloo WWTP	$14.1 M	$139,324	$19.4 M
Option 4 – Decommission St. Jacobs WWTP and transfer flows to Waterloo WWTP, maintain existing Heidelberg WWTP	$7.2 M	$181,105	$14.6 M
Option 5 - Decommission St. Jacobs WWTP and transfer flows to Waterloo WWTP, decommission Heidelberg WWTP and transfer flows to Waterloo WWTP	$11.8 M	$127,782	$16.7 M
Option 6 – Upgrade existing St. Jacobs WWTP and transfer flows beyond existing capacity to Waterloo WWTP, maintain existing Heidelberg WWTP	$8.4 M	$195,775	$16.4 M
Option 7 – Upgrade existing St. Jacobs WWTP and transfer flows beyond existing capacity to Waterloo WWTP, decommission Heidelberg WWTP and transfer flows to St. Jacobs WWTP	$13.9 M	$142,776	$19.4 M
Option 8 – Upgrade existing St. Jacobs WWTP and transfer flows beyond existing capacity to Waterloo WWTP, decommission Heidelberg WWTP and transfer flows to Waterloo WWTP	$13 M	$142,452	$18.4 M

1. Based on the an inflation rate of 3%, interest rate of 3%, and hydro cost of 10 cents/kWh

Evaluation Matrix

Options	Technical					Environmental					Social			Economical		Overall Ranking (Score)
	Satisfaction of objectives	Consistent with regulatory requirements, policies, guidelines and standards	Technical feasibility	System complexity	Average Score	Surface water impacts	Groundwater impacts	Land requirement	Impacts on Natural Environment During Construction	Average Score	Socio-economic impacts	Impacts on Archaeological and Heritage Resources	Average Score	Capital, O&M, and LCC	Average Score	
Option 1	○	○	◔	◑	◔	◑	○	○	◔	◔	◔	○	◔	◑	◑	2 ($\frac{16}{16}$)
Option 2	○	○	◔	◔	◔	◑	◔	○	◑	◔	◑	○	◔	●	●	6 ($\frac{27}{16}$)
Option 3	○	○	◑	◔	◔	◑	◔	○	◑	◔	◑	○	◔	●	●	7 ($\frac{28}{16}$)
Option 4	○	◔	◔	◔	◔	◔	○	○	◑	◔	◑	○	◔	◔	◔	1 ($\frac{14}{16}$)
Option 5	○	◔	◔	○	◔	◔	◔	○	◑	◔	◑	○	◔	◑	◑	3 ($\frac{18}{16}$)
Option 6	○	◔	◑	◑	◔	◑	○	○	◑	◔	◑	○	◔	◑	◑	4 ($\frac{21}{16}$)
Option 7	○	◔	◑	◔	◔	◑	◔	○	◑	◔	◑	○	◔	●	●	8 ($\frac{29}{16}$)
Option 8	○	◔	◑	◔	◔	◑	◔	○	◑	◔	◑	○	◔	◕	◕	5 ($\frac{25}{16}$)

Notes:



Preferred Alternative for Servicing St. Jacobs, Elmira and Heidelberg

- St. Jacobs
  - Reduce I/I and implement water efficiency
  - Decommission the St. Jacobs WWTP and transfer flows to the Waterloo WWTP after 2024
- Elmira
  - Reduce I/I and implement water efficiency
  - Optimize or minor upgrades to address current capacity limitations
- Heidelberg
  - Maintain existing Heidelberg WWTP
  - Review alternatives when existing WWTP needs to be replaced

What Happens Next?

Consider comments received at this PIC	December 2012
Prepare Master Plan Report	January 2013
Notify Public and Agencies of Completion of Master Plan Report	February 2013
Issue Notice of Completion and Place Report on Public Record for 30 Day Review	March 2013
Respond to comments received from the public and review agencies	April 2013
Undertake Further Studies for Preferred Alternative (Schedule B Class EA activities)	2013+

The Region is Interested in Your Comments

Public input is an important component of the Class EA process. Please deposit your comment form in the box provided or forward to the Region. Contact information:

Pam Law
Project Engineer

Regional Municipality of Waterloo
Transportation and Environmental Services, Water Services
150 Frederick Street , 7th Floor
Kitchener, ON N2G 4J3

519-575-4095
PLaw@regionofwaterloo.ca

Stephen Nutt
Project Manager

XCG Consultants Ltd.
820 Trillium Drive
Kitchener, ON N2R 1K4

519-741-5774
stephen@xcg.com

Region of Waterloo

St. Jacobs – Elmira Wastewater Treatment Master Plan



Thank you for your input and participation

XCG Environmental Engineers & Scientists

Hatch Mott MacDonald

ST. JACOBS – ELMIRA WASTEWATER TREATMENT MASTER PLAN

Region of Waterloo

Public Information Centre

5:00 PM to 7:00 PM
December 4, 2012 – St. Jacobs Community Centre, St. Jacobs

Introduction

The Regional Municipality of Waterloo (Region) is undertaking a Wastewater Treatment Master Plan for the communities of St. Jacobs and Elmira in the Township of Woolwich (Township). The wastewater systems in both communities are operated as a 2-tier system with the Township responsible for wastewater collection, and the Region responsible for wastewater treatment and biosolids management.

Background

In 2007, the Region completed a Region-wide Wastewater Treatment Master Plan that identified the need to develop a separate Master Plan for St. Jacobs and Elmira that would specifically examine the treatment requirements for these two communities.

This Master Plan is reviewing wastewater treatment needs for these two communities to meet growth in St. Jacobs and Elmira for the next 30 years to 2041.

What are the Study Objectives?

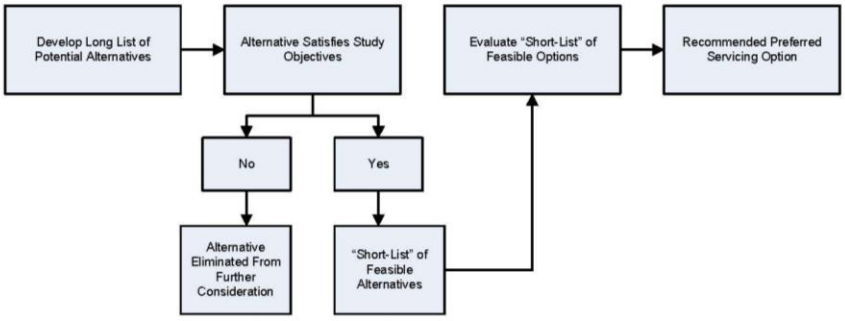
- Complete a Wastewater Treatment Master Plan for both the St. Jacobs and Elmira communities concurrently.
- Review wastewater treatment servicing in these communities and recommend a wastewater treatment strategy to meet growth for the next 30 years to 2041.
- Consider wastewater treatment requirements for St. Jacobs and Elmira and the feasibility of incorporating flows from the Heidelberg wastewater treatment plant (WWTP) as part of an overall solution.

Class Environmental Assessment Process

The study is being conducted in accordance with the requirements for Master Plans under the Municipal Class EA (Municipal Engineers Association, June 2000, as amended in 2007 and 2011). The Master Plan is following Phases 1 and 2 of the Municipal Class EA.

Evaluation Process

The evaluation process involved the following steps:



The short-listed options were evaluated using a number of criteria under the following categories:

- Technical
- Environmental
- Social
- Economical.

XCG Environmental Engineers & Scientists

Hatch Mott MacDonald

Region of Waterloo

What Options Were Evaluated?

The following is the short-list of options that were evaluated:

- Option 1 Upgrade and Expand St. Jacobs WWTP and Maintain Heidelberg WWTP.
- Option 2 Upgrade and Expand St. Jacobs WWTP, Decommission Heidelberg WWTP and Transfer Flows to St. Jacobs WWTP
- Option 3 Upgrade and Expand St. Jacobs WWTP, Decommission Heidelberg WWTP and Transfer Flows to Waterloo WWTP
- Option 4 Decommission St. Jacobs WWTP and Transfer Flows to Waterloo WWTP, Maintain Heidelberg WWTP (when capacity is available)
- Option 5 Decommission St. Jacobs WWTP and Transfer Flows to Waterloo WWTP, Decommission Heidelberg WWTP and Transfer Flows to Waterloo WWTP (when capacity is available)
- Option 6 Upgrade St. Jacobs WWTP and Transfer Flows Beyond Existing Capacity of St. Jacobs WWTP to Waterloo WWTP, Maintain Heidelberg WWTP
- Option 7 Upgrade St. Jacobs WWTP and Transfer Flows Beyond Existing Capacity of St. Jacobs WWTP to Waterloo WWTP, Decommission Heidelberg WWTP and Transfer Flows to St. Jacobs WWTP
- Option 8 Upgrade St. Jacobs WWTP and Transfer Flows Beyond Existing Capacity of St. Jacobs WWTP to Waterloo WWTP, Decommission Heidelberg WWTP and Transfer Flows to Waterloo WWTP

All options include Inflow and Infiltration (I/I) reduction programs and water efficiency. The Elmira WWTP capacity was found to be sufficient until 2041 with optimization and upgrades.

Recommended Alternative for Wastewater Treatment

Based on an evaluation using Technical, Environmental, Social and Economical criteria, the recommended alternative is:

- St. Jacobs
  - Reduce I/I and implement water efficiency
  - Decommission the St. Jacobs WWTP and transfer flows to the Waterloo WWTP after 2024 (Option 4)
- Elmira
  - Reduce I/I and implement water efficiency
  - Optimize or minor upgrades to address current capacity limitations
- Heidelberg
  - Maintain existing Heidelberg WWTP
  - Review alternatives when existing WWTP needs to be replaced

What are the Next Steps?

Comments and input received from this PIC will be used to finalize the evaluation of wastewater treatment needs for the communities of St. Jacobs, Elmira and Heidelberg. A Master Plan report will be prepared summarizing the study process and results.

The public, stakeholders and government agencies will be notified when the St. Jacobs – Elmira Wastewater Treatment Master Plan is completed. The Master Plan report will be available for a 30 day review and comment period.

Opportunities for Public Comment

We are interested in receiving your input. If you wish to comment on the Region of Waterloo St. Jacobs – Elmira Wastewater Treatment Master Plan, obtain additional information, or be placed on the mailing list to receive future notifications on the project, please contact:

Ms. Pam Law, P.Eng.
Project Engineer
Water Services, Region of Waterloo
150 Frederick Street, 7th Floor
Kitchener, Ontario, Canada, N2G 4J3
Phone: (519) 575-4095
Fax: (519) 575-4452
E-mail: PLaw@regionofwaterloo.ca

Additional information on the St. Jacobs – Elmira Wastewater Master Plan study is posted on the Region's web site at: www.regionofwaterloo.ca.

Dianne Damman

From: Pam Law <PLaw@regionofwaterloo.ca>
Sent: Wednesday, December 19, 2012 8:57 AM
To: 'Hugh Handy'; 'Stephen Nutt'; Dianne Damman; dkennaley; jvink; Richard Sigurdson
Subject: RE: St.Jacobs-Elmira WWTMP - Comments
Attachments: Letter to Pam Law - Comments on St Jacobs-Elmira WWTMP - December 17, 2012.pdf; St. Jacobs Land Holdings Map - December 14, 2012.pdf

Hugh,

Thank you for your interest in the project. In response to your inquiries for new residential development the Township assumes a land density of 45 ppl per hectare on developable lands (Greenfield lands, not including any Provincially constrained).

In regards to your second question about any information available on servicing these land holdings, this information would come from the Township. I have copied Dan Kennaley and Richard Sigurdson from the Township who may be able to respond to your question.

If you have any further questions, please let me know.

Pam

Pam Law, P.Eng.
Project Engineer
Water Services, Region of Waterloo
150 Frederick Street, 7th Floor
Kitchener, Ontario, Canada, N2G 4J3
Phone: (519) 575-4095 Fax: (519) 575-4452

From: Hugh Handy [mailto:hhandy@gspgroup.ca]
Sent: Monday, December 17, 2012 3:45 PM
To: Pam Law
Cc: Stephen Nutt (StephenN@xcg.com); Dianne Damman (ddamman@kw.igs.net); dkennaley
Subject: St.Jacobs-Elmira WWTMP - Comments

Good afternoon Pam,

Please see attached comment letter and map.

Looking forward to our further discussions.

If you have any questions in the meantime, please do not hesitate to call.

Thanks,
Hugh

Hugh Handy, MCIP, RPP
Associate

GSP Group Inc.

GSP group

SHAPING GREAT COMMUNITIES

PLANNERS
URBAN DESIGNERS
LANDSCAPE ARCHITECTS

KITCHENER OFFICE

GSP Group Inc.
72 Victoria Street S., Suite 201
Kitchener, ON N2G 4Y9
P 519.569.8883
F 519.569.8643

HAMILTON OFFICE

GSP Group Inc.
29 Rebecca Street, Suite 200
Hamilton, ON L8R 1B3
P 905.572.7477

www.gspgroup.ca

December 17, 2012 Project No. 12120

Ms. Pam Law
Project Engineer, Water Services
Regional Municipality of Waterloo
Transportation and Environmental Services
150 Frederick Street, 7th Floor
Kitchener, ON N2G 4J3

Re: Public Information Centre (PIC) – Request for Comments
St. Jacobs – Elmira Wastewater Treatment Master Plan (WWTMP)

Further to our attendance at the PIC held on December 4, 2012 at the St. Jacobs Community Centre, we appreciate the opportunity to provide comment on the WWTMP.

GSP Group Inc. represents owners of properties in the northwest quadrant of St. Jacobs as illustrated on the attached map. The properties are generally located in the area of Northside Drive and Hawkesville Road. There are a total of three properties and they are owned R. Frede Construction Ltd., 1604964 Ontario Ltd. (Mike Gilles and Richard Frede) and 650207 Ontario Ltd. (Stuart Martin)

The total land holding is comprised of approximately 28 hectares (70 acres). R. Frede Construction Ltd. owns approximately 0.9 hectares (2.2 acres) at 118 Northside Drive and this land is within Settlement boundary. The two remaining properties (i.e. 1604964 Ontario Ltd. and 650207 Ontario Ltd.) are situated between the Settlement boundary and the Countryside Line. 1604964 Ontario Ltd. owns a property adjacent to 118 Northside Drive property which is approximately 17.8 hectares (44 acres) in size. Finally, 650207 Ontario Ltd. owns approximately 9.7 hectares (24 acres) which has frontage on Hawkesville Road and lies immediately south of the 1604964 Ontario Ltd. property.

Based on our discussions, it is my understanding the wastewater treatment strategy has taken into account future growth to the Countryside line with respect to the above-noted land holdings. The recommended wastewater treatment strategy is intended to meet growth up to 2041. At this time the preferred alternative for servicing St. Jacobs is to ultimately decommission the St. Jacobs WWTP and transfer flows to the Waterloo WWTP after 2024.

It is further our understanding that the population estimates, anticipated land use and densities, timing of development, etc. was provided by the Township planning staff to the Region as part of determining projections for the WWTMP. Subsequent to the December 4th PIC, we have made inquiries with the Township planning staff, but have not received confirmation at this time as to how the above-noted land holdings were analyzed as part of this process.

The landowner group is interested in determining the data that went into the projections to ensure adequate capacity exists to ensure timely development of their properties.

Further, we would appreciate any information available at this time with respect to the intended method of servicing for these land holdings.

You have indicated your intent to prepare the Master Plan Report in January 2013. Accordingly, we would appreciate the opportunity to review this additional information from the Township and/or Region and provide further comment. If a meeting would assist to discuss this matter, we would be more than happy to set that up.

We appreciate your assistance and look forward to your response. In the meantime, should have any questions please do not hesitate to contact me in our Kitchener office.

Yours very truly,

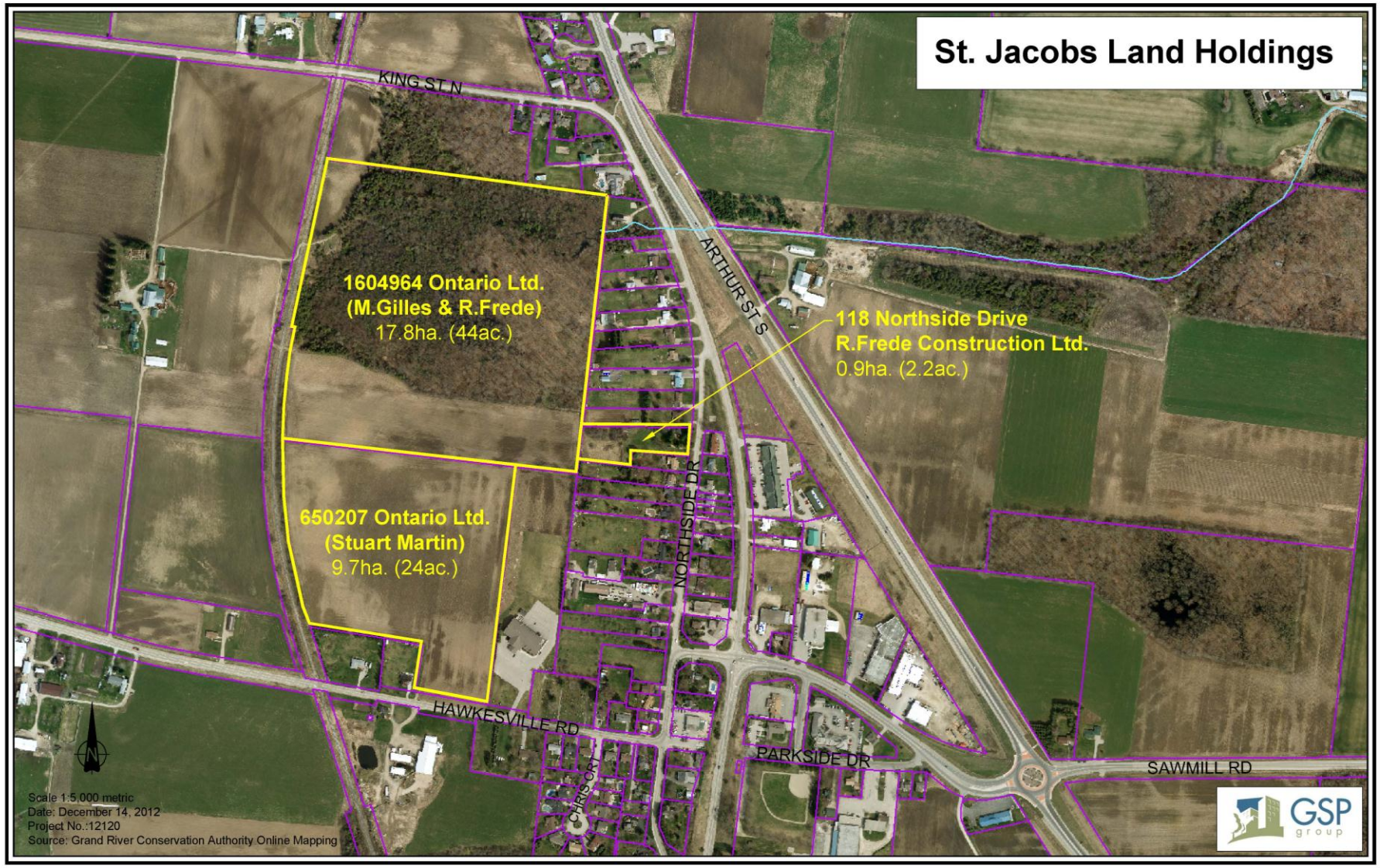
GSP Group Inc.



Hugh Handy, MCIP, RPP
Associate, Planner

enc.

cc Stephen Nutt, Project Manager, XCG Consultants Ltd.
Dianne Damman, D.C. Damman and Associates
Dan Kennaley, Township of Woolwich
Mike Gilles
Richard Frede
Stuart Martin


St. Jacobs Land Holdings
KING ST N
ARTHUR ST S
1604964 Ontario Ltd.
(M.Gilles & R.Frede)
17.8ha. (44ac.)
118 Northside Drive
R.Frede Construction Ltd.
0.9ha. (2.2ac.)
650207 Ontario Ltd.
(Stuart Martin)
9.7ha. (24ac.)
NORTHSIDE DR
HAWKESVILLE RD
CHRIS CRT
PARKSIDE DR
SAWMILL RD
Scale 1:5,000 metric
Date: December 14, 2012
Project No.:12120
Source: Grand River Conservation Authority Online Mapping
GSP group

Dianne Damman

From: Pam Law <PLaw@regionofwaterloo.ca>
Sent: December 5, 2012 11:26 AM
To: 'Hugh Handy'
Cc: 'Stephen Nutt'; Dianne Damman
Subject: St. Jacobs and Elmira Wastewater Treatment Master Plan
Attachments: DOCS_ADMIN-#1307115-v1-St_Jacobs-Elmira_PIC_Display_Boards_Dec_4_2012.pdf

Hi Hugh,

It was great meeting you last night. As a follow up to our conversation I am forwarding along a copy of the material that was presented at last night's PIC along with a link to our Water and Wastewater Monitoring Report. As I explained, the Monitoring report shows current flows to our wastewater treatment plants along with any approved allocated capacity.

http://www.regionofwaterloo.ca/en/aboutTheEnvironment/resources/2012_WATER_AND_WASTEWATER_MONITORING_REPORT_1159602.PDF
Please let me know if you have any further questions.
Pam

Pam Law, P.Eng.
Project Engineer
Water Services, Region of Waterloo
150 Frederick Street, 7th Floor
Kitchener, Ontario, Canada, N2G 4J3
Phone: (519) 575-4095 Fax: (519) 575-4452

Dianne Damman

From: Pam Law <PLaw@regionofwaterloo.ca>
Sent: December 5, 2012 11:12 AM
To: 'Amanda Froese'
Cc: Kevin Dolishny; 'Stephen Nutt'; Dianne Damman
Subject: RE: 4102-St.Jacobs - Elmira Wastewater Treatment Master Plan

Hi Amanda,

Thank you for passing this along. Staff from our department have reviewed the application you referenced and provided comment back to the Township. This information was accounted for in our population projections and should be reflected in the Region's Water and Wastewater Monitoring Report next year.

Thanks
Pam

From: Amanda Froese [mailto:amandaf@meritech.ca]
Sent: Wednesday, December 05, 2012 10:55 AM
To: Pam Law
Cc: filing
Subject: FW: 4102-St.Jacobs - Elmira Wastewater Treatment Master Plan

Pam,
We are working with the Developer of Jacob's Trail Phase 2 off Printery Road and Water Street in St. Jacobs. For your information all the submitted Draft Plan Supporting Documents are available on the Township of Woolwich website (http://www.woolwich.ca/en/newsevents/valleyview.asp). If you need any specific information about timing, population or anything else, please let me know.

Sincerely,
MERITECH ENGINEERING

Amanda J. Froese, P. Eng. LEED Green Assoc.
Project Manager/Engineer

Meritech Engineering
1315 Bishop Street North, Suite 202
Cambridge ON N1R 6Z2

t 519.623.1140 x 215
f 519.623.7334
c 519.841.7640
www.meritech.ca

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From: Sam Head [mailto:samh@dsh.ca]
Sent: Wednesday, December 05, 2012 10:14 AM

To: 'Ian Cook'; Ian Robertson; Amanda Froese; bromberghomes@rogers.com
Subject: FW: St.Jacobs - Elmira Wastewater Treatment Master Plan

Hi All,

FYI.

This is the information presented at the open house on the St. Jacobs Wastewater Master Plan.

Sam

From: Pam Law [mailto:PLaw@regionofwaterloo.ca]
Sent: December-05-12 9:05 AM
To: 'Sam Head'
Cc: Dianne Damman; 'Stephen Nutt'
Subject: RE: St.Jacobs - Elmira Wastewater Treatment Master Plan

Sam,

Here is a copy of the material that was presented yesterday. If you have any questions, please let me know. I believe we already have your name on our mailing list, but I will double check to be sure.

Pam

Pam Law, P.Eng.
Project Engineer
Water Services, Region of Waterloo
150 Frederick Street, 7th Floor
Kitchener, Ontario, Canada, N2G 4J3
Phone: (519) 575-4095 Fax: (519) 575-4452

From: Sam Head [mailto:samh@dsh.ca]
Sent: Tuesday, December 04, 2012 5:26 PM
To: Pam Law
Subject: St.Jacobs - Elmira Wastewater Treatment Master Plan

Hi Pam:

Sorry I cannot make the PIC open house tonight. Another engagement.

Please add my name to the list of interested parties to receive further notices and reports on the progress and completion of the study.

Thanks.

Sam Head, President
Dryden, Smith & Head
Planning Consultants Ltd.
54 Cedar Street N.
Kitchener ON N2H 2X1
T 519-745-3540
F 519-745-6960
Cell 519-591-3540

Dianne Damman

From: Pam Law <PLaw@regionofwaterloo.ca>
Sent: December 5, 2012 11:17 AM
To: 'Andrew Herreman'
Cc: stephen@xcg.com; Dianne Damman; 'Mark Anderson'
Subject: RE: St. Jacobs - Elmira Wastewater Treatment Master Plan, Notice of PIC
Attachments: DOCS_ADMIN-#1307115-v1-St_Jacobs-Elmira_PIC_Display_Boards_Dec_4_2012.pdf

Hi Andrew,

As requested, please find attached a copy of the material presented at last night's PIC.
It is important to note that this study is being completed as a Master Plan and there will be a more detailed study completed at a later date to examine potential forcemain alignments from St. Jacobs to Waterloo as well as planned construction for the WWTP site and to evaluate any potential impacts associated with these works.

Please let me know if you have any questions.
Pam

From: Andrew Herreman [mailto:aherreman@grandriver.ca]
Sent: Monday, December 03, 2012 1:26 PM
To: Pam Law
Cc: stephen@xcg.com
Subject: St. Jacobs - Elmira Wastewater Treatment Master Plan, Notice of PIC

Hi Pam and Steve, please find attached a copy of our letter regarding the above noted PIC. The original will be sent by mail.

Cheers,

Andrew Herreman
Resource Planner
Grand River Conservation Authority
400 Clyde Road
PO Box 729
Cambridge ON N1R 5W6
(519) 621-2763 x 2319

I-5

AGENCY AND STAKEHOLDER CONSULTATION

– *CORRESPONDENCE AND RESPONSES TO CORRESPONDENCE*

ABORIGINAL AFFAIRS AND NORTHERN DEVELOPMENT CANADA AND MINISTRY OF ABORIGINAL AFFAIRS

Dianne Damman

From: "Pam Law" <PLaw@regionofwaterloo.ca>
To: "'Dianne Damman'" <ddamman@kw.igs.net>
Cc: "'Stephen Nutt'" <stephen@xcg.com>
Sent: Tuesday, November 30, 2010 11:22 AM
Subject: FW: St. Jacobs - Elmira Wastewater Treatment Master Plan, Notice of |Study Commencement

Dianne,

Can you please save Don's response in our project file and could you check to make sure we have a representative from each of the departments Don lists on our mailing list?

Thanks
Pam

-----Original Message-----
From: Don Boswell [mailto:Don.Boswell@ainc-inac.gc.ca]
Sent: Tuesday, November 30, 2010 10:59 AM
To: Pam Law
Cc: Ralph Vachon
Subject: St. Jacobs - Elmira Wastewater Treatment Master Plan, Notice of |Study Commencement

I am writing in response to your letter of November 17, 2010 inquiring about claims in the above noted area.

In determining your duty to consult, you may wish to contact the First Nations in the vicinity of your area of interest to advise them of your intentions. To do this you may:

find the Reserves in your area of interest by consulting a map of the region such as the Province of Ontario Ministry of Aboriginal Affairs online map at
http://www.aboriginalaffairs.gov.on.ca/english/services/firstnations.asp; then
search for the First Nations located on those Reserves by using the INAC Search by Reserve site at
http://pse5-esd5.ainc-inac.gc.ca/fnp/Main/Search/SearchRV.aspx?lang=eng.

To determine the First Nations in your area of interest who have submitted claims please consult the Reporting Centre on Specific Claims at
http://pse4-esd4.ainc-inac.gc.ca/SCBRI/Main/ReportingCentre/External/ExternalReporting.aspx?lang=eng.

It should be noted that the reports available on the INAC website are updated regularly and therefore, you may want to check this site often for updates. In accordance with legislative requirements, confidential information has not been disclosed.

Please rest assured that it is the policy of the Government of Canada as expressed in The Specific Claims Policy and Process Guide that:

"in any settlement of specific native claims the government will take third party interests into account. As a general rule, the government will not accept any settlement which will lead to third parties being dispossessed."

We can only speak directly to claims filed under the Specific Claims Policy in the Province of Ontario. We cannot make any comments regarding potential or future claims, or claims filed under other departmental policies. This includes claims under Canada's Comprehensive Claims Policy or legal action by a First Nation against the Crown. You may wish to contact the Assessment and Historical Research Directorate at (819) 994-6453, the Consultation and Accommodation Unit at (613) 944-9313 and Litigation Management and Resolution Branch at (819) 934-2185 directly for more information.

You may also wish to visit http://www.ainc-inac.gc.ca/ai/mr/is/acp/acp-eng.asp on the INAC website for information regarding the Federal Action Plan on Aboriginal Consultation and Accommodation.

To the best of our knowledge, the information we have provided you is current and up-to-date. However, this information may not be exhaustive with regard to your needs and you may wish to consider seeking information from other government and private sources (including Aboriginal groups). In addition, please note that Canada does not act as a representative for any Aboriginal group for the purpose of any claim or the purpose of consultation.

I hope this information will be of assistance to you. I trust that this satisfactorily addresses your concerns.

Sincerely,

Don Boswell
Senior Claims Analyst
Ontario Research Team
Specific Claims Branch

Affaires indiennes et du Nord Canada
Indian and Northern Affairs Canada

www.ainc.gc.ca
www.inac.gc.ca

RECEIVED
DEC 2 2 2010
[redacted]

Votre référence - Your file

Notre référence - Our file

Pam Law
Project Engineer
Water, Services, Region of Waterloo
150 Frederick Street, 7th Floor
Kitchener, Ontario N2G 4J3

Dear Ms. Law

Re: St. Jacobs - Elmira Wastewater Treatment Master Plan: Notice of Study Commencement

I am writing in response to your letter of November 17, 2010 addressed to Ms. Josée Beauregard inquiring about any claims that may affect the subject property. I regret that we were unable to respond earlier.

We can inform you that our inventory includes active litigation in the vicinity of this property. They are *Six Nations of the Grand River Band of Indians v. Attorney General for Canada and Her Majesty the Queen in Right of Ontario, Ontario Superior Court of Justice, filed in Brantford, court reference number 406/95,* and

Chippewas of Kettle and Stoney Point v. Her Majesty the Queen in Right of Canada as represented by Attorney General of Canada and Minister for Department of Indian Affairs and Northern Development, Corporation of Township of Bosonquet, Paul Hendrick Wilmink, Joanne Cecilia Wilmink, Joyce Van Geel, Martha Jean Morrison, Paul L. Winger, Agnes J. Winger, Leon Edward, St. John, Margaret J. St. John, Daniel Albert Vincent Rusciolelli, Rachel Emma Rusciolelli, Domenico Abrogio, Maurina Ambrogio, William Walter Ellison, Gail Ann Ellison, National Trust Company, Joseph John Huybers, Joanne Maria Huybers, Karl Huetter, Inge Huetter, Annie Jeanette Dunston, Grace Marie Lasenby, Jack Harold Lasenby, Amin Mussani (in Trust), Donald Bruce Gray, Juliaan Alfons D'Hanyns, Simonne Clara D'Hanyns, Brian Bernard McGowan, Margaret Ann McGowan, Mary Lou LaPratte, Christopher Thomas Allan King, William John Harkness, Frances Curry Harkness, Barbara L. St. Louis, Eugene M. Sorin, Bank of Montreal, Frank Thoren, Cynthia Marie Thoren, The Toronto-Dominion Bank, Daniel Leo Bosnak, Ellen J. Bosnak, Edward G. Paschalidis, Veronika E. Paschalidis, Jack Malcolm Galbraith, Margaret Irene Galbraith, John Archibald Pedden, Dorothy Harriet Pedden, Gloria Ann Redmond, Carolyn Jane

Sheprak, Diana Mary Susan Sheprak, Lotte Nachtnebel, Josef Szela, Erika Szela, Roy Francis Giroux, Madonna Giroux, Derek Leslie Barker, Nan Francis Barker, George C. Wallis, Janet Wallis, Bernardus Josephus Veel, Hendrika Petronella Veel, St. Willibrord Community Credit Union Limited, David A. Voll, Diane M. Voll, CIBC Mortgage Corporation, Pierre Conrad Morisset, 876709 Ontario Ltd. Court file reference #C22725.

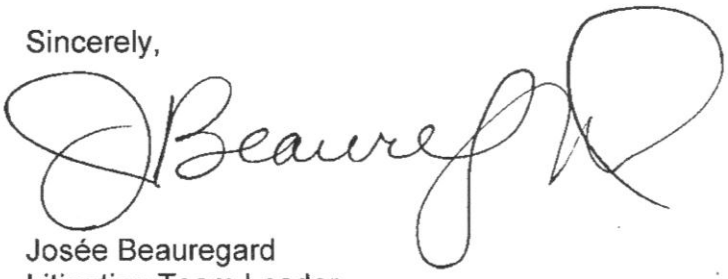
I am unable to comment with respect to the possible effect of these claims as the cases have not yet been adjudicated and any statement regarding the outcome of the litigation would be speculative at this point. It is recommended that you consult legal counsel as to the effect these actions could have on the lands you are concerned with.

If you are interested in further details about these claims, copies of the pleadings can be obtained from the Court for a fee. Please contact the appropriate Court Registry Office and make reference to the court file numbers listed above.

We cannot make any comments regarding claims filed under other departmental policies. For information on any claims you should also contact Don Boswell of the Specific Claims Branch at (819) 953-1940 to inquire about any Specific Claims. To inquire about any current Comprehensive Claims, please contact Nicole Cheechoo of Treaty and Aboriginal Government Central Operations at (819) 997-3499.

If you have any further questions please do not hesitate to contact me at (819)994-1947.

Sincerely,



Josée Beauregard
Litigation Team Leader
Eastern Litigation Directorate
Litigation Management and Resolution Branch

DISCLAIMER: In this Disclaimer, "Canada" means Her Majesty the Queen in right of Canada and the Minister of Indian Affairs and Northern Development and their servants and agents. Canada does not warrant or assume any legal liability or responsibility for the accuracy, completeness, or usefulness of any data or information disclosed with this correspondence or for any actions in reliance upon such data or information or on any statement contained in this correspondence. Data and information is based on information in departmental records and is disclosed for convenience of reference only. Canada does not act as a representative for any Aboriginal group for the purpose of any claim. Information from other government sources and private sources (including Aboriginal groups) should be sought, to ensure that the information you have is accurate and complete.

Ministry of Aboriginal Affairs

160 Bloor St. East, 9th Floor
Toronto, ON M7A 2E6
Tel: (416) 326-4740
Fax: (416) 325-1066
www.aboriginalaffairs.gov.on.ca

Ministère des Affaires Autochtones

160, rue Bloor Est, 9e étage
Toronto ON M7A 2E6
Tél. : (416) 326-4740
Téléc. : (416) 325-1066
www.aboriginalaffairs.gov.on.ca

Ontario

RECEIVED JAN 27 2011

JAN 24 2010

Reference: 739

Stephen Nutt, M. Eng., P. Eng
Consultant Project Manager
XCG Consultants Ltd.
820 Trillium Drive
Kitchener, Ontario, Canada, N2R 1K4

Re: St. Jacobs – Elmira Wastewater Treatment Master Plan
Notice of Study Commencement

Dear Mr. Stephen Nutt:

Thank you for your inquiry dated November 17, 2010 regarding the above-noted project.

As a member of the government review team, the Ministry of Aboriginal Affairs (MAA) identifies First Nation and Métis communities who may have the following interests in the area of your project:

- reserves;
- land claims or claims in litigation against Ontario;
- existing or asserted Aboriginal or treaty rights, such as harvesting rights; or
- an interest in your project's potential environmental impacts.

MAA is not the approval or regulatory authority for your project, and receives very limited information about projects in the early stages of their development. In circumstances where a Crown-approved project may negatively impact a claimed Aboriginal or treaty right, the Crown may have a duty to consult the Aboriginal community advancing the claim. The Crown often delegates procedural aspects of its duty to consult to proponents. Please note that the information in this letter should not be relied on as advice about whether the Crown owes a duty to consult in respect of your project, or what consultation may be appropriate. Should you have any questions about your consultation obligations, please contact the appropriate ministry.

You should be aware that many First Nations and Métis communities either have or assert rights to hunt and fish in their traditional territories. For First Nations, these territories typically include lands and waters outside of their reserves.

In some instances, project work may impact aboriginal archaeological resources. If any Aboriginal archaeological resources could be impacted by your project, you should contact your regulating or approving Ministry to inquire about whether any additional Aboriginal communities should be contacted. Aboriginal communities with an interest in archaeological resources may include communities who are not presently located in the vicinity of the proposed project.

With respect to your project, and based on the brief materials you have provided, we can advise that the project appears to be located in an area where Six Nations may have existing or asserted rights or claims in MAA's land claims process or litigation, that could be impacted by your project. Contact information is below:

Six Nations of the Grand River Territory P.O. Box 5000 Ohsweken, Ontario N0A 1M0	Chief William K. Montour (519) 445-2201 (Fax) 445-4208 wkm@sixnations.ca arleenmaracle@sixnations.ca
Haudenosaunee Confederacy Chiefs Council 2634 6th Line Road RR 2 Ohsweken, Ontario N0A 1M0	Chief Allen MacNaughton (519) 755-2769

The Government of Canada sometimes receives claims that Ontario does not receive, or with which Ontario does not become involved. For information about possible claims in the area, MAA recommends you contact the following federal contacts:

Ms. Janet Townson Claims Analyst, Ontario Team Specific Claims Branch Indian and Northern Affairs Canada 1310-10 Wellington St. Gatineau, QC K1A 0H4 Tel: (819) 953-4667 Fax: (819) 997-9873	Mr. Sean Darcy Manager Assessment and Historical Research Indian and Northern Affairs Canada 10 Wellington St. Gatineau, QC K1A 0H4 Tel: (819) 997-8155 Fax: (819) 997-1366

For federal information on litigation contact:

Mr. Marc-André Millaire
Litigation Team Leader for Ontario
Litigation Management and Resolutions Branch
Indian and Northern Affairs Canada
10 Wellington St.
Gatineau, QC K1A 0H4
Tel: (819) 994-1947
Fax: (819) 953-1139

Additional details about your project or changes to it that suggest impacts beyond what you have provided to date may necessitate further consideration of which Aboriginal communities may be affected by or interested in your undertaking. If you think that further consideration may be required, please bring your inquiry to whatever government body oversees the regulatory process for your project.

The information upon which the above comments are based is subject to change. First Nation or Métis communities can make claims at any time, and other developments can occur that could result in additional communities being affected by or interested in your undertaking.

Yours truly,

H. Levecque

Heather Levecque
Manager, Consultation Unit
Aboriginal Relations and Ministry Partnerships Division

Dianne Damman

From: Pam Law <PLaw@regionofwaterloo.ca>
Sent: April 8, 2011 8:44 AM
To: 'Dianne Damman'; 'Stephen Nutt'
Subject: FW: St. Jacobs - Elmire Wastewater Treatment Master Plan: Notice of Commencement.
Attachments: NCR-#3589401-v1-CIS_RESPONSE_-_ONTARIO_-_REGION_OF_WATERLOO.DOC

-----Original Message-----
From: CAU-UCA [mailto:CAU-UCA@ainc-inac.gc.ca]
Sent: Tuesday, April 05, 2011 3:16 PM
To: Pam Law
Subject: Re: St. Jacobs - Elmire Wastewater Treatment Master Plan: Notice of Commencement.

Ms. Pam Law,

Apologies for the confusion in relation to your request for information for the St. Jacobs - Elmire Wastewater Treatment Master Plan: Notice of Commencement. Attached is a scan of Aboriginal communities within a 100km radius.

Happy to discuss,
Corey Dekker
Consultation Information Service
1-613-944-9324

Greetings,

This email is a response to your request for baseline information held by INAC on established or potential Aboriginal and treaty rights, in the vicinity of the Waterloo Ontario. It is important to note that much of the information INAC holds, related to claims (specific, comprehensive, special) does not necessarily imply that a given "right" is at issue. Rather, much of INAC's input is included as background information that may or may not intersect with a specific s. 35 right. In most cases, the Aboriginal community will be best placed to explain their tradition use of land or their practices or assertions that would fall under s. 35.

INAC is currently in the process of developing an electronic system for gathering information on Aboriginal and Treaty rights (dubbed the Aboriginal and Treaty Rights Information System or ATRIS). ATRIS is still in development, however INAC officials have begun to test its features and to employ its assistance when responding to requests for information.

Using ATRIS, I have performed a search for communities which fall within 100km of the project location (see screenshot below) and included contact information for each as well as potentially relevant information in the area of claims, litigation, and other considerations.

Six Nations of the Grand River
PO BOX 5000
OHSWEKEN, ONTARIO
N0A1M0
Phone Number:(519) 445-2201
Fax Number:(519) 445-4208
Contact:WILLIAM (BILL) KENNETH MONTOUR

Claims
Six Nations of the Grand River have many specific claims filed with Canada, not all of which are currently active. Though, they could be reinitiated at a later date. The following narrative describes the current landscape:

From the 1980s to the mid-1990s, Six Nations submitted 28 specific claims to Canada. One of these specific claims, the 1875 railway expropriation claim, was settled in 1985. In 1995, however, Six Nations filed litigation against the Government of Canada and the Province of Ontario. In their lawsuit, Six Nations calls for an accounting of all the lands and moneys they had, or ought to have had, from 1784 to date, and provides 14 examples of the Crown's alleged mismanagement of their money and land. Due to the lawsuit, the previously submitted 28 specific claims were put into abeyance. In general, Six Nations' claims deal with past grievances that relate to lands known as the Haldimand Tract. These lands were set aside for Six Nations when they came from New York to Canada in 1784 as allies of the Crown after the American Revolution. Canada's negotiation of Six Nations' claims is an out-of-court process. In 1999, 2000 and 2001, all three parties-Six Nations, the Province of Ontario and the Government of Canada-turned from active litigation to talks to find common ground upon which to proceed with some form of out-of-court resolution. While these efforts did not produce results, other efforts have been made since 2004. The Government of Canada began exploratory discussions with the Six Nations' elected Chief and Council and the Province of Ontario to address

the claims. These discussions were interrupted when a group of Six Nations protesters occupied the then privately owned Douglas Creek Estates site in Caledonia.

Status: Negotiations are ongoing.

Link to a Map of the Haldimand Tract:
http://indigenews.kisikew.org/images/haldimand_tract_map.jpg

Litigation
There is some active litigation, however it is expressly tied to the assertions made in the above noted specific claims.

Mississaugas of the Credit
RR 6
HAGERSVILLE, ONTARIO
N0A1H0
Phone Number:(905) 768-1133
Fax Number:(905) 768-1225
Contact:M. BRYAN LAFORME - Chief

Claims
Name: Brant Tract Purchase
Status: Settled
Description: Alleged that 1797 treaty for cession of lands at Burlington Bay was illegal, and that the Mississauga Nation retained rights and title to lakeshore at Burlington Bay and 200 acres at Burlington Heights. (FN involved: Curve Lake, New Credit, Alderville, Scugog and Hiawatha). Note: this claim was settled on October 29, 2010.

Litigation
No active litigation

Caldwell
10297 TALBOT ROAD
BLENHEIM, ON, N0P1A0
Phone Number:(519) 676-5499
Fax Number:(519) 676-5899
Contact:LOUISE HILLIER - Chief

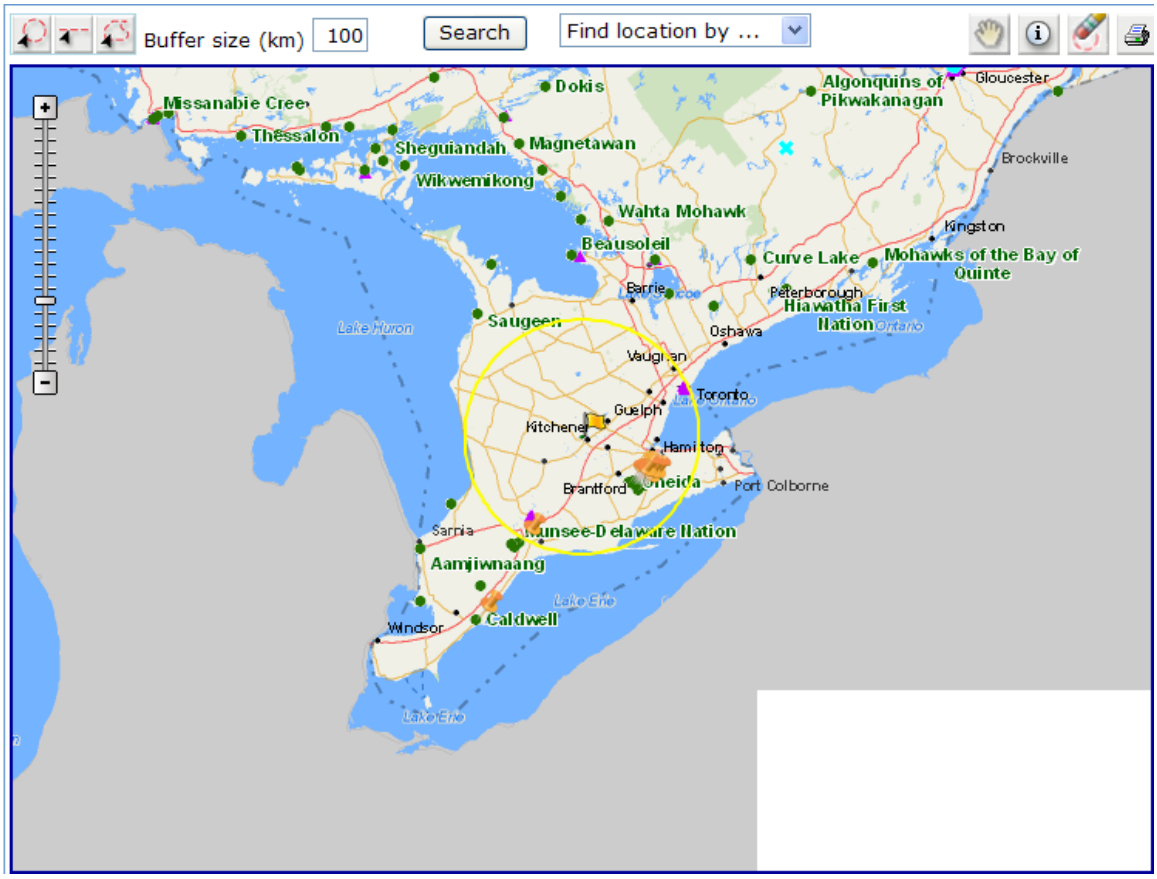
Claims
No active relevant claims according to ATRIS.

Litigation
No active relevant claims according to ATRIS.

Onieda Nation of the Thames
RR 2
SOUTHWOLD, ON, N0L2G0
Phone Number:(519) 652-3244
Fax Number:(519) 652-9287
Contact:JOEL ABRAM - Chief

Claims
No active relevant claims according to ATRIS.

Litigation
No active relevant claims according to ATRIS.



Metis Nation of Ontario

Metis have asserted rights throughout most of southern Ontario. The best source of information on the nature of these assertions are the Métis themselves, which can be contacted via their provincial organization.

Métis Consultation Unit
Métis Nation of Ontario Head Office
500 Old St. Patrick Street, Unit D
Ottawa, Ontario, K1N 9G4
Fax: (613) 725-4225
http://www.metisnation.org/home.aspx

Corey Dekker
Consultation and Accommodation Unit

Disclaimer

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Under no circumstances will the Government of Canada be liable to any person or business entity for any direct, indirect, special, incidental, consequential, or other damages based on any use of this information including, without limitation, any lost profits, business interruption, or loss of programs or information, even if the Government of Canada has been specifically advised of the possibility of such damages.

OTHER AGENCIES

RECEIVED NOV 2 6 2010

Ministry of the Environment
West Central Region

119 King Street West
12th Floor
Hamilton, Ontario L8P 4Y7
Tel.: 905 521-7640
Fax: 905 521-7820

Ministère de l'Environnement

119 rue King ouest
12e étage
Hamilton (Ontario) L8P 4Y7
Tél. : 905 521-7640
Téléc. : 905 521-7820

Ontario

November 24, 2010

Ms P. Law
Water Services, Region of Waterloo
150 Frederick Street, 7th Floor
Kitchener, Ontario
N2G 4J3

Dear Ms. Law:

Re: Notice of Study Commencement
St. Jacobs – Elmira Wastewater Treatment Master Plan

Thank you for your letter and Notice regarding the commencement of a Master Planning process that will review wastewater options for these two communities, taking into consideration those projects already implemented following the 1997 EA, and the more recent Regionwide Master Plan of 2007.

You have indicated the intent to follow the direction provided by the MEA Class EA, following approach #1 where the Master plan will be prepared following the completion of phases 1 and 2 of the EA process. It is therefore expected that the resulting Master Plan will serve as the basis for subsequent, project specific EAs to be undertaken for those projects that are identified by the Master Plan.

Recognizing that this is a proponent-driven process, we would like to assist by providing information and being available for discussions. To that end, have you contemplated the need to establish a Technical Steering Committee to inform the process? If so, we would be happy to participate.

In order to avoid issues that have arisen with other facilities in the Region, we would like to be participate at the point when you have identified the projects to ensure agreement as to their schedule, and subsequent EA requirements.

With respect to agency consultation, please keep in mind the range of other approvals and/or permits that may be required in order to implement the specific projects that are identified through the master planning exercise. It is crucial that these agencies are circulated so that their input is obtained and their issues are addressed.

In summary, it is our expectation that the master planning exercise will:

- Address the key principles of successful environmental assessment;
- Address at least the first two phases of the MEA;
- Allow for an integrated process with other planning initiatives;
- Provide a strategic level assessment of various options to better address overall system needs and potential impacts and mitigation;
- Take a system-wide approach to planning which relates infrastructure either geographically or by a particular function;
- Recommend an infrastructure master plan which can be implemented through the implementation of separate projects; and

- Include a description of the specific projects including any other approvals that will be required.

Please note that as part of the required stakeholder and agency consultation, proponents are advised to contact the following agencies to determine potentially affected Aboriginal communities in the project area. You are encouraged to visit the ministry's website at http://www.ene.gov.on.ca/en/eaab/aboriginal-resources.php for the most up to date contact list in this regard.

Should you have any questions regarding the Class EA process, please feel free to contact me at (905) 521-7864 or at Barbara.slattery@ontario.ca.

Sincerely,

Barbara Slattery

Barbara Slattery
EA/Planning Coordinator
Air, Pesticides & Environmental Planning

cc. ✓Mr. S. Nutt, XCG Consultants Ltd., 820 Trillium Drive, Kitchener, Ontario, N2R 1K4

Region of Waterloo

TRANSPORTATION AND
ENVIRONMENTAL SERVICES
Water Services

150 Frederick Street
Kitchener ON Canada N2G 4J3
Telephone: (519) 575-4426
Fax: (519) 575-4452
www.region.waterloo.on.ca

January 17, 2011

Ms. Barbara Slattery
EA/Planning Coordinator
Ministry of the Environment – West Central Region
119 King Street West, 12th Floor
Hamilton, ON L8P 4Y7

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Response to Notice of Study Commencement

Dear Ms. Slattery:

Thank you very much for your letter of November 24, 2010 in which you outline the Ministry of the Environment's expectations for the master planning exercise that we will be completing. We will ensure that these expectations are fulfilled as part of our undertaking.

As part of our project we will be having a Steering Committee that meets regularly at project milestones to provide input to the project. This Committee will provide guidance from a political and technical perspective and will include representatives from Municipal and Regional Council, Municipal and Regional Management as well as representatives from agencies such as the Grand River Conservation Authority. We appreciate your offer for assistance from the Ministry of the Environment and will be extending an invitation for representation from EA planning as well as the Technical Services Branch to sit on our Committee. We anticipate assimilative capacity will be one of the major challenges associated with our Master Plan which may necessitate additional meetings with the Ministry to discuss this topic.

If you have any questions or would like further information about the study, please contact the undersigned by phone at 519-575-4095 or by e-mail at PLaw@regionofwaterloo.ca. Thank you very much for your interest in the study.

Sincerely,

Pam Law, P.Eng.
Project Engineer
Water Services
cc. Mr. Steve Nutt, XCG Consultants Ltd.

Document Number: 915572 Version: 1

400 Clyde Road, P.O. Box 729 Cambridge, ON N1R 5W6

Phone: 519.621.2761 **Toll free:** 866.900.4722 **Fax:** 519.621.4844 **Online:** www.grandriver.ca

RECEIVED

November 29, 2010

Ms. Pam Law, P.Eng
Water Services, Region of Waterloo
150 Frederick Street, 7th Floor
Kitchener, ON, N2G 4J3

Dear Ms. Law:

Re: Notice of Study Commencement
St. Jacobs – Elmira Wastewater Treatment Master Plan

The Grand River Conservation Authority (GRCA) has received the Notice of Study Commencement for the Elmira Wastewater Master Plan. Please be advised that any future development within regulated areas requires the prior issuance of a permit pursuant to Ontario Regulation 150/06 from the GRCA.

Kindly forward any information pertaining to the study along to our office as it becomes available. We would like the opportunity to be involved in the development of the Master Plan through review and/or committee involvement.

Should you have any questions, please do not hesitate to contact the undersigned at ext. 2319.

Yours truly,

Melissa Larion, B.E.S., M.A.
Resource Planner
Grand River Conservation Authority

cc: Mr. Stephen Nutt, M. Eng, P. Eng., XCG Consultants Ltd., 820 Trillium Drive, Kitchener, ON, N2R 1K4

Member of Conservation ONTARIO

ISO 14001 Registered

Canadian Heritage Rivers System

Ministry of Municipal Affairs and Housing

Municipal Services Office - Western

659 Exeter Road, 2nd Floor
London ON N6E 1L3
Tel. (519) 873-4020
Toll Free 1-800-265-4736
Fax (519) 873-4018

Ministère des Affaires municipales et du Logement

Bureau des services aux municipalités - région de l'Ouest

659, rue Exeter, 2e étage
London ON N6E 1L3
Tél. (519) 873-4020
Sans frais 1 800 265-4736
Téléc (519) 873-4018

Ontario

December 23, 2010

Ms. Pam Law, P.Eng.
Project Engineer, Water Services
Regional Municipality of Waterloo
150 Fredrick Street
Kitchener, ON N2G 4J3

Dear Ms. Law:

Re: **Municipal Class Environmental Assessment-Study Commencement**
St Jacobs-Elmira Wastewater Treatment Master Plan
Township of Woolwich, Region of Waterloo

Thank you for your recent circulation of the above-noted matter. In this regard, we offer the following comments for your consideration.

It is understood the Regional Municipality of Waterloo is undertaking a Wastewater Treatment Master Plan for the communities of St. Jacobs and Elmira in the Township of Woolwich. The wastewater systems in both communities are operated as a 2-tier system with the Township responsible for wastewater collection and general pumping, and the Region responsible for wastewater treatment and biosolids management. It is understood the Region owns the two wastewater treatment plants located in St. Jacob's and Elmira.

Further, it is understood that in 1997 a Class Environmental Assessment study was undertaken to examine alternatives to providing adequate wastewater treatment capacity to St. Jacobs and Elmira to the year 2021. In addition, a Region-wide Waste Treatment Master Plan was completed in 2007 and it identified the need to develop a Master Plan for St. Jacobs and Elmira which specifically examined the treatment requirements for these two communities. It is understood the proposed undertaking will review wastewater treatment servicing for St. Jacobs and Elmira since the implementation of the recommendation of the 1997 Class EA study. In addition, it is understood the Region-wide Wastewater Treatment Master Plan completed in 2007 will be considered as part of this undertaking. We also note the Notice of Study Commencement states, "The Master Plan will recommend servicing requirements to meet growth in St. Jacobs and Elmira for the next 30 years."

This office provides access to provincial services on municipal government, finance and administration, as well as land use planning and development issues covered under the *Planning Act*. Section 2 of the *Planning Act* speaks to matters of provincial interest. This section directs decision-making bodies (whether it is a council of a municipality, a local board, a planning board, a minister of the Crown and a ministry, board, commission or agency of the government, or the Ontario Municipal Board) to be consistent with the policy statements issued under Section 3 of the *Planning Act* in exercising any authority that affects a planning matter.

The current policy on land use planning matters for Ontario is the "Provincial Policy Statement, 2005" (PPS) and with respect to the Township of Woolwich and the Region of Waterloo, the "Growth Plan for the Greater Golden Horseshoe" also applies. The PPS speaks to issues such as the promotion of efficient, cost-effective development and land use patterns, and the proper consideration of the various resources of this province as well as matters dealing with public health and safety. The Growth Plan speaks to managing growth, and planning for the necessary infrastructure to accommodate growth in the Greater Golden Horseshoe. Where there is a conflict between the Growth Plan and the PPS, the Growth Plan prevails unless the conflict is between policies relating to the natural environment or human health. In these situations, the policies that provide more protection to the natural environment or human health prevail. The Township of Woolwich falls within the Growth Plan Area.

The requirements of the *Planning Act* apply to applications for planning approvals under this legislation; these applications include official plan amendments and zoning bylaw amendments. From our review of this particular matter, it appears no such approvals are being sought at this time. However, as previously stated we note the Notice of Study Commencement states, "The Master Plan will recommend servicing requirements to meet growth in St. Jacobs and Elmira for the next 30 years."

The Growth Plan for the Greater Golden Horseshoe contains population forecasts for the Region of Waterloo to the year 2031 and further, the Region of Waterloo adopted a new Official Plan containing population forecasts to the year 2029. Section 1.1.2 of the Provincial Policy Statement limits the amount of land that can be designated for employment, housing and other land uses to a 20 year planning horizon. On this basis, this project may have implications with respect to those matters covered by the PPS and the Growth Plan as noted above, and we recommend that you consider these policies in the development of this Master Plan.

In addition to the above, environmental assessment studies that review and develop a Master Plan for wastewater supply servicing should consider the following: 1) appropriate size and type of system(s) to accommodate present and future requirements; 2) the services can be sustained by the water resources upon which they rely; 3) the system(s) are located and designed in accordance with provincial standards; 4) the services are financially viable and comply with all other regulatory requirements; 5) water conservation and water use efficiency is promoted; and 6) human health and the natural environment is protected. Additionally, you should ensure that the local Official Plan policies regarding municipal wastewater services and management are considered and integrated into the development of this Master Plan.

Finally, our comments on this undertaking should not be considered as approval for any other related applications under the *Planning Act* or other provincial legislation that may be required, may be related to, or may result from this project.

Please keep us on your circulation list for this project. If you have any questions or comments, please telephone me at (519) 873-4695 or by email at: Dwayne.Evans@ontario.ca.

Yours truly,

Dwayne Evans

Dwayne Evans, M.A., MCIP, RPP
Planner
Municipal Services Office – Western

Region of Waterloo

TRANSPORTATION AND
ENVIRONMENTAL SERVICES
Water Services

150 Frederick Street
Kitchener ON Canada N2G 4J3
Telephone: (519) 575-4426
Fax: (519) 575-4452
www.region.waterloo.on.ca

January 14, 2011

Mr. Dwayne Evans
Planner
Ministry of Municipal Affairs and Housing
Municipal Services Office - Western
659 Exeter Road, 2nd Floor
London, Ontario N6E 4J3

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Response to Notice of Study Commencement

Dear Mr. Evans:

Thank you very much for your letter of December 23, 2010 in which you outline the services of your office, as well as information on the Provincial Policy Statement and the Growth Plan for the Greater Golden Horseshoe. Your letter also outlines considerations for the environmental assessment studies that review and develop a Master Plan for wastewater supply servicing.

We note your comments and will continue to provide relevant project information and notifications as the Master Plan process progresses. Please note that we have added your name to our project mailing list, in addition to Mr. Matthew Ferguson.

If you have any questions or would like further information about the study, please contact the undersigned by phone at 519-575-4095 or by e-mail at PLaw@regionofwaterloo.ca. Thank you very much for your interest in the study.

Sincerely,

Pam Law, P.Eng.
Project Engineer
Water Services

cc. Mr. Steve Nutt, XCG Consultants Ltd.

Ontario Realty Corporation
Société immobilière de l'Ontario

One Dundas Street West, Suite 2000, Toronto, ON M5G 2L5
1, rue Dundas Ouest, bureau 2000, Toronto, ON M5G 2L5

January 11, 2011

To Pam Law, P.Eng.,

RE: **St. Jacobs - Elmira Wastewater Treatment Master Plan**
Notice of Study Commencement

Thank you for circulating Ontario Realty Corporation (ORC) on your Notice of Study Commencement. The ORC is the strategic manager of the government's real property with a mandate of maintaining and optimizing value of the portfolio, while ensuring real estate decisions reflect public policy objectives of the government.

As you may be aware, ORC is responsible for managing real property that is owned by the Ministry of Energy and Infrastructure (MEI). Our preliminary review of your notice and supporting information indicates that ORC-managed property is directly in the study area. As a result, your proposal may have the potential to impact this property and/or the activities of tenants present on ORC-managed lands. Attached please find a map that identifies these properties to assist you in identifying and avoiding potential impacts on ORC-managed lands. Please note that lands managed by Hydro One, on behalf of ORC are in the study area. These lands are also subject to the same following requirements.

Potential Negative Impacts to ORC Tenants and Lands

General Impacts
Negative environmental impacts associated with the project design and construction, such as the potential for dewatering, dust, noise and vibration impacts, and impacts to natural heritage features/habitat and functions, should be avoided and/or appropriately mitigated in accordance with applicable regulations best practices and Ministry of Natural Resources (MNR) and Ministry of the Environment (MOE) standards. Avoidance and mitigation options that characterize baseline conditions and quantify the potential impacts should be present as part of the EA project file. Details of appropriate mitigation, contingency plans and triggers for implementing contingency plans should also be present.

Impacts to Land holdings
Negative impacts to land holdings, such as the taking of developable parcels of ORC managed land or fragmentation of utility or transportation corridors, should be avoided. If the potential for such impacts is present as part of this undertaking, you should contact the undersigned to discuss these issues at the earliest possible stage of your study.

If takings are suggested as part of any alternative these should be appropriately mapped and quantified within EA report documentation. In addition, details of appropriate mitigation and or next steps related to compensation for any required takings should be

present. ORC requests circulation of the draft EA report prior to finalization if potential impacts to ORC-managed lands are present as part of this study.

Heritage Management Process & Class Environmental Assessment (EA) Process

Should the proposed activities impact cultural heritage features, on ORC managed lands, a request to examine cultural heritage issues which can include the cultural landscape, archaeology and places of sacred and secular value could be required. The Ontario Realty Corporation Heritage Management Process should be used for identifying and conserving heritage properties in the provincial portfolio (this document can be downloaded from the Heritage section of our website: http://www.ontariorealty.ca/What-We-Do/Heritage.htm). Through this process, ORC identifies, communicates and conserves the values of its heritage places. In addition, the Class EA ensures that ORC considers the potential effects of proposed undertakings on the environment, including cultural heritage.

Potential Triggers Related to MEI's Class EA

The ORC is required to follow the MEI Class Environmental Assessment Process for Realty Activities Not Related to Electricity Projects (MEI Class EA). The MEI Class EA applies to a wide range of realty and planning activities including leasing or letting, planning approvals, dispostion, granting of easements, demolition and property maintenance/repair. For details on the ORC Class EA please visit the Environment and Heritage page of our website found at http://www.ontariorealty.ca/AssetFactory.aspx?did=2240

If the MEI Class EA is triggered, and deferral to another ministry's or agency's Class EA or individual EA is requested, the alternative EA will be subject to a critical review prior to approval for any signoff of a deferral by the proponent. The alternative EA needs to fulfill the minimum criteria of the MEI Class EA. When evaluating an alternative EA there must be explicit reference to the corresponding undertaking in the MEI Class EA (*e.g.,* if the proponent identifies the need to acquire land owned by MEI, then "acquisition of MEI-owned land", or similar statement, must be referenced in the EA document). Furthermore, sufficient levels of consultation with MEI's/ORC's specific stakeholders, such as the Ontario Ministry of Natural Resources, must be documented with the relevant information corresponding to MEI's/ORC's undertaking and the associated maps. In addition to archaeological and heritage reports, a Phase I Environmental Site Assessment (ESA), on ORC lands should also be incorporated into the alternative EA study. Deficiencies in any of these requirements could result in an inability to defer to the alternative EA study and require completing MEI's Class EA prior to commencement of the proposed undertaking.

In summary, the purchase of MEI-owned/ORC-managed lands or disposal of rights and responsibilities (e.g. easement) for ORC-managed lands triggers the application of the

MEI Class EA. If any of these realty activities affecting ORC-managed lands are being proposed as part of any alternative, please contact the Sales and Marketing Group through ORC's main line (Phone: 416-327-3937, Toll Free: 1-877-863-9672), and contact the undersigned at your earliest convenience to discuss next steps.

Specific Comments

If an EA for this project is currently being undertaken and the undertaking directly affects all or in part any ORC-managed property, please send the undersigned a copy of the DRAFT EA report and allow sufficient time (minimum of 30 calendar days) for comments and discussion prior to finalizing the report to ensure that all MEI Class EA requirements can be met through the EA study.

Concluding Comments

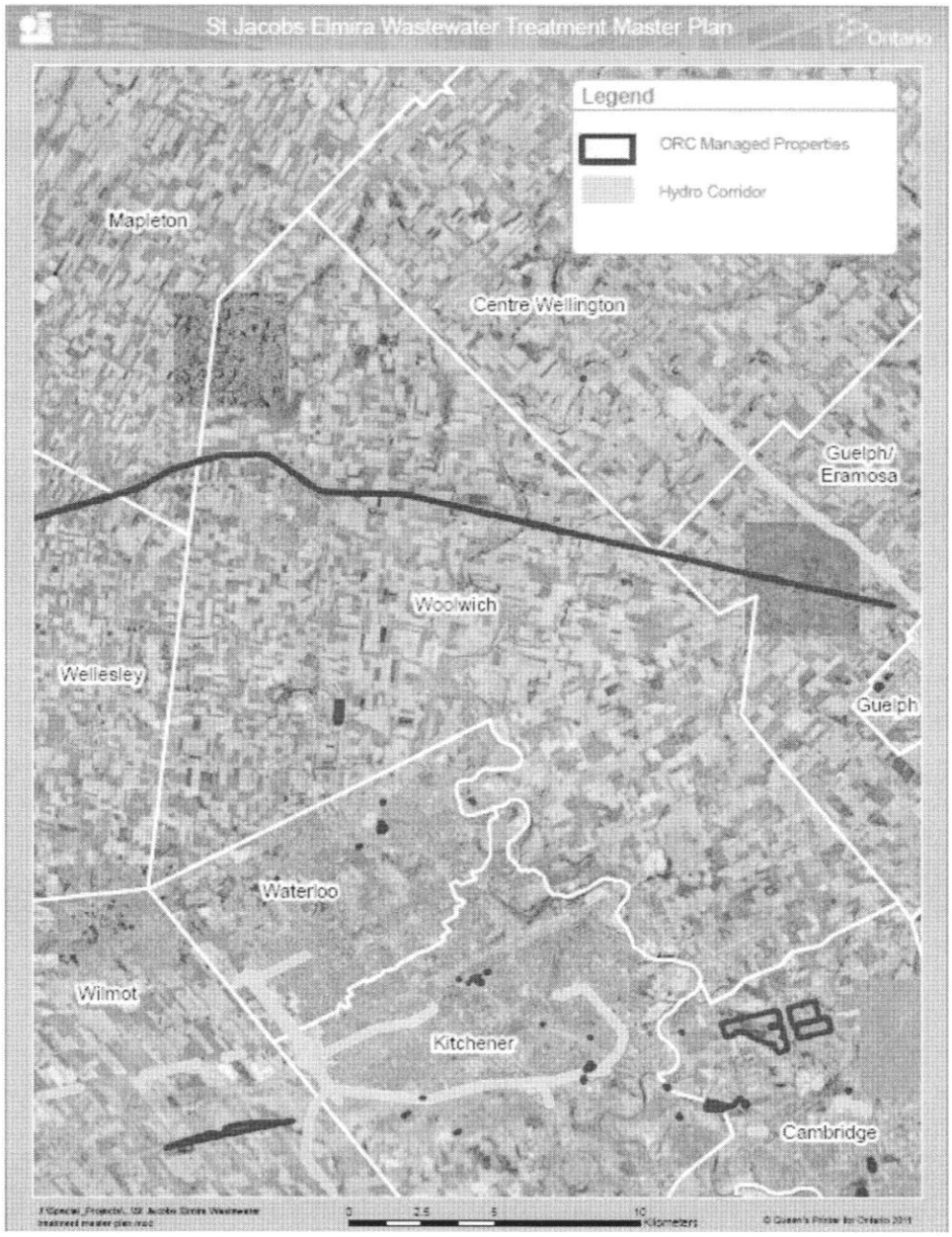
Thank you for the opportunity to provide initial comments on this undertaking. If you have any questions on the above I can be reached at the contacts below.

Sincerely,

L. Myslicki

Lisa Myslicki
Environmental Coordinator
Ontario Realty Corporation - Professional Services
1 Dundas Street West,
Suite 2000, Toronto, Ontario
M5G 2L5
(416) 212-3768
lisa.myslicki@ontariorealty.ca

Appendix 1: Location of ORC property



Region of Waterloo

TRANSPORTATION AND
ENVIRONMENTAL SERVICES
Water Services

150 Frederick Street
Kitchener ON Canada N2G 4J3
Telephone: (519) 575-4426
Fax: (519) 575-4452
www.region.waterloo.on.ca

January 14, 2011

Ms. Lisa Myslicki
Environmental Coordinator
Ontario Realty Corporation – Professional Services
1 Dundas Street West, Suite 2000
Toronto, Ontario M5G 2L5

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Response to Notice of Study Commencement

Dear Ms. Myslicki:

Thank you very much for your letter of January 11, 2011 in which you provide information on potential negative impacts to ORC tenants and lands, and potential triggers related to the Ministry of Energy and Infrastructure's Class Environmental Assessment. Your letter also includes Appendix 1, a map illustrating the location of ORC property.

We note your comments and will continue to provide relevant project information and notifications as the Master Plan process progresses. Please note that we have added your name to our project mailing list, in addition to Mr. Anton Pojasok.

If you have any questions or would like further information about the study, please contact the undersigned by phone at 519-575-4095 or by e-mail at PLaw@regionofwaterloo.ca. Thank you very much for your interest in the study.

Sincerely,

Pam Law, P.Eng.
Project Engineer
Water Services

cc. Mr. Steve Nutt, XCG Consultants Ltd.

400 Clyde Road, P.O. Box 729 Cambridge, ON N1R 5W6

Phone: 519.621.2761 **Toll free:** 866.900.4722 **Fax:** 519.621.4844 **Online:** www.grandriver.ca

December 3, 2012

Ms. Pam Law
Project Engineer, Water Services
Region of Waterloo
150 Frederick Street, 7th Floor
Kitchener, ON N2G 4J3

Dear Ms. Law:

Re: St. Jacobs – Elmira Wastewater Treatment Master Plan – Notice of Public Information Centre

---

We have received the Public Information Centre (PIC) notice for the St. Jacobs – Elmira Wastewater Treatment Master Plan which will review the wastewater treatment servicing for these two communities and recommend wastewater treatment requirements to meet growth in St. Jacobs and Elmira for the next 30 years.

Our Water Quality Engineer is a member of the Steering Committee for this project and will be in attendance at the PIC. Our interest in this project relates to assimilative capacity as well as our regulatory role. We wish to note that the study area contains numerous natural hazard and natural heritage features including Canagagigue Creek, the Conestogo River and their tributaries, floodplain, erosion hazards, wetlands, and the allowances adjacent to these features. These features and their allowances are regulated under Ontario Regulation 150/06 – Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Regulation. Any future development within the regulated areas will require the prior issuance of permit from the GRCA.

It would be appreciated if you could please forward any information presented at the meeting as well as the draft report to the attention of Mark Anderson and Andrew Herreman.

Should you have any questions or require any information, please contact Andrew Herreman, Resource Planer at 519-621-2763 ext. 2319.

Yours truly,

Beth Brown

Beth Brown
Supervisor of Resource Planning
Grand River Conservation Authority
BB/ah

c.c. XCG Consultants Ltd. c/o Steve Nutt – 820 Trillium Drive, Kitchener, ON N2R 1K4
Mark Anderson, GRCA

Member of Conservation Ontario, representing Ontario's 36 Conservation Authorities ▪ The Grand – A Canadian Heritage River

Ontario
Infrastructure Ontario

One Dundas Street West, Suite 2000, Toronto, ON M5G 2L5
1, rue Dundas Ouest, bureau 2000, Toronto, ON M5G 2L5

December 25, 2012

Thank you for circulating Infrastructure Ontario (formerly the Ontario Realty Corporation) on your Notice. Infrastructure Ontario (IO) is the strategic manager of the provincial government's real estate property with a mandate of maintaining and optimizing value of the portfolio, while ensuring real estate decisions reflect public policy objectives of the government.

As you may be aware, *IO is responsible for managing real estate property that is owned by Her Majesty the Queen in Right of Ontario as represented by the Minister of Infrastructure (MOI).* There is a potential that IO manages lands that fall within your study area. As a result, your proposal may impact IO managed properties and/or the activities of tenants present on IO-managed lands. In order to determine if IO property is within your study area, IO requires that the proponent of the project conduct a title search by reviewing parcel register(s) for adjoining lands, to determine the extent of ownership by MOI or it's predecessors (listed below) ownership. Please contact IO if any ownership of provincial government lands are known to occur within your study area and are proposed to be impacted. IO is obligated to complete due diligence for any realty activity on IO managed lands and this should be incorporated into all project timelines. IO managed lands can ***include within the title but is not limited to*** variations of the following: Her Majesty the Queen/King, OLC, ORC, Public Works, Hydro One, PIR, MGS, MBS, MOI, MTO, MNR and MEI*. Please ensure that a copy of your notice is also sent to the ministry/agency on title. As an example, if the study area includes a Provincial Park, then MNR is to also to be circulated notices related to your project.

Potential Negative Impacts to IO Tenants and Lands

General Impacts
Negative environmental impacts associated with the project design and construction, such as the potential for dewatering, dust, noise and vibration impacts, and impacts to natural heritage features/habitat and functions, should be avoided and/or appropriately mitigated in accordance with applicable regulations best practices and Ministry of Natural Resources (MNR) and Ministry of the Environment (MOE) standards. Avoidance and mitigation options that characterize baseline conditions and quantify the potential impacts should be present as part of the EA project file. Details of appropriate mitigation, contingency plans and triggers for implementing contingency plans should also be present.

Impacts to Land holdings
Negative impacts to land holdings, such as the taking of developable parcels of IO managed land or fragmentation of utility or transportation corridors, should be avoided. If the potential for such impacts is present as part of this undertaking, you should contact the undersigned to discuss these issues at the earliest possible stage of your study.

If takings are suggested as part of any alternative these should be appropriately mapped and quantified within EA report documentation. In addition, details of appropriate mitigation and or next steps related to compensation for any required takings should be present. IO requests circulation of the draft EA report prior to finalization if potential impacts to IO-managed lands are present as part of this study.

416.327.3937 416.327.1906 info@infrastructureontario.ca www.infrastructureontario.ca

Heritage Management Process & Class Environmental Assessment (EA) Process

Should the proposed activities impact cultural heritage features on IO managed lands, a request to examine cultural heritage issues which can include the cultural landscape, archaeology and places of sacred and secular value could be required. The IO (formerly Ontario Realty Corporation) Heritage Management Process should be used for identifying and conserving heritage properties in the provincial portfolio (this document can be downloaded from the Heritage section of our website: http://www.ontariorealty.ca/What-We-Do/Heritage.htm). Through this process, IO identifies, communicates and conserves the values of its heritage places. In addition, the Class EA ensures that IO considers the potential effects of proposed undertakings on the environment, including cultural heritage.

Potential Triggers Related to MOI's Class EA

IO is required to follow the MOI Class Environmental Assessment Process for Realty Activities Not Related to Electricity Projects (MOI Class EA). The MOI Class EA applies to a wide range of realty and planning activities including leasing or letting, planning approvals, dispostion, granting of easements, demolition and property maintenance/repair. For details on the MOI Class EA please visit the Environment and Heritage page of our website found at http://www.infrastructureontario.ca/What-We-Do/Buildings/Realty-Services/Environmental-Management/Class-EAs/
Please note that completion of any EA process does not necessarily provide an approval for IO's EA process unless the alternative EA incorporates IO's applicable Class EA requirements.

If the MOI Class EA is triggered, and deferral to another ministry's or agency's Class EA or individual EA is requested, the alternative EA will be subject to a critical review prior to approval for any signoff of a deferral by the proponent. The alternative EA needs to fulfill the minimum criteria of the MOI Class EA. When evaluating an alternative EA there must be explicit reference to the corresponding undertaking in the MOI Class EA (*e.g.*, if the proponent identifies the need to acquire land owned by MOI, then "acquisition of MOI-owned land", or similar statement, must be referenced in the EA document). Furthermore, sufficient levels of consultation with MOI's/IO's specific stakeholders, such as the MNR, must be documented with the relevant information corresponding to MOI's/IO's undertaking and the associated maps. In addition to *archaeological and heritage reports, a Phase I Environmental Site Assessment (ESA)*, on IO lands should also be incorporated into the alternative EA study. Deficiencies in any of these requirements could result in an inability to defer to the alternative EA study and require completing MOI's Class EA prior to commencement of the proposed undertaking.

In summary, the purchase of MOI-owned/IO-managed lands or disposal of rights and responsibilities (e.g. easement) for IO-managed lands triggers the application of the MOI Class EA. If any of these realty activities affecting IO-managed lands are being proposed as part of any alternative, please contact the Sales and Marketing Group through IO's main line (Phone: 416-327-3937, Toll Free: 1-877-863-9672), and contact the undersigned at your earliest convenience to discuss next steps.

Specific Comments

If an EA for this project is currently being undertaken and **only if** the undertaking directly affects all or in part any IO-managed property, please send the undersigned a copy of the DRAFT EA report and allow sufficient time (minimum of 30 calendar days) for comments and discussion prior to finalizing the report to ensure that all MOI Class EA requirements can be met through the EA study.

Please remove IO from your circulation list, with respect to this project, if there are no IO managed lands in the study area. In addition, in the future, please send only **electronic copies of notices** for any projects impacting IO managed lands to: Keith.Noronha@infrastructureontario.ca

Thank you for the opportunity to provide initial comments on this undertaking. If you have any questions on the above I can be reached at the contacts below.

Sincerely,



Lisa Myslicki
Environmental Advisor, Environmental Management
Infrastructure Ontario
1 Dundas Street West,
Suite 2000, Toronto, Ontario
M5G 2L5
(416) 212-3768
lisa.myslicki@infrastructureontario.ca

* Below are the acronyms for agencies/ministries listed in the above letter
OLC: Ontario Lands Corporation
ORC: Ontario Realty Corporation
PIR: Public Infrastructure and Renewal
MGS: Ministry of Government Services
MBS: Management Board and Secretariat
MOI: Ministry of Infrastructure
MTO: Ministry of Transportation
MNR: Ministry of Natural Resources
MEI: Ministry of Energy and Infrastructure

Region of Waterloo

TRANSPORTATION AND
ENVIRONMENTAL SERVICES
Water Services

150 Frederick Street
Kitchener ON Canada N2G 4J3
Telephone: (519) 575-4426
Fax: (519) 575-4452
www.region.waterloo.on.ca

January 3, 2013

Ms. Lisa Myslicki
Environmental Advisor, Environmental Management
Infrastructure Ontario
1 Dundas Street West, Suite 2000
Toronto, Ontario
M5G 2L5

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan

Dear Ms. Myslicki:

Thank you very much for your letter of December 25, 2012, responding to the Notice of Public Information Centre for the St. Jacobs – Elmira Wastewater Treatment Master Plan. We appreciate the comments that you provided.

The recommended preferred alternative that has been identified through the Master Plan process involves the following:

- St. Jacobs Wastewater Treatment Plant (WWTP)
  - Reduce Inflow/Infiltration (I/I) and implement water efficiency
  - Decommission the St. Jacobs WWTP and transfer flows to the Waterloo WWTP after 2024

- Elmira WWTP
  - Reduce I/I and implement water efficiency
  - Optimize or minor upgrades to address current capacity limitations

- Heidelberg WWTP
  - Maintain existing Heidelberg WWTP
  - Review alternatives when existing WWTP needs to be replaced.

No provincial lands are required for the WWTP infrastructure. At this time, it is expected that the forcemain route to transfer flows from the St. Jacobs WWTP to the Waterloo WWTP will be within existing road allowances. However, a separate Class Environmental Assessment (EA) will be undertaken subsequent to this study to identify the detailed forcemain route. We will include Infrastructure Ontario on the mailing list to receive future notifications as part of this separate Class EA process.

If you have any further questions or comments, please contact me by phone at 519-575-4095 or by e-mail at PLaw@regionofwaterloo.ca. Thank you very much for your interest in the study.

Sincerely,



Pam Law, P.Eng.
Project Engineer
Water Services

cc. Mr. Steve Nutt, XCG Consultants Ltd.

STAKEHOLDERS

MERITECH

RECEIVED
OCT 2 1 2010
WATER SERVICES

October 13, 2010

Water Services Department
Regional Municipality of Waterloo
150 Frederick Street, 5th Floor
Kitchener, ON N2G 4J3

Attention: Ms. Pam Law, P. Eng.
Project Engineer, Water Services

Dear Ms. Law,

Re: Woolwich Wastewater Master Plan, C2010-03
Township of Woolwich

On behalf of our client, Valley View Heights (St. Jacobs) Ltd., we have reviewed the Request for Expressions of Interest – C2010-03, for Consulting Engineering Services for the St. Jacobs & Elmira Wastewater Master Plan and offer the following for inclusion into the study process.

The Region of Waterloo's Wastewater Treatment Master Plan states that "consideration could be given to pumping wastewater to the Waterloo WWTP via the City of Waterloo collection system" which we believe is a viable option that ought to be investigated further. Our client has worked proactively and cooperatively with the Township of Woolwich to reduce flows to the St. Jacobs WWTP, but despite considerable time, effort and money over the past decade, the Village of St. Jacobs remains plagued by insufficient capacity at the plant. It is our understanding that the plant operates well within its design parameters during regular, dry weather flows, but reaches its operational limit during high inflow and infiltration (I&I) periods; as a small plant, these dramatic fluctuations are not easily accommodated.

The Village of St. Jacobs is a desirable place to live and, therefore, there is a demand for more development in the area. This can take the form of greenfield or infill residential, as well as employment lands. The Township of Woolwich is currently in a difficult position because they cannot allow for further development due to capacity limitations at the Wastewater Treatment Plant. With such a limited capacity available, opportunities for future growth, whether it is employment opportunities or residential development, are currently constrained. This is to the detriment of the economic development of the area.

Current land owners see the value in being proactive and are attempting to address the capacity issue through the design of their own developments. For example, our client has undertaken to investigate the viability and cost of redirecting flows from a portion of the Village to a new pumping sanitary on their lands at the south end of St. Jacobs, and pumped to Waterloo, so as to free up capacity in the Village for other users. This illustrates the range of options that may exist for St. Jacobs.

WWW.MERITECH.ON.CA

Therefore, as part of the study options for the Wastewater Master Plan, we respectfully request that the Region of Waterloo direct the selected consultant to examine the feasibility of diverting some or all of the sanitary flows from the St. Jacobs Waste Water Treatment Plant to the City of Waterloo.

We would be pleased to meet with you and your consultant team at your convenience.

Yours very truly,

MERITECH ENGINEERING



Ian S. Robertson, P. Eng.
Director of Engineering

ISR/mlb
Enclosures (1)

cc Township of Woolwich
City of Waterloo
Valley View Heights (St. Jacobs) Ltd.

Region of Waterloo

TRANSPORTATION AND
ENVIRONMENTAL SERVICES
Water Services

150 Frederick Street
Kitchener ON Canada N2G 4J3
Telephone: (519) 575-4426
Fax: (519) 575-4452
www.region.waterloo.on.ca

November 1, 2010
File: E12-40/8294-60

Mr. Ian Robertson, P. Eng.

Meritech Engineering
1315 Bishop St. North, Suite 202
Cambridge, ON N1R 6Z2

Dear Mr. Robertson,

Re: St. Jacobs – Elmira Wastewater Treatment Master Plan

Thank you for your letter and your interest in the St. Jacobs and Elmira Wastewater Treatment Master Plan. We have just recently awarded this project and are currently in the process of commencing the Class Environmental Assessment (EA) process which will review wastewater treatment servicing for these two communities for the next 30 years.

Thank you for providing us with your specific concerns relating to wastewater treatment capacity within St. Jacobs. We appreciate your comments and as part of the EA process will be looking at all feasible options for wastewater treatment for these communities which will include the examination of diverting some or all of the sanitary flows from these communities to an alternate treatment location.

We have added your contact information to our project mailing list and you will be providing any notifications on the project as they are produced. If you have any questions or comments in the interim, please do not hesitate to contact me.

Yours truly,

Pam Law
Project Engineer
Water Services
(519)-575-4095
Plaw@regionofwaterloo.ca

Dianne Damman

From: Pam Law <PLaw@regionofwaterloo.ca>
Sent: November 29, 2012 11:38 AM
To: 'Hugh Handy'
Cc: 'Stephen Nutt'; 'Dianne Damman'
Subject: RE: St. Jacobs

Hi Hugh,
The flow projections will be presented at next Tuesday's PIC and here are the populations that were used to develop these projections. This will be documented in the Master Plan report which we anticipate to be completed into the first quarter of next year.

As mentioned on the phone, the population estimate for 2041 is anticipated to represent build out to the Country Side Lines.

Year	Projected Residential Wastewater Treatment Service Population	Projected Total Flows (m^3/d)
Current (2005 - 2009)	1,836	1,050
2011	1,950	1,115
2016	2,235	1,278
2021	2,520	1,441
2026	2,805	1,604
2029	2,976	1,702
2031	3,090	1,767
2041	3,660	2,093

Pam

Pam Law, P.Eng.
Project Engineer
Water Services, Region of Waterloo
150 Frederick Street, 7th Floor
Kitchener, Ontario, Canada, N2G 4J3
Phone: (519) 575-4095 Fax: (519) 575-4452

From: Hugh Handy [mailto:hhandy@gspgroup.ca]
Sent: Wednesday, November 28, 2012 12:26 PM
To: Pam Law
Subject: St. Jacobs

Hi Pam,

Thank you very much for taking the time with me yesterday by phone to talk about the St. Jacobs-Elmira Wastewater Treatment Master Plan.

As a follow-up -- are you able to release the population and development information which you based your calculations on for growth out to the Countryside line?

Let me know.

Thanks,
Hugh

Hugh Handy, MCIP, RPP
Associate

GSP Group Inc.
72 Victoria Street South, Suite 201
Kitchener, Ontario
N2G 4Y9
Phone (519) 569-8883 ext. 222
Fax (519) 569-8643

I-6

ABORIGINAL CONSULTATION

- *NOTICE OF COMMENCEMENT LETTERS*
- *NOTICE OF PUBLIC INFORMATION CENTRE LETTERS*
- *NOTICE OF COMPLETION LETTERS*

NOTICE OF COMMENCEMENT

Region of Waterloo

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November 17, 2010

Ms. Margaret Sault
Mississaugas of the New Credit First Nation
RR #6, 468 New Credit Road
Hagersville, Ontario N0A 1H0

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Notice of Study Commencement

Dear Ms. Sault:

The Regional Municipality of Waterloo (Region) is undertaking a Wastewater Treatment Master Plan for the communities of St. Jacobs and Elmira in the Township of Woolwich (Township). The wastewater systems in both communities are operated as a 2-tier system with the Township responsible for wastewater collection and general pumping, and the Region responsible for wastewater treatment and biosolids management. The Region owns the two wastewater treatment plants located in St. Jacobs and Elmira.

In 1997, a Class Environmental Assessment (EA) study examined alternatives to providing adequate wastewater treatment capacity to St. Jacobs and Elmira to the year 2021. In addition, a Region-wide Wastewater Treatment Master Plan (WWTMP) was completed in 2007, and identified the need to develop a Master Plan for St. Jacobs and Elmira which specifically examined the treatment requirements for these two communities.

This Master Plan will review wastewater treatment servicing for these two communities since the implementation of the recommendations of the 1997 Class EA study, as well as the completion of the 2007 WWTMP. The Master Plan will recommend wastewater treatment requirements to meet growth in St. Jacobs and Elmira for the next 30 years.

The study is being conducted in accordance with the requirements for Master Plans under the Municipal Class Environmental Assessment (EA) (Municipal Engineers Association, June 2000, as amended in 2007). The Master Plan will follow Phases 1 and 2 of the Municipal Class EA.

The purpose of this letter is to advise you of the commencement of this study. The Region of Waterloo has retained XCG Consultants Ltd. and Hatch Mott MacDonald to undertake the study. Please see attached for a copy of the Notice of Commencement that will be published in the local newspaper to advise the general public of the study. Information updates on the Master Plan will be posted on the Region of Waterloo web site at: www.region.waterloo.on.ca/water.

If you have any initial concerns or comments regarding this study, we would appreciate receiving your comments in writing. It is also recognized that you may or may not want to receive further notifications regarding the study. If this is the case, we would appreciate you advising us in writing. Written replies would be appreciated no later than **December 15, 2010**.

A Public Information Centre (PIC) will be scheduled during the study to provide background information, and to present the preferred wastewater treatment solution and the recommended Master Plan. Details of the PIC will be provided at a future date.

If you have any questions or would like further information about the study, please contact the undersigned by phone at 519-575-4095 or by e-mail at PLaw@regionofwaterloo.ca. Thank you very much for your interest in the study.

Sincerely,



Pam Law, P.Eng.
Project Engineer
Water Services

cc. Mr. Steve Nutt, XCG Consultants Ltd.

Region of Waterloo

TRANSPORTATION AND
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Water Services

150 Frederick Street
Kitchener ON Canada N2G 4J3
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Fax: (519) 575-4452
www.region.waterloo.on.ca

November 17, 2010

Lonny Bomberry
Director
Six Nations of the Grand River
Land and Resources Department
P.O. Box 5000
2498 Chiefswood Road
Ohsweken, Ontario N0A 1M0

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Notice of Study Commencement

Dear Lonny Bomberry:

The Regional Municipality of Waterloo (Region) is undertaking a Wastewater Treatment Master Plan for the communities of St. Jacobs and Elmira in the Township of Woolwich (Township). The wastewater systems in both communities are operated as a 2-tier system with the Township responsible for wastewater collection and general pumping, and the Region responsible for wastewater treatment and biosolids management. The Region owns the two wastewater treatment plants located in St. Jacobs and Elmira.

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If you have any questions or would like further information about the study, please contact the undersigned by phone at 519-575-4095 or by e-mail at PLaw@regionofwaterloo.ca. Thank you very much for your interest in the study.

Sincerely,



Pam Law, P.Eng.
Project Engineer
Water Services

cc. Mr. Steve Nutt, XCG Consultants Ltd.

Region of Waterloo

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November 17, 2010

Mr. Paul General
Eco-Centre Manager
Six Nations of the Grand River
Land and Resources Department
Six Nations Council
P.O. Box 5000
2676 Fourth Line Road
Ohsweken, Ontario N0A 1M0

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Notice of Study Commencement

Dear Mr. General:

The Regional Municipality of Waterloo (Region) is undertaking a Wastewater Treatment Master Plan for the communities of St. Jacobs and Elmira in the Township of Woolwich (Township). The wastewater systems in both communities are operated as a 2-tier system with the Township responsible for wastewater collection and general pumping, and the Region responsible for wastewater treatment and biosolids management. The Region owns the two wastewater treatment plants located in St. Jacobs and Elmira.

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Sincerely,



Pam Law, P.Eng.
Project Engineer
Water Services

cc. Mr. Steve Nutt, XCG Consultants Ltd.

Region of Waterloo

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ENVIRONMENTAL SERVICES
Water Services

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Kitchener ON Canada N2G 4J3
Telephone: (519) 575-4426
Fax: (519) 575-4452
www.region.waterloo.on.ca

November 17, 2010

Mr. Leroy Hill
Secretary
Six Nations Haudenosaunee Confederacy Council
Haudenosaunee Resource Centre
2634 6th Line
RR #2
Ohsweken, Ontario N0A 1M0

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Notice of Study Commencement

Dear Mr. Hill:

The Regional Municipality of Waterloo (Region) is undertaking a Wastewater Treatment Master Plan for the communities of St. Jacobs and Elmira in the Township of Woolwich (Township). The wastewater systems in both communities are operated as a 2-tier system with the Township responsible for wastewater collection and general pumping, and the Region responsible for wastewater treatment and biosolids management. The Region owns the two wastewater treatment plants located in St. Jacobs and Elmira.

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Sincerely,



Pam Law, P.Eng.
Project Engineer
Water Services

cc. Mr. Steve Nutt, XCG Consultants Ltd.

NOTICE OF PUBLIC INFORMATION CENTRE

Region of Waterloo

TRANSPORTATION AND
ENVIRONMENTAL SERVICES
Water Services

150 Frederick Street
Kitchener ON Canada N2G 4J3
Telephone: (519) 575-4426
Fax: (519) 575-4452
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November 07, 2012

Ms. Margaret Sault
Mississaugas of the New Credit First Nation
RR #6, 468 New Credit Road
Hagersville, Ontario N0A 1H0

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Notice of Public Information Centre

Dear Ms. Margaret Sault,

The Regional Municipality of Waterloo (Region) is undertaking a Wastewater Treatment Master Plan for the communities of St. Jacobs and Elmira in the Township of Woolwich (Township). The wastewater systems in both communities are operated as a 2-tier system with the Township responsible for wastewater collection and general pumping, and the Region responsible for wastewater treatment and biosolids management.

A Region-wide Wastewater Treatment Master Plan (WWTMP) was completed in 2007, and identified the need to develop a Master Plan for St. Jacobs and Elmira which specifically examined the treatment requirements for these two communities.

This Master Plan is reviewing wastewater treatment servicing for these two communities and will recommend wastewater treatment requirements to meet growth in St. Jacobs and Elmira for the next 30 years.

The study is being conducted in accordance with the requirements for Master Plans under the Municipal Class Environmental Assessment (EA) (Municipal Engineers Association, June 2000, as amended in 2007 and 2011). The Master Plan is following Phases 1 and 2 of the Municipal Class EA.

A Public Information Centre (PIC) has been scheduled to receive input and comments from interested members of the public. The PIC will provide information on the project, including population and flow projections, the identification and evaluation of potential servicing alternatives, the evaluation of a short-list of feasible options, and the recommended preferred alternative for servicing St. Jacobs and Elmira.

The PIC will be held as follows:

Tuesday, December 4, 2012
5:00 PM to 7:00 PM
St. Jacobs Community Centre, 31 Parkside Drive
St. Jacobs, Ontario

Information on the St. Jacobs – Elmira Wastewater Treatment Master Plan study is posted on the Region's web site at: www.regionofwaterloo.ca. The information presented at this PIC will be available on this web site after December 4, 2012.

If you have any questions or would like further information about the study, please contact the undersigned by phone at 519-575-4095 or by e-mail at PLaw@regionofwaterloo.ca. Thank you very much for your interest in the study.

Sincerely,



Pam Law, P.Eng.
Project Engineer
Water Services

cc. Mr. Steve Nutt, XCG Consultants Ltd.

Region of Waterloo

TRANSPORTATION AND
ENVIRONMENTAL SERVICES
Water Services

150 Frederick Street
Kitchener ON Canada N2G 4J3
Telephone: (519) 575-4426
Fax: (519) 575-4452
www.region.waterloo.on.ca

November 07, 2012

Mr. Lonny Bomberry
Director
Six Nations of the Grand River
Land and Resources Department,
P.O. Box 5000, 2498 Chiefswood Road
Ohsweken, Ontario N0A 1M0

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Notice of Public Information Centre

Dear Mr. Lonny Bomberry,

The Regional Municipality of Waterloo (Region) is undertaking a Wastewater Treatment Master Plan for the communities of St. Jacobs and Elmira in the Township of Woolwich (Township). The wastewater systems in both communities are operated as a 2-tier system with the Township responsible for wastewater collection and general pumping, and the Region responsible for wastewater treatment and biosolids management.

A Region-wide Wastewater Treatment Master Plan (WWTMP) was completed in 2007, and identified the need to develop a Master Plan for St. Jacobs and Elmira which specifically examined the treatment requirements for these two communities.

This Master Plan is reviewing wastewater treatment servicing for these two communities and will recommend wastewater treatment requirements to meet growth in St. Jacobs and Elmira for the next 30 years.

The study is being conducted in accordance with the requirements for Master Plans under the Municipal Class Environmental Assessment (EA) (Municipal Engineers Association, June 2000, as amended in 2007 and 2011). The Master Plan is following Phases 1 and 2 of the Municipal Class EA.

A Public Information Centre (PIC) has been scheduled to receive input and comments from interested members of the public. The PIC will provide information on the project, including population and flow projections, the identification and evaluation of potential servicing alternatives, the evaluation of a short-list of feasible options, and the recommended preferred alternative for servicing St. Jacobs and Elmira.

The PIC will be held as follows:

Tuesday, December 4, 2012
5:00 PM to 7:00 PM
St. Jacobs Community Centre, 31 Parkside Drive
St. Jacobs, Ontario

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November 07, 2012

Mr. Paul General
Eco-Centre Manager
Six Nations of the Grand River
Land and Resources Department, Six Nations Council,
2676 Fourth Line Road, P.O. Box 5000
Ohsweken, Ontario N0A 1M0

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Notice of Public Information Centre

Dear Mr. Paul General,

The Regional Municipality of Waterloo (Region) is undertaking a Wastewater Treatment Master Plan for the communities of St. Jacobs and Elmira in the Township of Woolwich (Township). The wastewater systems in both communities are operated as a 2-tier system with the Township responsible for wastewater collection and general pumping, and the Region responsible for wastewater treatment and biosolids management.

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Sincerely,



Pam Law, P.Eng.
Project Engineer
Water Services

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Region of Waterloo

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November 07, 2012

Mr. Leroy Hill
Secretary
Six Nations Haudenosaunee Confederacy Council
Haudenosaunee Resource Centre, 2634 6th Line, RR #2
Ohsweken, Ontario N0A 1M0

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Notice of Public Information Centre

Dear Mr. Leroy Hill,

The Regional Municipality of Waterloo (Region) is undertaking a Wastewater Treatment Master Plan for the communities of St. Jacobs and Elmira in the Township of Woolwich (Township). The wastewater systems in both communities are operated as a 2-tier system with the Township responsible for wastewater collection and general pumping, and the Region responsible for wastewater treatment and biosolids management.

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Sincerely,



Pam Law, P.Eng.
Project Engineer
Water Services

cc. Mr. Steve Nutt, XCG Consultants Ltd.

NOTICE OF COMPLETION

I-7

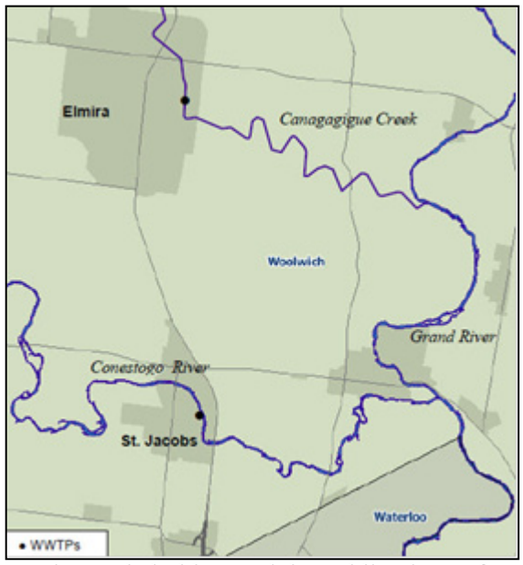
NOTICE OF COMPLETION

- *NEWSPAPER AD*
- *EXAMPLE LETTERS*

NOTICE OF COMPLETION

St. Jacobs – Elmira Wastewater Treatment Master Plan

The Regional Municipality of Waterloo (Region) has completed a Wastewater Treatment Master Plan for the communities of St. Jacobs and Elmira in the Township of Woolwich (Township). The wastewater systems in both communities are operated as a 2-tier system with the Township responsible for wastewater collection, and the Region responsible for wastewater treatment and biosolids management.



The St. Jacobs – Elmira Wastewater Treatment Master Plan reviewed wastewater treatment servicing for these two communities, as well as the community of Heidelberg, and recommends servicing requirements to meet growth in St. Jacobs and Elmira for the next 30 years.

The study was conducted in accordance with the requirements for Master Plans under the Municipal Class Environmental Assessment (EA) (Municipal Engineers Association, June 2000, as amended in 2007 and 2011). The Master Plan has been prepared following Phases 1 and 2 of the Municipal Class EA.

Based on the study findings and input from regulatory agencies, stakeholders and the public, the preferred alternative includes:

- Elmira Wastewater Treatment Plant (WWTP)
  - Continue to reduce Infiltration and Inflow (I/I) and to implement water efficiency measures
  - Optimize or upgrade the WWTP to address current capacity limitations
- Heidelberg WWTP
  - Continue to operate existing facility
  - Review alternatives at the time that the existing works need to be replaced
- St. Jacobs WWTP
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  - Decommission the St. Jacobs WWTP and transfer flows to the Waterloo WWTP after 2024.

The St. Jacobs – Elmira Wastewater Treatment Master Plan is available for review on the Region's web site at www.regionofwaterloo.ca. The Master Plan is also available for viewing at the following locations for a 30 day period between March 12, 2013 and April 11, 2013:

Region of Waterloo
Clerk's Office
150 Frederick Street, 2nd Floor
Kitchener, ON N2G 4J3
Phone: 519-575-4420

Township of Woolwich
Clerk's Office
24 Church Street West
Elmira, ON N3B 2Z6
Phone: 519-669-1647

Please provide written comments on the Master Plan to Mr. Jorge Cavalcante, Region of Waterloo by April 11, 2013 to the address provided below.

If you have any questions or comments or wish to obtain more information on the study, please contact either of the following project team members:

Mr. Jorge Cavalcante, P.Eng.
Manager, Engineering & Planning
Water Services, Region of Waterloo
150 Frederick Street, 7th Floor
Kitchener, Ontario, Canada, N2G 4J3
Phone: (519) 575-4412
Fax: (519) 575-4452
E-mail: JCavalcante@regionofwaterloo.ca

Mr. Stephen Nutt, M. Eng., P. Eng.
Consultant Project Manager
XCG Consultants Ltd.
820 Trillium Drive
Kitchener, Ontario N2R 1K4
Phone: 519-741-5774
Fax: 519-741-5627
Email: stephen@xcg.com

All comments and information received from individuals, stakeholder groups and agencies regarding this study are being collected to assist the Region of Waterloo in making a decision. Under the *Municipal Act*, personal information such as name, address, telephone number, and property location that may be included in a submission becomes part of the public record. Questions regarding the collection of this information should be forwarded to the Regional staff member indicated above.

This notice was first issued on March 12, 2013.

Region of Waterloo

TRANSPORTATION AND
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www.region.waterloo.on.ca

March 12, 2013

Ms. Allison Berman
Aboriginal Affairs and Northern Development Canada
300 Sparks Street, Room 205
Ottawa, Ontario K1A 0H4

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Notice of Completion

Dear Ms. Allison Berman:

The Regional Municipality of Waterloo (Region) has completed a Wastewater Treatment Master Plan for the communities of St. Jacobs and Elmira in the Township of Woolwich (Township). The wastewater systems in both communities are operated as a 2-tier system with the Township responsible for wastewater collection, and the Region responsible for wastewater treatment and biosolids management.

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Phone: 519-575-4420

Township of Woolwich
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24 Church Street West
Elmira, ON N3B 2Z6
Phone: 519-669-1647

Please provide written comments on the Master Plan to Mr. Jorge Cavalcante, Manager, Engineering and Planning, Water Services, Region of Waterloo by April 11, 2013.

If you have any questions or would like further information about the study, please contact Mr. Jorge Cavalcante by phone at 519-575-4412 or by e-mail at JCavalcante@regionofwaterloo.ca. Thank you very much for your interest in the study.

Sincerely,



Pam Law, P.Eng.
Project Engineer
Water Services

cc. Mr. Steve Nutt, XCG Consultants Ltd.

Region of Waterloo

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www.region.waterloo.on.ca

March 12, 2013

Mr.Martin Rukavina
Ministry of Aboriginal Affairs
160 Bloor Street E., 9th Floor
Toronto, Ontario M7A 2E6

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Notice of Completion

Dear Mr.Martin Rukavina:

The Regional Municipality of Waterloo (Region) has completed a Wastewater Treatment Master Plan for the communities of St. Jacobs and Elmira in the Township of Woolwich (Township). The wastewater systems in both communities are operated as a 2-tier system with the Township responsible for wastewater collection, and the Region responsible for wastewater treatment and biosolids management.

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Pam Law, P.Eng.
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March 12, 2013

Ms. Barb Slattery
Ministry of the Environment, West Central Region
12th Floor, 119 King Street West
Hamilton, Ontario L8P 4Y7

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Notice of Completion

Dear Ms. Barb Slattery:

The Regional Municipality of Waterloo (Region) has completed a Wastewater Treatment Master Plan for the communities of St. Jacobs and Elmira in the Township of Woolwich (Township). The wastewater systems in both communities are operated as a 2-tier system with the Township responsible for wastewater collection, and the Region responsible for wastewater treatment and biosolids management.

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March 12, 2013

Mr. Paul Odom
Ministry of the Environment, West Central Region
12th Floor, 119 King Street West
Hamilton, Ontario L8P 4Y7

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Notice of Completion

Dear Mr. Paul Odom:

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Project Engineer
Water Services

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Region of Waterloo

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www.region.waterloo.on.ca

March 12, 2013

Ms. Greta Najcler
Ministry of the Environment, Guelph District Office
4th Floor, 1 Stone Road West
Guelph, Ontario N1G 4Y2

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Notice of Completion

Dear Ms. Greta Najcler:

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Phone: 519-669-1647

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Water Services

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Region of Waterloo

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March 12, 2013

Ms. Jane Glassco
Ministry of the Environment, Guelph District Office
4th Floor, 1 Stone Road West
Guelph, Ontario N1G 4Y2

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Notice of Completion

Dear Ms. Jane Glassco:

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Project Engineer
Water Services

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Region of Waterloo

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Fax: (519) 575-4452
www.region.waterloo.on.ca

March 12, 2013

Ms. Carol Neumann
Ministry of Agriculture, Food and Rural Affairs
Elora Resource Centre, Unit 10,
6484 Wellington Road 7
Elora, Ontario N0B 1S0

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Notice of Completion

Dear Ms. Carol Neumann:

The Regional Municipality of Waterloo (Region) has completed a Wastewater Treatment Master Plan for the communities of St. Jacobs and Elmira in the Township of Woolwich (Township). The wastewater systems in both communities are operated as a 2-tier system with the Township responsible for wastewater collection, and the Region responsible for wastewater treatment and biosolids management.

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Based on the study findings and input from regulatory agencies, stakeholders and the public, the preferred alternative includes:

- Elmira Wastewater Treatment Plant (WWTP)
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  - Optimize or upgrade the WWTP to address current capacity limitations
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Region of Waterloo
Clerk's Office
150 Frederick Street, 2nd Floor
Kitchener, ON N2G 4J3
Phone: 519-575-4420

Township of Woolwich
Clerk's Office
24 Church Street West
Elmira, ON N3B 2Z6
Phone: 519-669-1647

Please provide written comments on the Master Plan to Mr. Jorge Cavalcante, Manager, Engineering and Planning, Water Services, Region of Waterloo by April 11, 2013.

If you have any questions or would like further information about the study, please contact Mr. Jorge Cavalcante by phone at 519-575-4412 or by e-mail at JCavalcante@regionofwaterloo.ca. Thank you very much for your interest in the study.

Sincerely,



Pam Law, P.Eng.
Project Engineer
Water Services

cc. Mr. Steve Nutt, XCG Consultants Ltd.

Region of Waterloo

TRANSPORTATION AND
ENVIRONMENTAL SERVICES
Water Services

150 Frederick Street
Kitchener ON Canada N2G 4J3
Telephone: (519) 575-4426
Fax: (519) 575-4452
www.region.waterloo.on.ca

March 12, 2013

Mr. Chris Stack
Ministry of Tourism and Culture
14th Floor, Suite 405, 30 Duke Street West
Kitchener, Ontario N2H 3W5

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Notice of Completion

Dear Mr. Chris Stack:

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March 12, 2013

Mr. Dwayne Evans
Ministry of Municipal Affairs and Housing
2nd Floor, 659 Exeter Road
London, Ontario N6E 1L3

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Notice of Completion

Dear Mr. Dwayne Evans:

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March 12, 2013

Mr. Ken Cornelisse
Ministry of Natural Resources
Guelph District Office, 1 Stone Road West
Guelph, Ontario N1G 4Y2

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Notice of Completion

Dear Mr. Ken Cornelisse:

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March 12, 2013

Mr. Mike Stone
Ministry of Natural Resources
Guelph District Office, 1 Stone Road West
Guelph, Ontario N1G 4Y2

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Notice of Completion

Dear Mr. Mike Stone:

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March 12, 2013

Ms. Ann Baldwin
Ministry of Transportation
659 Exeter Road, 4th Floor
London, Ontario N6E 1L3

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Notice of Completion

Dear Ms. Ann Baldwin:

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www.region.waterloo.on.ca

March 12, 2013

Mr. Anton Pojasok
Infrastructure Ontario
11th Floor, Ferguson Block,
77 Wellesley Street West
Toronto, Ontario M7A 2G3

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Notice of Completion

Dear Mr. Anton Pojasok:

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March 12, 2013

Ms. Lisa Myslicki
Infrastructure Ontario
1 Dundas Street West, Suite 2000
Toronto, Ontario M5G 2L5

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Notice of Completion

Dear Ms. Lisa Myslicki:

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March 12, 2013

Mr. Joe Farwell
Grand River Conservation Authority
400 Clyde Road, P.O. Box 729
Cambridge, Ontario N1R 5W6

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Notice of Completion

Dear Mr. Joe Farwell:

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March 12, 2013

Ms. Barb Brown
Grand River Conservation Authority
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Cambridge, Ontario N1R 5W6

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Notice of Completion

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March 12, 2013

Ms. Sandra Cooke
Grand River Conservation Authority
400 Clyde Road, P.O. Box 729
Cambridge, Ontario N1R 5W6

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Notice of Completion

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Clerk's Office
150 Frederick Street, 2nd Floor
Kitchener, ON N2G 4J3
Phone: 519-575-4420

Township of Woolwich
Clerk's Office
24 Church Street West
Elmira, ON N3B 2Z6
Phone: 519-669-1647

Please provide written comments on the Master Plan to Mr. Jorge Cavalcante, Manager, Engineering and Planning, Water Services, Region of Waterloo by April 11, 2013.

If you have any questions or would like further information about the study, please contact Mr. Jorge Cavalcante by phone at 519-575-4412 or by e-mail at JCavalcante@regionofwaterloo.ca. Thank you very much for your interest in the study.

Sincerely,



Pam Law, P.Eng.
Project Engineer
Water Services

cc. Mr. Steve Nutt, XCG Consultants Ltd.

Region of Waterloo

TRANSPORTATION AND
ENVIRONMENTAL SERVICES
Water Services

150 Frederick Street
Kitchener ON Canada N2G 4J3
Telephone: (519) 575-4426
Fax: (519) 575-4452
www.region.waterloo.on.ca

March 12, 2013

Mr. Mark Anderson
Grand River Conservation Authority
400 Clyde Road, P.O. Box 729
Cambridge, Ontario N1R 5W6

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Notice of Completion

Dear Mr. Mark Anderson:

The Regional Municipality of Waterloo (Region) has completed a Wastewater Treatment Master Plan for the communities of St. Jacobs and Elmira in the Township of Woolwich (Township). The wastewater systems in both communities are operated as a 2-tier system with the Township responsible for wastewater collection, and the Region responsible for wastewater treatment and biosolids management.

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March 12, 2013

Mr. Andrew Herreman
Grand River Conservation Authority
400 Clyde Road, P.O. Box 729
Cambridge, Ontario N1R 5W6

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Notice of Completion

Dear Mr. Andrew Herreman:

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March 12, 2013

Mr. Dan Kennaley
Township of Woolwich
24 Church Street West, P.O. Box 158
Elmira, Ontario N3B 2Z6

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Notice of Completion

Dear Mr. Dan Kennaley:

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March 12, 2013

Mr. David Brenneman
Township of Woolwich
24 Church Street West, P.O. Box 158
Elmira, Ontario N3B 2Z6

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Notice of Completion

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March 12, 2013

Mr. Bill Garibaldi
City of Waterloo
265 Lexington Court
Waterloo, Ontario N2J 4A8

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Notice of Completion

Dear Mr. Bill Garibaldi:

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www.region.waterloo.on.ca

March 12, 2013

Mr. Scott Amos
City of Waterloo
100 Regina Street South
Waterloo, Ontario N2J 4A8

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Notice of Completion

Dear Mr. Scott Amos:

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March 12, 2013

Mr. Tim Anderson
City of Waterloo
100 Regina Street South
Waterloo, Ontario N2J 4A8

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Notice of Completion

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www.region.waterloo.on.ca

March 12, 2013

Ms. Selvi Kongara
City of Brantford
100 Wellington Square, P.O. Box 818
Brantford, Ontario N3T 5R7

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Notice of Completion

Dear Ms. Selvi Kongara:

The Regional Municipality of Waterloo (Region) has completed a Wastewater Treatment Master Plan for the communities of St. Jacobs and Elmira in the Township of Woolwich (Township). The wastewater systems in both communities are operated as a 2-tier system with the Township responsible for wastewater collection, and the Region responsible for wastewater treatment and biosolids management.

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March 12, 2013

Mr. Charles S. Esendal, P.Eng., MBA
Hydro One Networks
483 Bay Street, TCT 15-A11, North Tower,
Toronto, Ontario M5G 2P5

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Notice of Completion

Dear Mr. Charles S. Esendal, P.Eng., MBA:

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March 12, 2013

Mr. Joe Gennaro
Waterloo North Hydro
300 Northfield Drive East
Waterloo, Ontario N2J 4A3

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Notice of Completion

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Kitchener, ON N2G 4J3
Phone: 519-575-4420

Township of Woolwich
Clerk's Office
24 Church Street West
Elmira, ON N3B 2Z6
Phone: 519-669-1647

Please provide written comments on the Master Plan to Mr. Jorge Cavalcante, Manager, Engineering and Planning, Water Services, Region of Waterloo by April 11, 2013.

If you have any questions or would like further information about the study, please contact Mr. Jorge Cavalcante by phone at 519-575-4412 or by e-mail at JCavalcante@regionofwaterloo.ca. Thank you very much for your interest in the study.

Sincerely,



Pam Law, P.Eng.
Project Engineer
Water Services

cc. Mr. Steve Nutt, XCG Consultants Ltd.

Region of Waterloo

TRANSPORTATION AND
ENVIRONMENTAL SERVICES
Water Services

150 Frederick Street
Kitchener ON Canada N2G 4J3
Telephone: (519) 575-4426
Fax: (519) 575-4452
www.region.waterloo.on.ca

March 12, 2013

Mr. Ted Hancocks
Rogers Cable
85 Grand Crest Place, P.O. Box 488
Kitchener, Ontario N2G 4A8

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Notice of Completion

Dear Mr. Ted Hancocks:

The Regional Municipality of Waterloo (Region) has completed a Wastewater Treatment Master Plan for the communities of St. Jacobs and Elmira in the Township of Woolwich (Township). The wastewater systems in both communities are operated as a 2-tier system with the Township responsible for wastewater collection, and the Region responsible for wastewater treatment and biosolids management.

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March 12, 2013

Ms. Gayle Widmeyer
Bell Canada
575 Riverbend Drive, 2nd Floor
Kitchener, Ontario N2K 3S3

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Notice of Completion

Dear Ms. Gayle Widmeyer:

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March 12, 2013

Mr. Craig Fisher
Canadian Pacific Railway
401 9th Avenue SW, Suite 700
Calgary, AB T2P 4Z4

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Notice of Completion

Dear Mr. Craig Fisher:

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March 12, 2013

Mr. John MacTaggart
CN Great Lakes
4 Welding Way, P.O. Box 1000
Concord, Ontario L4K 1B9

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Notice of Completion

Dear Mr. John MacTaggart:

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March 12, 2013

Mr. Kevin Schimus
Union Gas
603 Kumpf Drive
Waterloo, Ontario N2V 1K3

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Notice of Completion

Dear Mr. Kevin Schimus:

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March 12, 2013

Mr. Russell McLean
Enbridge Gas Distribution Inc.
P.O. Box 650
Scarborough, Ontario M1K 5E3

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Notice of Completion

Dear Mr. Russell McLean:

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March 12, 2013

Ms. Cara Clairman
Ontario Power Generation Inc.
700 University Avenue
Toronto, Ontario L5G 1X6

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Notice of Completion

Dear Ms. Cara Clairman:

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March 12, 2013

Ms. Margaret Sault
Mississaugas of the New Credit First Nation
RR #6, 468 New Credit Road
Hagersville, Ontario N0A 1H0

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Notice of Completion

Dear Ms. Margaret Sault:

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March 12, 2013

Mr. Lonny Bomberry
Six Nations of the Grand River
Land and Resources Department,
P.O. Box 5000, 2498 Chiefswood Road
Ohsweken, Ontario N0A 1M0

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Notice of Completion

Dear Mr. Lonny Bomberry:

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March 12, 2013

Mr. Paul General
Six Nations of the Grand River
Land and Resources Department, Six Nations Council,
2676 Fourth Line Road, P.O. Box 5000
Ohsweken, Ontario N0A 1M0

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TRANSPORTATION AND
ENVIRONMENTAL SERVICES
Water Services

150 Frederick Street
Kitchener ON Canada N2G 4J3
Telephone: (519) 575-4426
Fax: (519) 575-4452
www.region.waterloo.on.ca

March 12, 2013

Mr. Leroy Hill
Six Nations Haudenosaunee Confederacy Council
Haudenosaunee Resource Centre,
2634 6th Line, RR #2
Ohsweken, Ontario N0A 1M0

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Notice of Completion

Dear Mr. Leroy Hill:

The Regional Municipality of Waterloo (Region) has completed a Wastewater Treatment Master Plan for the communities of St. Jacobs and Elmira in the Township of Woolwich (Township). The wastewater systems in both communities are operated as a 2-tier system with the Township responsible for wastewater collection, and the Region responsible for wastewater treatment and biosolids management.

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Based on the study findings and input from regulatory agencies, stakeholders and the public, the preferred alternative includes:

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150 Frederick Street, 2nd Floor
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Phone: 519-575-4420

Township of Woolwich
Clerk's Office
24 Church Street West
Elmira, ON N3B 2Z6
Phone: 519-669-1647

Please provide written comments on the Master Plan to Mr. Jorge Cavalcante, Manager, Engineering and Planning, Water Services, Region of Waterloo by April 11, 2013.

If you have any questions or would like further information about the study, please contact Mr. Jorge Cavalcante by phone at 519-575-4412 or by e-mail at JCavalcante@regionofwaterloo.ca. Thank you very much for your interest in the study.

Sincerely,



Pam Law, P.Eng.
Project Engineer
Water Services

cc. Mr. Steve Nutt, XCG Consultants Ltd.

Region of Waterloo

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March 12, 2013

Mr. Chris Gosselin
Region of Waterloo Ecological and Environmental Advisory Committee
Region of Waterloo, 150 Frederick Street
Kitchener, Ontario N2G 4J3

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Notice of Completion

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March 12, 2013

Mr. Ron Ormson
City of Waterloo Environmental Advisory Committee
100 Regina Street South
Waterloo, Ontario N2J 4A8

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Notice of Completion

Dear Mr. Ron Ormson:

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March 12, 2013

Mr. Ken Hunsberger
Waterloo Federation of Agriculture
2417 Erbs Road, RR #2
Baden, Ontario N3A 3M3

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Notice of Completion

Dear Mr. Ken Hunsberger:

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March 12, 2013

Mr. Stephen May
The Waterloo Stewardship Network
c/o Ministry of Natural Resources, Guelph District Office,
1 Stone Road West
Guelph, Ontario N1G 4Y2

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Notice of Completion

Dear Mr. Stephen May:

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March 12, 2013

Ms. Sangeeta Chopra, M.Eng., P.Eng.
Veolia Water Solutions& Technologies Canada
2000 Argentia Road, Plaza IV, Suite 430
Mississauga, Ontario L5N 1W1

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Notice of Completion

Dear Ms. Sangeeta Chopra, M.Eng., P.Eng.:

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March 12, 2013

Mr. Nicholas P. Bogaert, BES
MHBC Planning
540 Bingemans Centre Drive, Suite 200
Kitchener, Ontario N2B 3X9

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Notice of Completion

Dear Mr. Nicholas P. Bogaert, BES:

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March 12, 2013

Mr. Pierre Chauvin, MA, MCIP, RPP
MHBC Planning
540 Bingemans Centre Drive, Suite 200
Kitchener, Ontario N2B 3X9

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March 12, 2013

Mr. Ian S. Robertson, P.Eng.
Meritech Engineering
1315 Bishop Street North, Suite 202
Cambridge, Ontario N1R 6Z2

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Notice of Completion

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March 12, 2013

Ms. Amanda Froese
Meritech Engineering
1315 Bishop Street North, Suite 202
Cambridge, Ontario N1R 6Z2

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March 12, 2013

Mr. Jason Malfara, B.E.S.
Activa Group
735 Bridge Street West
Waterloo, Ontario N2V 2H1

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Notice of Completion

Dear Mr. Jason Malfara, B.E.S.:

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Region of Waterloo
Clerk's Office
150 Frederick Street, 2nd Floor
Kitchener, ON N2G 4J3
Phone: 519-575-4420

Township of Woolwich
Clerk's Office
24 Church Street West
Elmira, ON N3B 2Z6
Phone: 519-669-1647

Please provide written comments on the Master Plan to Mr. Jorge Cavalcante, Manager, Engineering and Planning, Water Services, Region of Waterloo by April 11, 2013.

If you have any questions or would like further information about the study, please contact Mr. Jorge Cavalcante by phone at 519-575-4412 or by e-mail at JCavalcante@regionofwaterloo.ca. Thank you very much for your interest in the study.

Sincerely,



Pam Law, P.Eng.
Project Engineer
Water Services

cc. Mr. Steve Nutt, XCG Consultants Ltd.

Region of Waterloo

TRANSPORTATION AND
ENVIRONMENTAL SERVICES
Water Services

150 Frederick Street
Kitchener ON Canada N2G 4J3
Telephone: (519) 575-4426
Fax: (519) 575-4452
www.region.waterloo.on.ca

March 12, 2013

Mr. Larry Masseo, MCIP, RPP
Activa Group
735 Bridge Street West
Waterloo, Ontario N2V 2H1

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Notice of Completion

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March 12, 2013

Ms. Valerie Schmidt, MCIP, RPP
Activa Group
735 Bridge Street West
Waterloo, Ontario N2V 2H1

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Notice of Completion

Dear Ms. Valerie Schmidt, MCIP, RPP:

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March 12, 2013

Mr. Joel Cotter, MCIP, RPP
43 Treeview Drive
St. Jacobs, Ontario N0B 2N0

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Notice of Completion

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March 12, 2013

Mr. Dave Hicknell, CET
Gamsby and Mannerow Limited
975 Wallace Avenue North
Listowel, Ontario N4W 1M6

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Notice of Completion

Dear Mr. Dave Hicknell, CET:

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March 12, 2013

Ms. Jennifer Passy, BES, MCIP, RPP
Valley View Heights (St. Jacobs) Ltd.
169 Lexington Court, Unit B-1
Waterloo, Ontario N2J 4R3

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Notice of Completion

Dear Ms. Jennifer Passy, BES, MCIP, RPP:

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March 12, 2013

Mr. Andrew Head
Dryden, Smith & Head Planning Consultants Ltd.
54 Cedar Street N.
Kitchener, Ontario N2H 2X1

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Notice of Completion

Dear Mr. Andrew Head:

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March 12, 2013

Mr. Sam Head
Dryden, Smith & Head Planning Consultants Ltd.
54 Cedar Street N.
Kitchener, Ontario N2H 2X1

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March 12, 2013

Mr. Marc Ethier, C.E.T.
Waterloo Regional Office Ontario Clean Water Agency
490 Dutton Drive, Suite B3
Waterloo, Ontario N2L 6H7

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Notice of Completion

Dear Mr. Marc Ethier, C.E.T.:

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March 12, 2013

Mr. Ryan Connor
CH2M Hill
72 Victoria Street South, Suite 300
Kitchener, Ontario N2G 4Y9

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Notice of Completion

Dear Mr. Ryan Connor:

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March 12, 2013

Ms. Monique Conley
Reed Construction Data Canada
500 Hood Road, 4th Floor
Markham, Ontario L3R 9Z3

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Notice of Completion

Dear Ms. Monique Conley:

The Regional Municipality of Waterloo (Region) has completed a Wastewater Treatment Master Plan for the communities of St. Jacobs and Elmira in the Township of Woolwich (Township). The wastewater systems in both communities are operated as a 2-tier system with the Township responsible for wastewater collection, and the Region responsible for wastewater treatment and biosolids management.

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The study was conducted in accordance with the requirements for Master Plans under the Municipal Class Environmental Assessment (EA) (Municipal Engineers Association, June 2000, as amended in 2007 and 2011). The Master Plan has been prepared following Phases 1 and 2 of the Municipal Class EA.

Based on the study findings and input from regulatory agencies, stakeholders and the public, the preferred alternative includes:

- Elmira Wastewater Treatment Plant (WWTP)
  - Continue to reduce Infiltration and Inflow (I/I) and to implement water efficiency measures
  - Optimize or upgrade the WWTP to address current capacity limitations

- Heidelberg WWTP
  - Continue to operate existing facility
  - Review alternatives at the time that the existing works need to be replaced

- St. Jacobs WWTP
  - Continue to reduce I/I and to implement water efficiency measures
  - Decommission the St. Jacobs WWTP and transfer flows to the Waterloo WWTP after 2024.

The St. Jacobs – Elmira Wastewater Treatment Master Plan is available for review on the Region's web site at www.regionofwaterloo.ca. The Master Plan is also available for viewing at the following locations for a 30 day period between March 12, 2013 and April 11, 2013:

Region of Waterloo
Clerk's Office
150 Frederick Street, 2nd Floor
Kitchener, ON N2G 4J3
Phone: 519-575-4420

Township of Woolwich
Clerk's Office
24 Church Street West
Elmira, ON N3B 2Z6
Phone: 519-669-1647

Please provide written comments on the Master Plan to Mr. Jorge Cavalcante, Manager, Engineering and Planning, Water Services, Region of Waterloo by April 11, 2013.

If you have any questions or would like further information about the study, please contact Mr. Jorge Cavalcante by phone at 519-575-4412 or by e-mail at JCavalcante@regionofwaterloo.ca. Thank you very much for your interest in the study.

Sincerely,



Pam Law, P.Eng.
Project Engineer
Water Services

cc. Mr. Steve Nutt, XCG Consultants Ltd.

Region of Waterloo

TRANSPORTATION AND
ENVIRONMENTAL SERVICES
Water Services

150 Frederick Street
Kitchener ON Canada N2G 4J3
Telephone: (519) 575-4426
Fax: (519) 575-4452
www.region.waterloo.on.ca

March 12, 2013

Ms. Christine Furlong
Triton Engineering
14-105 Queen Street West
Fergus, Ontario N1M 1S6

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Notice of Completion

Dear Ms. Christine Furlong:

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Kitchener ON Canada N2G 4J3
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www.region.waterloo.on.ca

March 12, 2013

Mr. Hugh Handy
GSP Group Inc.
72 Victoria Street South, Suite 201
Kitchener, Ontario N2G 4Y9

RE: St. Jacobs – Elmira Wastewater Treatment Master Plan
Notice of Completion

Dear Mr. Hugh Handy:

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Sincerely,



Pam Law, P.Eng.
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cc. Mr. Steve Nutt, XCG Consultants Ltd.