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.: 3-3167-01-01
August 17, 2016

ARTHUR WASTEWATER TREATMENT PLANT CLASS ENVIRONMENTAL ASSESSMENT ENVIRONMENTAL STUDY REPORT

Prepared for:

TOWNSHIP OF WELLINGTON NORTH
7490 Sideroad 7 West, P.O. Box 125
Kenilworth, ON
N0G 2E0

Attention:
Director of Public Works

Prepared by:

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

ES 1. EXECUTIVE SUMMARY

ES 1.1 Introduction

The Arthur Wastewater Treatment Plant (WWTP), constructed in approximately 1990, services the community of Arthur in the Township of Wellington North (the Township). The WWTP is an extended aeration plant with tertiary filtration, effluent storage lagoons, and seasonal discharge of final effluent to the Conestogo River. The rated average day flow (ADF) capacity of the works is 1,465 m^3/d. Flow to the WWTP is conveyed via two sewage pumping stations (Wells St. Sewage Pumping Station (SPS) and Frederick St. SPS) and gravity sewers.

The Arthur WWTP is currently operating at approximately 92% of its rated ADF capacity. To meet the servicing requirements of future growth in the service area, the Arthur WWTP will have to be expanded beyond its existing rated capacity. In addition, historic bypass events at the Frederick St. SPS indicate that a capacity increase of this SPS will be required to meet servicing requirements for the current service population as well as planned growth. As such, this project is a "Schedule C" activity under the Municipal Class Environmental Assessment (Class EA) process.

ES 1.1.1 Study and Service Area

The Arthur WWTP is situated on Preston Street South in the community of Arthur located in the Township of Wellington North. The study area has been defined as the property where the Arthur WWTP is located and the area of the community of Arthur serviced by the Arthur WWTP. This includes the effluent Holding Ponds and associated forcemain between the WWTP and the lagoons, as well as the two SPSs (Wells St. SPS and Frederick St. SPS). Figure ES.1 shows the location of the WWTP, Holding Ponds and two SPSs.

ES 1.1.2 Class Environmental Assessment Process

The publication of this Environmental Study Report (ESR) represents the conclusion of Phase 4 of the Class EA, including public and agency consultation. The purpose of the ESR document is to report all the activities undertaken to date through Phase 1, 2 and 3 of the Municipal Class EA process.

The ESR will be placed on the public record by issuing a Notice of Completion and interested individuals will have 30 days to provide comments. If comments arise that cannot be resolved or mitigated in discussions with the Township within the 30-day period, a person/party may request the Minister of the Environment to issue a Part II Order for an individual Environmental Assessment.

The request must be directed to the Minister of the Environment and Climate Change at the following address:

Minister of the Environment and Climate Change
11th Floor, Ferguson Block
77 Wellesley Street West
Toronto, ON
M7A 2T5

A copy of all requests should be forwarded to the Township at the following address:

Mr. Matthew Aston
Director of Public Works
Township of Wellington North
7490 Sideroad 7 W, PO Box 125
Kenilworth, ON
N0G 2E0
Telephone: 519-848-3620 x31
Fax: 519-848-3228
E-mail: maston@wellington-north.com

If no request for a Part II Order is received, the Township may proceed to implement the project as described in the ESR.

Figure ES.1 Location Map of Arthur WWTP, Holding Ponds and SPS

ES 1.2 Problem Statement

ES 1.2.1 Study Objective

A Class EA of the Arthur WWTP was initiated by the Township with the objective of identifying the most cost-effective, environmentally sound, and sustainable approach to provide wastewater treatment capacity to accommodate future growth in the community of Arthur.

ES 1.2.2 Justification and Need for Project

Table ES.1 presents the future service population and wastewater flows based on planned growth in the service area. As can be seen in Table ES.1, the projected 2031 average wastewater flows exceed the existing Arthur WWTP ADF capacity of 1,465 m^3/d. As a result, additional wastewater servicing capacity must be provided to accommodate planned growth in the community.

Table ES.1 Projected ADF Flows to the Arthur WWTP

Parameter	Historic (to 2012)	Projected 2031
Service Population	2,596	3,594
Average Day Flow (ADF)	1,171 m^3/d	2,300 m^3/d
Total Projected ADF as % of Existing Rated ADF Capacity	92%	157%

ES 1.3 Existing Conditions

The Arthur WWTP is an extended aeration plant with seasonal effluent discharge, and includes grit removal, screening, biological treatment, single point chemical addition for phosphorus removal, secondary settling, tertiary filtration, and ultraviolet disinfection. Filtered effluent is disinfected prior to seasonal discharge into the outfall to the Conestogo River. Sludge is digested onsite via aerobic digestion and utilized on agricultural lands.

ES 1.4 Description of Alternative Solution

The preferred alternative for the Arthur WWTP was identified as Alternative 8 - Expand and Upgrade the Existing Plant to treat future flows and loads. In addition to having the lowest relative 25-year life cycle cost, this option offered the following advantages relative to the other alternatives.

- Treatment at the existing Arthur WWTP would allow for the continued use of existing infrastructure, which results in capital cost savings.
- Utilizing existing tankage and buildings will result in less impact on the natural and social environment during construction due to a smaller construction footprint, a shorter construction period, and less truck traffic within the community.
- No land acquisition is required, resulting in capital cost savings, and less impact on the natural environment (i.e. site already used for this purpose).

ES 1.5 Effluent Limits and Discharge Restrictions for the Expanded and Upgraded WWTP

An assimilative capacity assessment was undertaken to support the development of effluent limits for the expanded Arthur WWTP. Based on this analysis, effluent objectives and limits presented in Table ES.2 were developed.

Table ES.2 Future Design Effluent Objectives and Compliance Limits for Phases 1 and 2

Parameter	Phase 1 Capacity (1,860 m^3/d) Proposed Values		Phase 2 Capacity (2,300 m^3/d) Approved Values	
	Objective Concentration	Compliance Limit	Objective Concentration	Compliance Limit
BOD_5	6 mg/L	10 mg/L	5 mg/L	10 mg/L
TSS	6 mg/L	10 mg/L	5 mg/L	10 mg/L
TP	0.21 mg/L	0.25 mg/L	0.17 mg/L	0.25 mg/L
TAN	0.6 mg/L	3.5 mg/L (1) 2.8 mg/L (2)	0.5 mg/L	3.5 mg/L (1) 2.8 mg/L (2)
E. coli (3)	-	100 cfu/100 mL	-	100 cfu/100mL
pH	-	6 - 8	-	6 - 8

Notes:
1. For discharge during January, February, March, April, May, November, and December.
2. For discharge during October.
3. Based on a monthly geometric mean.

In addition to effluent concentration requirements, the Arthur WWTP will only be permitted to discharge to the Conestogo River during the months of October through May. The actual allowable effluent flow rate will depend on the effluent total ammonia nitrogen (TAN) concentration and the flow rate in the Conestogo River. Table ES.3 presents the proposed ratio of river flow to allowable plant effluent flow as a function of effluent TAN for each month from October through May. Table ES.4 presents the proposed maximum allowable daily effluent flow from the Arthur WWTP.

Table ES.3 Allowable River Flow to Effluent Flow Ratio Table

Month	TAN (mg/L)(1)					
	≤0.65	>0.65 - 1.0	>1.0 - 1.5	>1.5 - 2.0	>2.0 - 2.8	>2.8 - 3.5
January	0.9	0.9	1.7	2.7	4.7	5.8
February	0.7	0.7	0.7	0.9	1.8	2.6
March	1.0	1.0	1.8	2.9	4.9	6.0
April	2.3	4.2	7.5	10.7	15	18.8
May	3.5	5.7	11.4	15.3	22.9	45.8
October	1.4	1.7	3.8	4.8	9.5	- (1)
November	1.4	1.4	1.6	2.5	4.1	5.5
December	1.4	2.4	4.3	6.5	10.4	13

Notes:
1 Proposed ECA TAN effluent limit for October is 2.8 mg/L.

Table ES.4 Maximum Daily Effluent Flow from the Arthur WWTP

Month	Allowable Maximum Daily Flow (m^3/d)
January	5,000
February	5,000
March	5,500
April	3,200
May	1,300
October	1,400
November	4,600
December	3,800

The Ministry of the Environment and Climate Change (MOECC) accepted the effluent discharge requirements as presented above.

ES 1.6 Public Consultation Process

A comprehensive public consultation program was undertaken as part of this Class EA. Public and agency contact was initiated with an official notification of the undertaking. A notification of project commencement was published in the Arthur Enterprise News and Wellington Advertiser, with the first publication date of November 14, 2012, and was circulated to review agencies and nearby residents. A study mailing list was developed at the beginning of the project and updated over the course of the study.

Public Information Centers (PICs) were held on March 19, 2013, June 10, 2014 and March 30, 2016 at the Arthur Community Center. Notification of the PICs was made through newspaper advertisements, the Township website, and mailings to the mailing list of agency contacts and nearby residents.

ES 1.7 Description of Preferred Design Concept

ES 1.7.1 Arthur WWTP

Phase 3 of the Class EA process evaluated alternative design concepts to implement the preferred alternative selected. Based on the evaluation undertaken and documented in this ESR, the preferred design concept (Alternative 8) for wastewater treatment includes:

- New preliminary treatment consisting of flow metering, mechanically cleaned bar screens with standby manual bar screen, vortex grit separators and headworks building complete with odour control and all appurtenances.
- Decommissioning of the existing headworks.
- Twin existing package extended aeration plant.
- Upgraded blower capacity and all appurtenances.
- Construction of new conveyance system to the Holding Ponds consisting of a new forcemain, upgraded effluent pumps and all appurtenances.
- Additional standby power and increased electrical service.

A preliminary evaluation of existing treatment capacity indicated that an interim capacity of 1,860 m^3/d could be achieved by upgrading only some of the unit processes. Therefore, the Township wishes to implement the preferred design concept in two phases, with the rated plant ADF being 1,860 m^3/d in Phase 1, and 2,300 m^3/d in Phase 2.

Four sludge management options were considered as part of this study. As part of Phase 1, the preferred sludge management strategy is Option D - Liquid sludge shipped to the Lystek regional processing facility located in Dundalk, Ontario. No capital upgrades are required for this option.

At the Phase 2 plant capacity, three sludge management options represent viable sludge management alternatives, namely:

- Option A - onsite aerobic digestion, with onsite storage and seasonal land application of liquid biosolids.
- Option B - onsite aerobic digestion, with onsite storage of biosolids using geotextile tubes, and dewatered cake land applied seasonally.
- Option D - liquid sludge shipped to the Lystek regional processing facility located in Dundalk, Ontario.

As such, the final evaluation and selection of a biosolids management strategy should be completed at part of the preliminary design of the Phase 2 plant upgrade.

A proposed site plan showing the expansion and upgrades is provided in Figure ES.2. The site layout will be finalized during the preliminary and detailed design stage.

ES 1.7.2 Frederick St. SPS

Due to capacity limitations at the Frederick St. SPS, an upgrade and expansion is required. Based on an evaluation of historic and projected flows, the minimum required future capacity of the Frederick St. SPS is approximately 110 L/s.

An overview of the required expansion to the Frederick St. SPS is presented in Figure ES.3. The need for equalization at the Frederick St. SPS will be evaluated during preliminary design of the Phase 1 and Phase 2 plant expansion. Figure ES.3 shows there is space available onsite if equalization at the Frederick St. SPS is required in the future.

ES 1.8 Preferred Alternative Estimated Cost

The estimated capital cost of the proposed expansion and upgrades to the Arthur WWTP and Frederick St. SPS are presented in Table ES.5.

Table ES.5 Cost of Preferred Design Concept for Upgrades

Item	Estimated Capital Cost	
	Phase 1	Phase 2
Liquid Treatment Train Upgrades at Arthur WWTP	\$4.8M	\$8.1M
Solids Treatment Train Upgrades at Arthur WWTP	\$0 (1)	\$0 to \$5.1M (2)
Sub-Total for Arthur WWTP (Phases 1 and 2, both liquid and solids treatment train upgrades)	\$12.9M to \$18.0M (3)	
Frederick St. SPS Upgrades	\$2.9M (4)	
Total Estimated Cost	**\$15.8M to \$20.9M**	

Notes:

All costs are conceptual level opinions of probably costs and are considered to be accurate to within -25 to +40 percent exclusive of HST.

1. The preferred sludge management option for Phase 1 (Option D - Lystek) has no associated capital costs.
2. Phase 2 solids treatment train upgrade costs will depend on final section of preferred Phase 2 sludge management option, either Option A, B, or D.
3. Total estimated capital cost for Arthur WWTP upgrades will depend on solids treatment train option selected for Phase 2.
4. Assumes no equalization provided at Frederick St SPS. Should equalization be provided, this could impact the required upgrades, and associated costs, at both the Frederick St. SPS and Arthur WWTP.

These costs are based on a conceptual level of design and are generally accepted to be accurate to within a range of -25% to +40%.

ES 1.9 Proposed Mitigation Measures

Measures are proposed to minimize community impacts by minimizing noise, dust, vibration and traffic during construction of the upgraded and expanded Arthur WWTP and Frederick St. SPS. On-going monitoring of process performance and implementation of upgrades to biosolids management and headworks will mitigate impacts from the operation of the expanded Arthur WWTP.

ES 1.10 Completion of Class EA

The Township has determined through a Schedule C Class EA that the most cost conscious and environmentally sound approach to providing wastewater services to the Township up to 2031 is to expand and upgrade the existing Arthur WWTP to treat flows up to 2,300 m^3/d and to expand the Frederick St. SPS to a minimum estimated capacity of 110 L/s.

This ESR will be placed on the public record for a period of 30 days, after which time any comments or request from stakeholders, agencies, or concerned parties will be address according to the procedures outlined in the Municipal Class EA (2000, as amended in 2007, 2011 and 2015). If concerns cannot be resolved, a request can be made to the MOECC for the proponent to comply with Part II of the Environmental Assessment Act (referred to as a Part II Order), according to the procedures specified in the Municipal Class EA. If no requests for Part II Order are received, the Town will proceed with preliminary design, detailed design and construction of the proposed works.

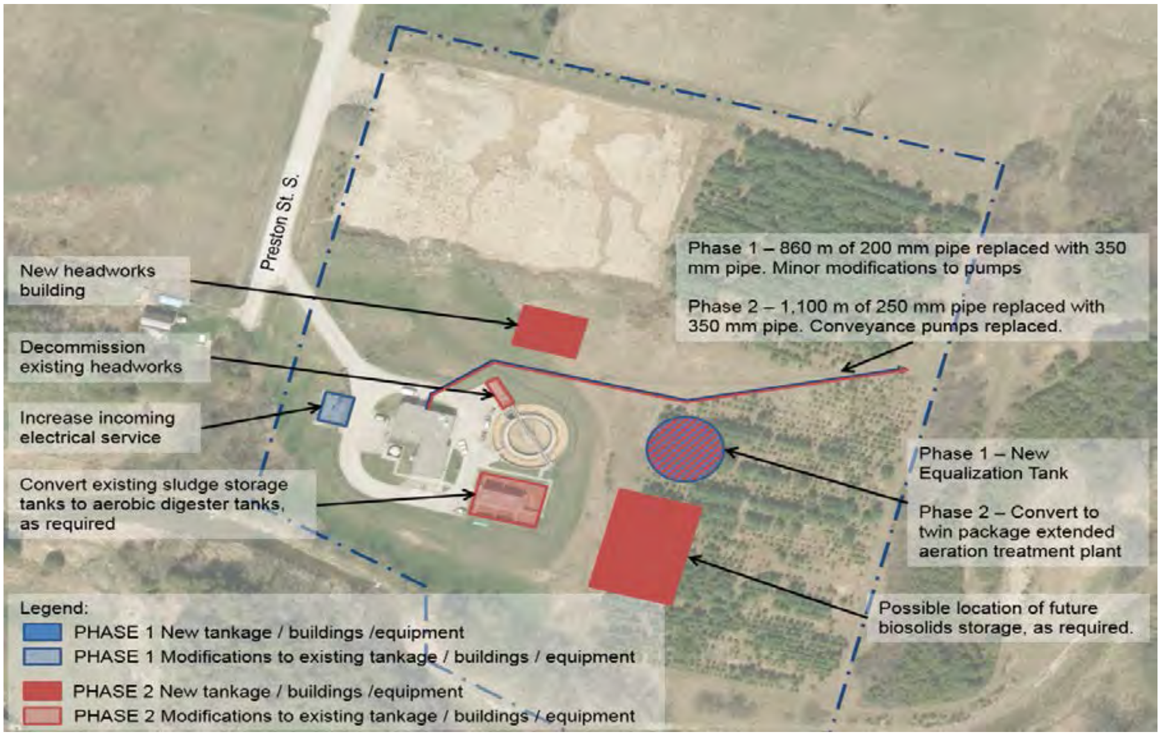


Figure ES.2 Preferred Alternative Design Conceptual Layout for the Arthur WWTP

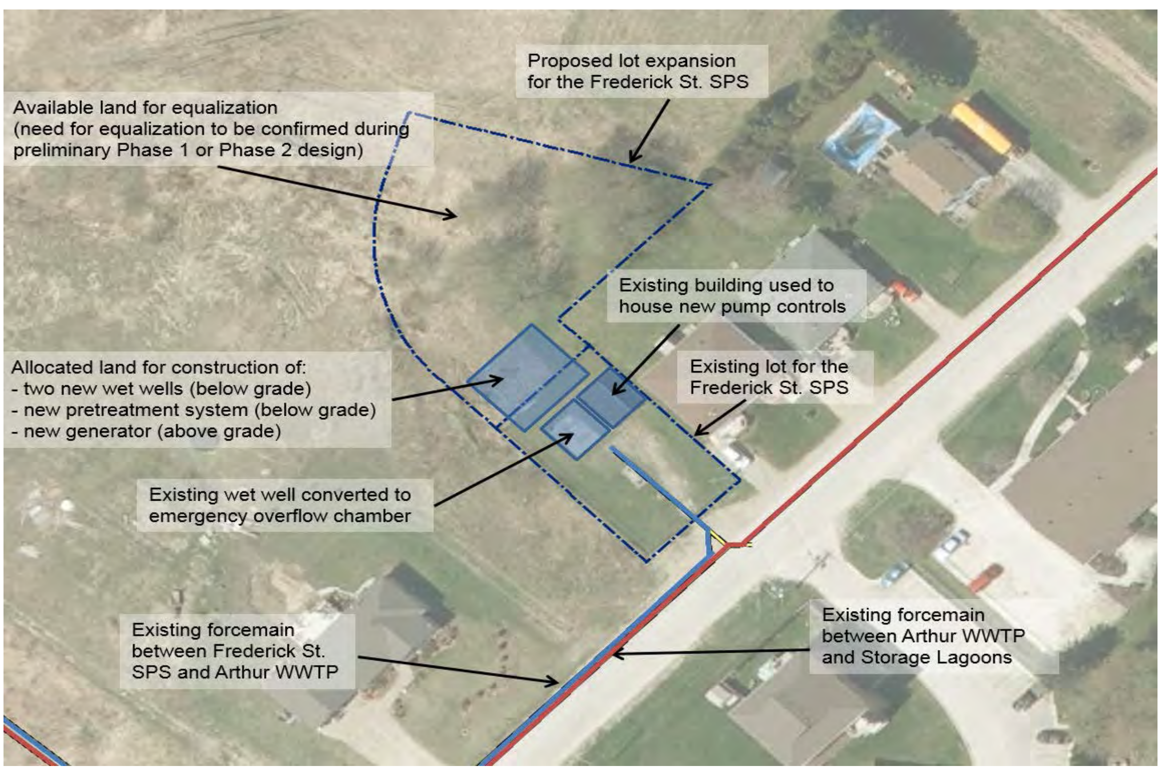


Figure ES.3 Preferred Alternative Design Conceptual Layout for the Frederick St. SPS

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

1. INTRODUCTION

The Arthur Wastewater Treatment Plant (WWTP) provides tertiary treatment for wastewater generated in the Village of Arthur. The plant is operated under Ministry of the Environment and Climate Change (MOECC) Certificate of Approval (CofA) No. 3-1256-88-908 issued August 9, 1990 (see Appendix A). The Arthur WWTP has an average day flow (ADF) CofA rated capacity of 1,465 m^3/d. During the period May 1 to September 15, flow from the secondary treatment system is pumped to Holding Ponds for storage. During the period September 16 to April 30, effluent from the plant can be discharged to the Conestogo River if flows in the river are adequate. During this discharge period, the Holding Pond contents are combined with the plant's secondary clarifier effluent, and this flow is then treated by the tertiary filter and ultraviolet (UV) disinfection system prior to discharge to the Conestogo River.

Flow to the WWTP is conveyed via two sewage pumping stations (SPS), namely the Wells St. SPS and Frederick St. SPS, as well as the Preston St. gravity sewer. The Frederick St. SPS and the Wells St. SPS are operated under MOE CofA No. 3-1256-88-908 issued August 9, 1990 (see Appendix A).

The Arthur WWTP is currently operating at approximately 92% of its rated ADF capacity. To meet the servicing requirements of future growth in the service area, the Arthur WWTP may have to be expanded beyond its existing rated capacity. In addition, historic bypass events at the Frederick St. SPS indicate that the capacity of this SPS will be required to meet servicing requirements for the current service population as well as planned growth. The Wells St SPS was shown to have capacity for the planned growth given its catchment area (details are provided in Section 8). As such, this project is a “Schedule C” activity under the Municipal Class Environmental Assessment (Class EA) process.

XCG Consultants Ltd. (XCG), in association with D.C. Damman and Associates and R.J. Burnside & Associates Ltd., were retained by the Township to provide engineering services for the Class EA of the Arthur WWTP.

1.1 Study and Service Area

The Arthur WWTP is situated southeast of the intersection of Duke Street and Preston Street in the Village of Arthur. The Holding Ponds are located northeast of the intersection of Eliza Street and Frederick Street East. The Frederick St. SPS is located at the southern end of Frederick St, and the Wells St. SPS is located on Wells St., approximately 675 m south of Highway 6. The community is located in southern Ontario, approximately 40 km west of Orangeville. The study area has been defined as the property where the Arthur WWTP is located, the property where the Holding Ponds are located, the properties where the two SPSs are located, and the community of Arthur serviced by the Arthur WWTP. Figure 1.1 shows the locations of the WWTP, Holding Ponds and two SPSs within the community of Arthur.

1.2 Layout of this Report

The Problem Statement is defined in Section 2, while details regarding the review of existing conditions in the study area, including the WWTP, Holding Ponds, Wells St. SPS and Frederick St. SPS, are presented in Section 3. The development and evaluation of alternative solutions and design concepts and the proposed phased construction plan for upgrades to the Arthur WWTP are presented in Sections 3 to 7. Details regarding the evaluation of upgrade and expansion requirements for the Wells St. SPS and Frederick St. SPS are presented in Section 8.

Section 9 provides a summary of the Public Consultation process followed as part of this Class EA study.

Section 10 provides an overall summary of the preferred design concept, including upgrades and expansions to the Arthur WWTP and Frederick St. SPS, and proposed mitigation measures to be implemented during construction and operation of the upgraded and expanded facilities.

1.3 Class Environmental Assessment Process

A Class EA is a process which identifies and assesses possible adverse effects to the environment caused by infrastructure projects. The Municipal Class EA process is illustrated in Figure 1.2. There are five phases to the Class EA process, namely:

Phase 1: Identify potential or existing environmental problems.

Phase 2: Identify potential solutions to the environmental problems.

Phase 3: Examine different methods and processes that can be used to resolve the problems.

Phase 4: Summarize the work completed in Phases 1 to 3 in an Environmental Study Report (ESR).

Phase 5: Project is implemented.

There are three different types of projects or schedules defined within the Class EA; Schedule A/A+, B and C, in increasing order based on the potential for adverse environmental effects as described below:

Schedule A: Expected to have minimal adverse effects on the environment and are considered to be exempt from the Class EA process.

Schedule A+: Expected to have minimal adverse effects on the environment and are required to inform the public of project implementation. Also, is considered to be exempt from the Class EA Process

Schedule B: Expected to have adverse effects on the environment and are required to have agency screening.

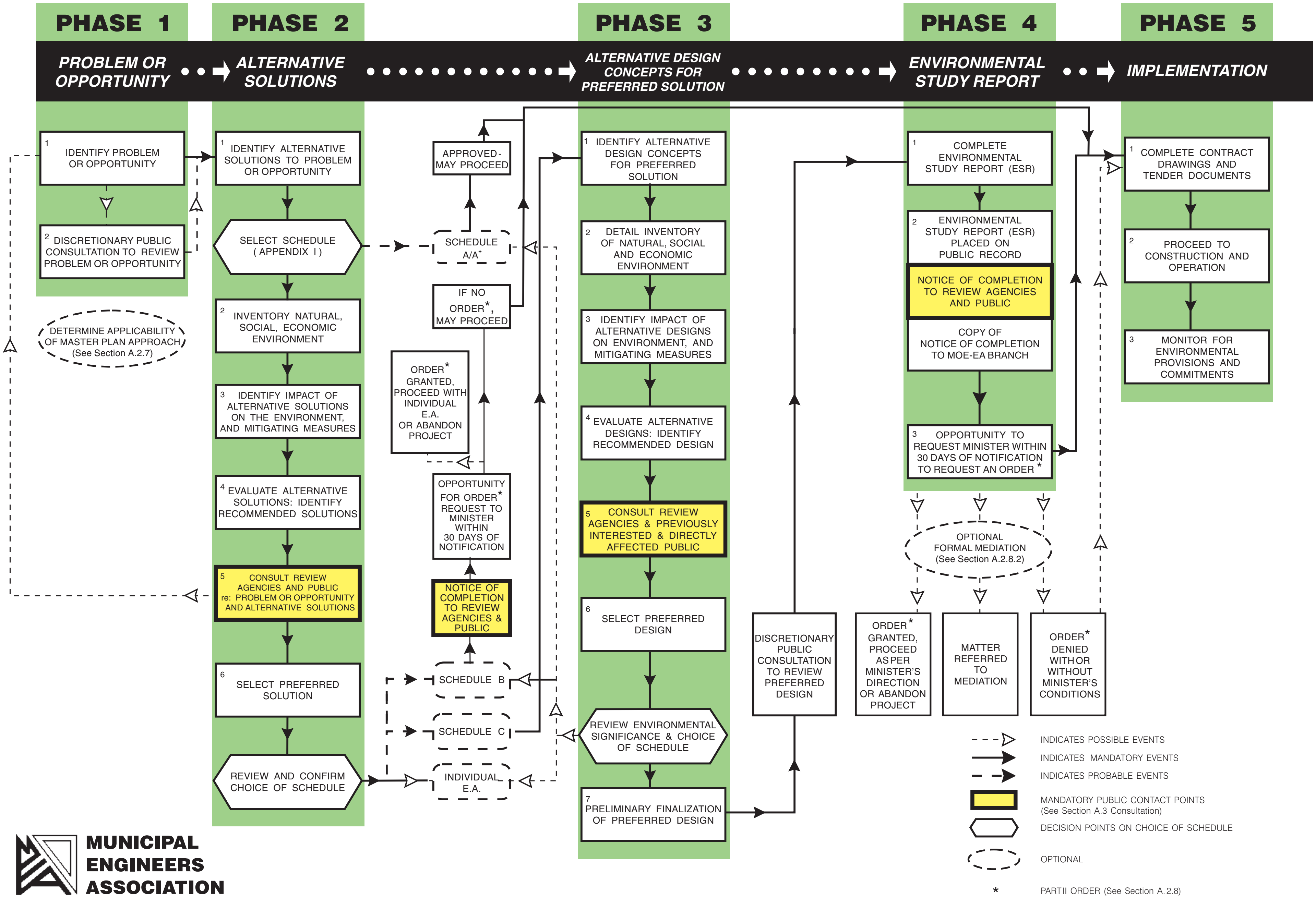
Schedule C: Potential for significant environmental effects and is required to complete the Class EA with all phases.

This project was undertaken as a Schedule C project under the Class EA process.

Figure 1.1 Location Map of Arthur WWTP and Holding Ponds

Figure 1.2 MUNICIPAL CLASS EA PLANNING AND DESIGN PROCESS

NOTE: *This flow chart is to be read in conjunction with Part A of the Municipal Class EA*



MUNICIPAL ENGINEERS ASSOCIATION

The publication of this ESR represents the conclusion of Phase 4 of the Class EA, including public and agency consultation. The Environmental Study Report will be placed on the public record by issuing a Notice of Completion and interested individuals will have 30 days to provide comments. If comments arise that cannot be resolved or mitigated in discussions with the Township of Wellington North within the 30-day period, a person/party may request the Minister of the Environment issue a Part II Order for an individual EA. The request must be directed to the Minister of the Environment and Climate Change at the following address:

Minister of the Environment and Climate Change
11th Floor, Ferguson Block
77 Wellesley Street West
Toronto, ON
M7A 2T5

A copy of all requests should be forwarded to the Township of Wellington North at the following address:

Mr. Matthew Aston
Director of Public Works
Township of Wellington North
P.O. Box 125, 7490 Sideroad 7 W
Kenilworth, ON
N0G 3E0
Telephone: 519-848-3620
Fax: 519-848-3228
E-mail: maston@wellington-north.com

If no request for a Part II Order is received, the Township will proceed to implement the project as described in this ESR.

2. PROBLEM STATEMENT

2.1 Study Objective

A Class EA of the Arthur WWTP was initiated by the Township with the objective of identifying the most cost-effective, environmentally sound, and sustainable approach to provide wastewater treatment capacity to accommodate future growth in the community of Arthur.

2.2 Justification and Need for the Project

The future servicing needs for the Village of Arthur are based on the historic flows from the existing service area, plus the projected flows attributed to future residential and industrial/commercial/institutional (ICI) development. Consideration was given to the anticipated growth in flows from the single largest contributor of industrial flows to the Arthur WWTP, Golden Valley Farms (Golden Valley). Table 2.1 presents the future projected flows due to contributions from residential sources, commercial/industrial sources, and Golden Valley to 2031.

Table 2.1 Arthur WWTP 2031 Flow Projections

Parameter	Value
Residential Flow Projections	
2012 Service Population	2,596
Historical ADF	1,171 m^3/d
Future Eastridge Contribution	103 lots
2031 Projected Service Population	3,310
2031 Service Population incl. Eastridge	3,310 + 284 = 3,594
Population Growth	998
Design Per Capita Flow	370 L/cap.d
Design Per Capita Average Inflow and Infiltration	90 L/cap.d
2031 Residential Flow	1,630 m^3/d
ICI Flow Projections	
Industrial - Golden Valley Historic Flows	171 m^3/d
Industrial - Golden Valley Growth Flows to 2031	11 m^3/d
Commercial/Industrial Land Flows	488 m^3/d
Total ICI Flow Projections	670 m^3/d
TOTAL 2031 FLOW PROJECTION	**2,300 m^3/d**

The projected 2031 average wastewater flows exceed the existing Arthur WWTP ADF rated capacity of 1,465 m^3/d. As a result, additional wastewater treatment capacity must be provided to accommodate planned growth in the service area to the year 2031. Based on conservative estimates of the potential wastewater flow reductions that could be achieved by a combination of water conservation and Inflow and Infiltration reduction, it is unlikely that these measures alone would eliminate the need to provide additional wastewater treatment capacity to service projected growth.

Based on the flow projections, a design ADF capacity of 2,300 m^3/d is proposed to provide servicing to the year 2031. Details regarding the development of future service population and average day wastewater flows can be found in Appendix B.

2.3 Flow Projections and Loadings

A phased-in approach to increasing the capacity of the Arthur WWTP was considered as part of this study. A preliminary evaluation of existing treatment capacity indicated that an interim capacity of 1,860 m^3/d could be achieved by upgrading only some of the unit processes, reducing short-term capital expenditures. Therefore, a two-phase approach was developed, with Phase 1 having a design ADF capacity of 1,860 m^3/d and Phase 2 having a design ADF of 2,300 m^3/d. Table 2.2 presents the design wastewater flows, loadings and characteristics based on growth projections for both Phase 1 and Phase 2. Details regarding the development of the design flows and raw wastewater quality can be found in Appendix E and Appendix F. This design basis, in terms of flows and raw wastewater quality, was used to develop the conceptual level upgrade requirements for each alternative.

Table 2.2 Summary of Arthur WWTP Design Basis

Parameter	Phase 1 (Interim)	Phase 2 (to year 2031)
ADF	1,860 m^3/d	2,300 m^3/d
MDF	7,853 m^3/d	8,784 m^3/d
PIF	11,592 m^3/d	12,887 m^3/d
BOD_5		
Average Loading	291 kg/d	363 kg/d
Maximum Month Loading (1)	437 kg/d	545 kg/d
Average Concentration	157 mg/L	158 mg/L
TSS		
Average Loading	291 kg/d	377 kg/d
Maximum Month Loading (1)	437 kg/d	566 kg/d
Average Concentration	157 mg/L	164 mg/L
TKN		
Average Loading	60.0 kg/d	74.0 kg/d
Maximum Month Loading (1)	89.9 kg/d	111 kg/d
Average Concentration	32.2 mg/L	32.2 mg/L
TP		
Average Loading	10.1 kg/d	13.3 kg/d
Maximum Month Loading (1)	15.2 kg/d	19.9 kg/d
Average Concentration	5.44 mg/L	5.77 mg/L

Notes:

ADF - Average Day Flow

MDF - Maximum Day Flow

PIF - Peak Instantaneous Flow

BOD_5 - 5-day Biochemical Oxygen Demand

TSS - Total Suspended Solids

TKN - Total Kjeldahl Nitrogen

TP - Total Phosphorus

1. Estimations of maximum month loading for Phase 1 and Phase 2 developed assuming a typical maximum month factor of 1.5.

3. EXISTING CONDITIONS

This section describes the existing natural and socio-economic environment in the study area and provides detailed information on the existing Arthur WWTP, Holding Ponds and Frederick St. SPS sites. Details on the existing conditions at the Arthur WWTP and Holding Ponds are provided in Appendix C, while details related to the Frederick St. SPS are provided in Appendix H.

3.1 Natural Environment

The following section provides summary information on the physiological, biophysical, watercourses, woodlots, wetland, and terrestrial features located within the study area.

3.1.1 Physiography

According to the Map 2556 entitled “Quaternary Geology of Ontario – Southern Sheet,” published by the Ministry of Northern Development and Mines (1991), the study area is located an area of Tavistock Till. The deposits consist of sandy silt to silt matrix, silty clay matrix, with moderate to high carbonate content. According to Map 2544 entitled “Bedrock Geology of Ontario – Southern Sheet”, the bedrock in the area generally consists of limestone, dolostone, shale, sandstone, gypsum and salt of the Upper Silurian Grouping and the Salina Formation. According to Map 2715 entitled “Physiography of Southern Central Portion of Southern Ontario”, the study area is located in the physiographic area of a till plain (undrumlinized).

3.1.2 Biophysical Environment

There are no Areas of Natural and Scientific Interest (ANSIs) within the study area. The Luther Marsh Wildlife Management Area, which is a provincially significant wetland, is located approximately 12 km northeast of the study area.

3.1.3 Watercourses

The outfall for the Arthur WWTP discharges to the Conestogo River. The Conestogo River is in the Lake Erie Basin and is part of the Grand River Watershed.

3.2 Socio-Economic Environment

The following sections provide summary information on existing and planned land uses within the study area as well existing heritage and archaeological resources.

3.2.1 Existing and Future Land Uses

The Arthur WWTP is situated southeast of the intersection of Duke Street and Preston Street in the Village of Arthur. According to the Wellington County Official Plan (2010), the WWTP property is zoned industrial. Immediately to the north of the WWTP property boundary is zoned residential, while land to the south and east is zoned "core greenlands." Adjacent to the northwest boundary of the WWTP property and across from Preston St S is Policy Area PA6-5, a former waste disposal site. This is a closed and rehabilitated landfill site. Future land uses may include recreational or public uses, but residential land uses will not be permitted.

The Holding Ponds are located northeast of the intersection of Eliza Street and Frederick Street East. The Holding Ponds property is zoned industrial. The west property boundary and western half of the south property boundary is zoned residential.

The Frederick St. SPS is located near the intersection of Frederick St. and Francis St. The property surrounding the SPS is zoned residential. The Wells St. SPS is located on Wells St. approximately 675 m south of Highway 6. The property surrounding the SPS is zoned industrial.

3.2.2 Cultural, Heritage and Archaeological Resources

The Arthur WWTP was constructed on the existing site in approximately 1990. There are no known archaeological resources on the properties where the Arthur WWTP, Holding Ponds or Frederick St. SPS are located.

A Cultural Heritage Impact Assessment (CHIA) was conducted as part of this study, and the associated report and addendum is located in Appendix J. The CHIA scope included the Arthur WWTP site, Frederick St. SPS site, and the forcemain route between the WWTP and Holding Ponds. The Holding Ponds site and Wells St. SPS site were not included in the CHIA as no required upgrades or expansions to this SPS were identified as part of this study.

There was no legislative reason identified from a cultural heritage perspective that the Arthur WWTP cannot be expanded. The primary cultural concern associated with the expansion of the Arthur WWTP identified in this assessment was the potential impact on the recreational use of the site by affecting the use of the Arthur River Trails, which opened on September 14, 2013, and are used by the community year-round for walking, bird watching, snowshoeing and cross country skiing. A review of the proposed design option indicates no negative impacts to the recreational use of the site are anticipated; however, special consideration should be given to any potential impacts during the detailed design phase of any future expansion to the Arthur WWTP.

The CHIA also identified ten (10) potential heritage value properties located adjacent to the proposed forcemain upgrade which should be considered for listing on a municipal heritage register. The proposed forcemain upgrade is not expected to have any effect on the identified properties, however careful planning of forcemain construction is required to make sure there are no unanticipated effects.

3.3 Technical Environment

This section presents a detailed description of the existing Arthur WWTP (including the Holding Ponds), the Wells St. SPS, and the Frederick St. SPS.

3.3.1 Existing Wastewater Treatment Plant

The Arthur WWTP is an extended aeration (EA) plant, providing tertiary treatment for wastewater generated in the former Village of Arthur. The plant is operated under MOECC CofA No. 3-1256-88-908 issued August 9, 1990. The Arthur WWTP has an average day CofA rated capacity of 1,465 m^3/d. A copy of the current CofA is provided in Appendix A.

Screened wastewater flows through a manually adjustable weir gate to a circular combined treatment unit (CTU), consisting of two outer aeration tanks and one inner circular clarifier. Flow is split evenly between the two cell annular, ring-type aeration tanks, each equipped with a coarse bubble air diffusion system consisting of approximately 84 coarse bubble air diffusers in each aeration cell. The two cell annular, ring-type aeration tanks provide a total liquid volume of 1,073 m^3.

Alum is added to the mixed liquor immediately downstream of the aeration tanks and upstream of the secondary clarifier. Final clarification is provided by one 13.5 m diameter (i.e. 143 m^2 surface area) centre inlet clarifier as a part of the CTU. The secondary clarifier is equipped with a sludge collector mechanism and a scum skimming mechanism.

Settled sludge flows from the secondary clarifier to a 50 m^3 sludge hopper. Sludge is pumped from the sludge hopper via two variable speed submersible sludge pumps to the aerobic digesters. One pump is dedicated to returning return activated sludge (RAS) to upstream of the aeration tanks and one pump is dedicated to pumping waste activated sludge (WAS) to the aerobic digester.

During periods where the Arthur WWTP cannot discharge due to low flows in the river (nominally from May 1 to September 15), secondary effluent is pumped to the Holding Ponds for storage. During the discharge period (September 16 to April 30), if there is adequate flow in the Conestogo River, the Holding Pond contents are combined with the plant's secondary clarifier effluent, filtered, and discharged.

There are three Holding Ponds located at the northeast side of the village, each with a capacity of 133,300, 87,200, and 122,500 m^3, respectively for a total storage volume of 343,000 m^3. All flow being pumped to the Holding Ponds and returned to the plant is measured via an electromagnetic flow meter.

Tertiary filtration is provided by six continuous backwash, upflow, and deep bed granular media filter modules. The effluent filters have a total filtration area of 27.9 m^2. Filter reject or backwash water is returned to upstream of the aeration tanks. Tertiary effluent is disinfected by an UV disinfection system consisting of two banks of UV lamps in series. Each bank of UV lamps contains 8 modules with 4 lamps per module.

A composite auto-sampler is located between the two banks of UV lamps and takes final effluent samples to monitor effluent quality from the plant. Final effluent flow is measured by a Parshall flume then discharged through the outfall to the Conestogo River.

Sludge produced at the Arthur WWTP is treated in a two-stage aerobic digestion process. Air to the digesters is provided by coarse bubble diffusers and two blowers. Digested sludge is stored in four sludge storage tanks each with a volume of 150 m^3 prior to being hauled for land application.

A process flow schematic of the Arthur WWTP is shown in Figure 3.2. An aerial photo showing the site layout is shown in Figure 3.3. A summary of the unit process design of the Arthur WWTP is presented in Table 3.1.

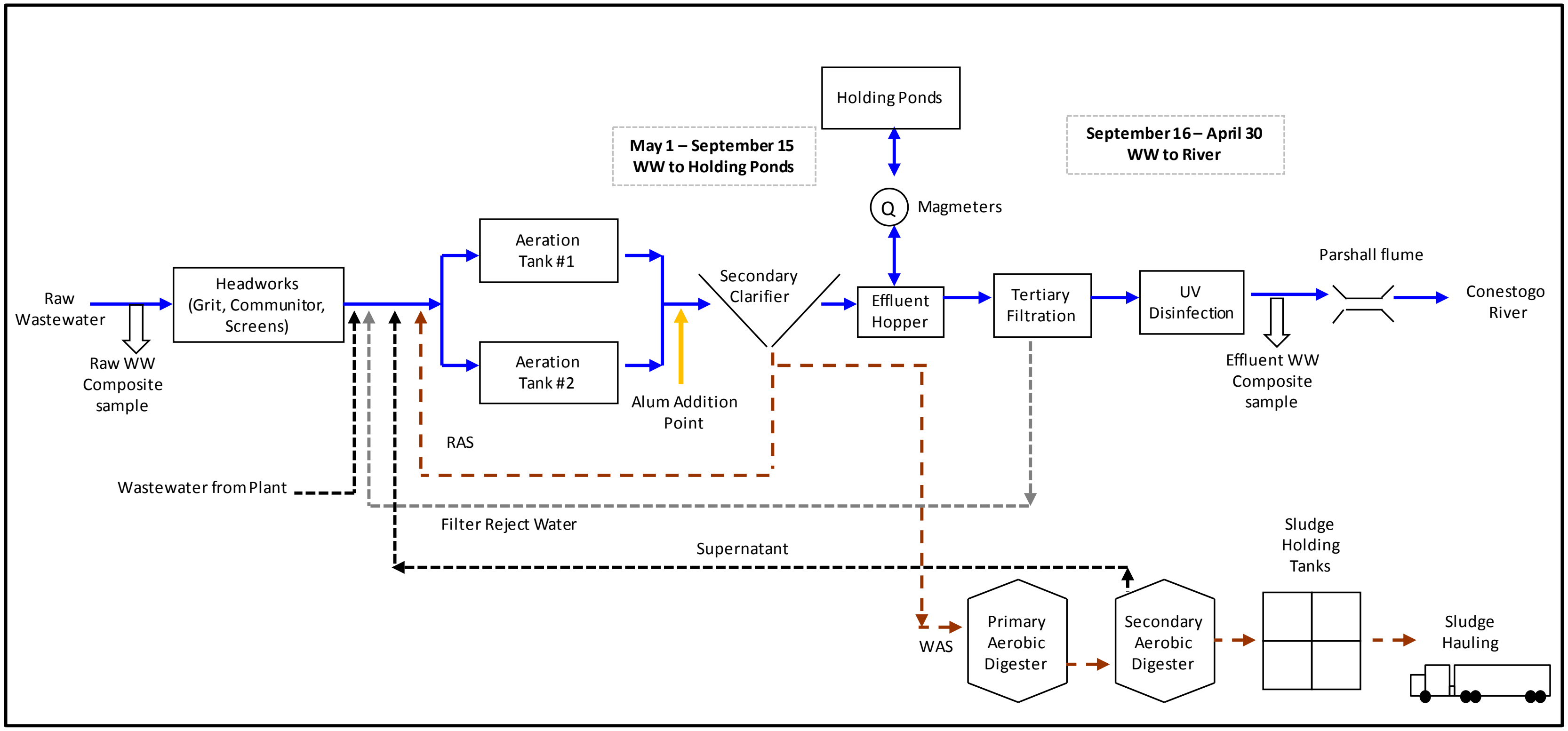


Figure 3.1   Process Flow Schematic

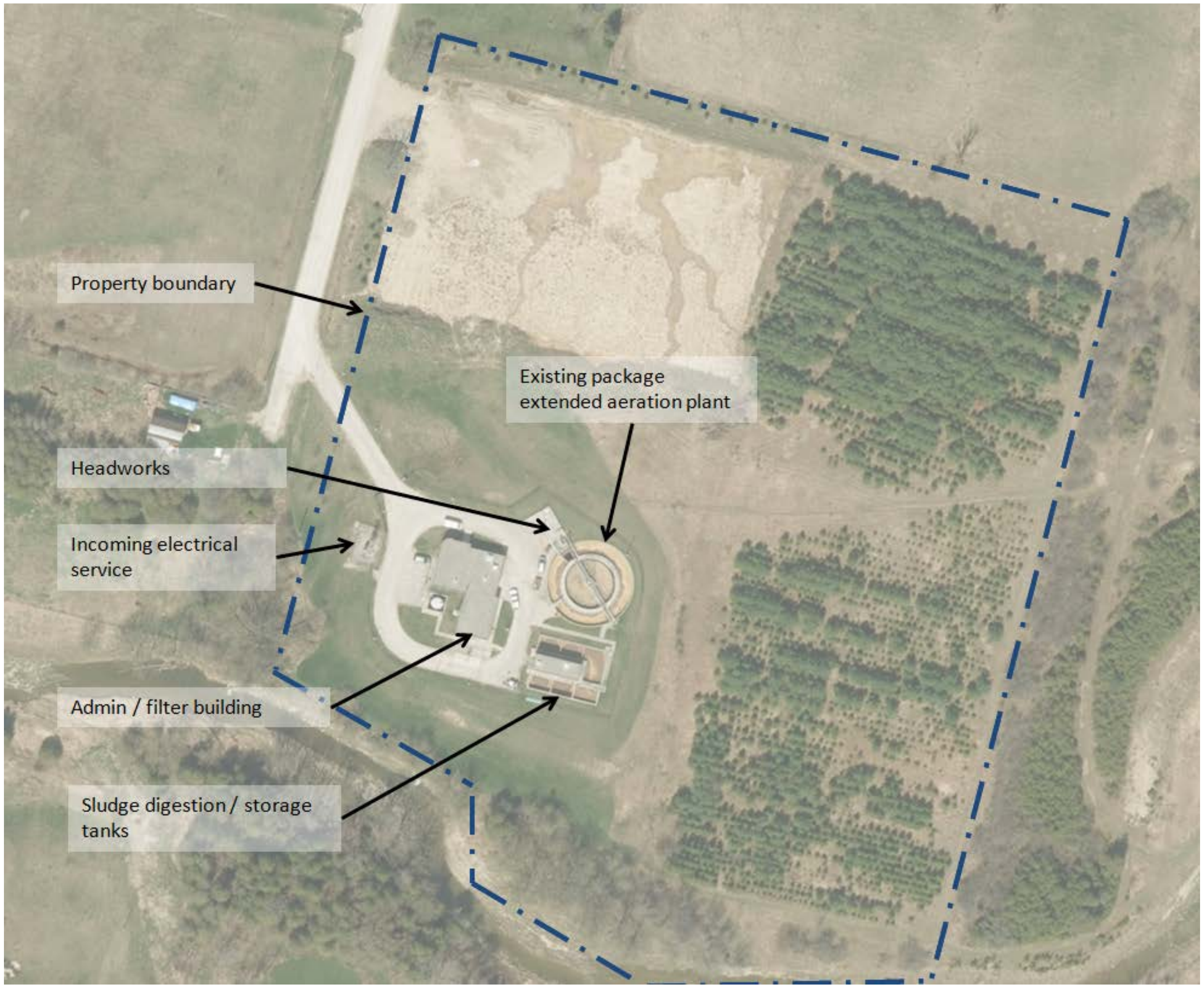


Figure 3.2 Site Layout - Arthur WWTP

Table 3.1 Summary of Existing Process Design

Parameter	Process Design [1]
Grit Removal	
Type	Manually cleaned Grit Channels
Number	2
Dimensions	5.4 m x 0.75 m x 0.5 m SWD
Capacity	5,045 m^3/d
Comminution	
Capacity	5,045 m^3/d
Screening	
Type	Manually cleaned
Capacity	5,045 m^3/d
Aeration Tank	
Number	2 cell annular ring type aeration tank
Dimensions	27.95 m Equivalent Length x 4.65 m x 4.18 m SWD - Cell 1 27.26 m Equivalent Length x 4.65 m x 4.18 m SWD - Cell 2
Volume (each cell)	543 m^3 - Cell 1 530 m^3 - Cell 2
Volume (total)	1,073 m^3
Diffuser Type	Coarse Bubble
Blowers	
Number	2 (1 duty, 1 standby)
Capacity	486 L/s, each
RAS/WAS Pumps	
Number	2
Capacity	34 L/s, each
Storage Volume	50 m^3
Secondary Clarifier	
Type	Circular inlet clarifier
Number	1
Dimensions	13.5 m diameter x 3.8 m SWD
Surface Area	143 m^2
Chemical Pumps (Alum)	
Number	2 (1 duty, 1 standby)
Capacity	250 L/d, each
Chemical Storage Volume	23 m^3 storage tank & 450 L day tank
Tertiary Filtration	
Type	Continuous backwash, upflow, deep bed granular media (1 m depth)
Number of Modules	6
Total Filtration Area	27.9 m^3
Backwash pumps	2 wash water reject pumps (1 duty), each rated at 6.1 L/s at 3.5 m TDH
UV Disinfection	
No. of banks	2 banks in series
Modules Per bank	8
Lamps per module	4
Channel dimension	7.9 m long x 0.5 m wide x 0.9 m SWD
Capacity	6,500 m^3/d

Table 3.1 Summary of Existing Process Design

Parameter	Process Design [1]
Effluent Pumps to Holding Ponds	
Type	Horizontal split case
Number	2
Capacity	58.5 L/s @ 64 m TDH
Effluent Storage Facilities	
Type	Holding Ponds
Number	3
Total Volume	340,000 m^3
Aerobic Digestion	
Primary Digester	
Dimensions	9.4 m x 6.5 m x 5.0 m SWD
Volume	305.5 m^3
Secondary Digester	
Dimensions	5.0 m x 6.5 m x 5.0 m SWD
Volume	162.5 m^3
Sludge Storage	
Number of Tanks	4
Dimensions (each)	6 m x 5 m x 5 m SWD
Volume (each)	150 m^3
Volume (total)	600 m^3
Sludge Transfer Pumps	
Type	Horizontally mounted end suction
Number	2
Capacity	38 L/s @ 12 m TDH
Digester Supernatant Pumps	
Number	2
Capacity	7.5 L/s @ 6 m TDH
Secondary Digester Decant Pump	
Number	1
Capacity	6 L/s @ 4 m TDH
Sludge Blowers	
Number	2
Capacity	150 L/s, each

Notes:
SWD – side water depth
RAS – return activated sludge/WAS - waste activated sludge
TDH - total dynamic head
1. Based on the Certificate of Approval (C of A) No. 3-1256-88-908, issued August 9, 1990.

3.3.1.1 Effluent Objectives and Compliance Requirements

The CofA Number 3-1256-88-908 specifies annual concentration limits for the existing treatment plant for biological oxygen demand (BOD_5), Total Suspended Solids (TSS), Total Phosphorous (TP), total ammonia nitrogen (TAN), and *E. coli*. Monthly compliance limits are also included for BOD_5, TSS, TP, and TAN. The effluent non-compliance limit for *E. coli* is 200 organisms/100 mL (average geometric mean density).

Table 3.2 presents the CofA effluent limits for the Arthur WWTP. There are no effluent objectives in the CofA. A copy of the CofA is located in Appendix A.

Table 3.2 CofA Non-Compliance Limits

Parameter	Average Annual Concentration (mg/L)	Average Monthly Concentration (mg/L)	Annual Average Loading[2] (kg/d)
BOD_5	10	15	14.65
TSS	10	15	14.65
TP	1	1	1.47
TAN	1.5	2.3	2.2
E. coli [1]	200 counts/100mL		

Notes:

Effluent from the plant may be discharged directly to the Conestogo River from September 16 to April 30, provided that there is adequate flow in the river.

1. Based on average geometric mean density.
2. Based on an average day flow of 1,465 m^3/d.

3.3.1.2 Historical Plant Flows

Table 3.3 summarizes historic flows (2007 to 2012) treated at the Arthur WWTP, including the historical average day flow (ADF) and maximum day flow (MDF) for both the raw flow and the final effluent flow from the Arthur WWTP. The historic estimated raw sewage ADF to the Arthur WWTP (2007 - 2012) was 1,342 m^3/d, which is equivalent to 92 percent of the plant's CofA rated ADF capacity. The highest flow year during this period occurred in 2012, when the plant was operating at 1,484 m^3/d, or approximately 101 percent of the CofA rated capacity. Additional detail is provided in Appendix C.

Table 3.3 Summary of Historical Flow (2007 – 2012)

Year	Estimated Raw Sewage Flow			Final Effluent/Discharge Flow		
	Average Day Flow (m^3/d)	Maximum Day Flow		Average Day Flow (m^3/d)	Maximum Day Flow	
		(m^3/d)	MDF Factor		(m^3/d)	MDF Factor
2007	1,157	5,559	4.8	1,213	7,431	6.1
2008	1,436	5,284	3.7	1,381	5,821	4.2
2009	1,265	5,875	4.6	1,632	5,925	3.6
2010	1,309	4,157	3.2	1,294	4,837	3.7
2011	1,402	5,035	3.6	1,458	5,667	3.9
2012	1,484	4,365	2.9	1,579	5,929	3.8
Overall	**1,342**	5,875	4.4	**1,426**	7,431	5.2
CofA Rated Capacity	**1,465**	**6,500**	-	-	-	-

3.3.1.3 *Historic Raw Sewage Quality and Loadings*

Influent wastewater samples are collected using a raw sewage automatic composite sampler located upstream of the grit channels, prior to preliminary treatment. Table 3.4 presents historical influent wastewater concentrations for 2007 to 2012. Based on the historic averages, the wastewater can be characterised as low to medium strength with respect to BOD_5, TSS, TP, and TKN.

Table 3.4 Historical Influent Wastewater Concentrations

Year	BOD_5 (mg/L)	TSS (mg/L)	TP (mg/L)	TKN (mg/L)
2007	148	184	4.67	34.5
2008	141	134	4.74	27.3
2009	134	141	4.54	35.3
2010	154	157	5.47	35.8
2011	172	118	4.67	31.3
2012	183	133	4.42	31.2
AVERAGE	**154**	**151**	**4.76**	**32.9**
Typical Raw Sewage Concentrations (1, 2)	*110 (low)* *190 (med)* *350 (high)*	*112 (low)* *200 (med)* *400 (high)*	*4 (low)* *7 (med)* *12 (high)*	*20 (low)* *40 (med)* *70 (high)*

Notes:
1. 1. Metcalf and Eddy (2003). Wastewater Engineering: Treatment and Reuse, 4th Ed.2. The “low”, “med”, and “high” refer to low, medium, and high strength wastewaters. Low strength wastewaters based on approximate flowrate of 750 L/capita/d, medium strength on 460 L/capita/d, and high strength on 240 L/capita/d.

The historic per capita loadings were 82 g BOD_5/capita·d, 74 g TSS/capita·d, 17.3 g TKN/capita·d and 2.8 g TP/capita·d. The historic per capita loadings for TSS and TP are lower than the typical per capita loadings of 90 g/capita·d values for TSS (MOE, 2008) and 3.3 g/capita·d for TP (Metcalf & Eddy, 2003). The historic per capita loading for BOD_5 and TKN is slightly higher than the typical per capita loading of 75 g/capita·d for BOD_5 (MOE, 2008) and 13.3 g/capita·d for TKN (Metcalf & Eddy, 2003)

3.3.1.4 Historic Final Effluent Quality

Table 3.5 presents historic effluent concentrations for the Arthur WWTP.

Table 3.5 Historic Effluent Wastewater Concentrations (2007 – 2012)

Year	BOD_5 (1) (mg/L)	TSS (1) (mg/L)	TAN (1) (mg/L)	TP (1) (mg/L)	*E.coli* (2) (cfu/100 mLs)
2007	3.1 (3.8)	4.5 (6.3)	0.12 (0.18)	0.30 (0.42)	10 (24)
2008	2.4 (3.2)	2.9 (3.6)	0.24 (0.53)	0.33 (0.51)	10 (50)
2009	2.6 (3.0)	4.0 (7.3)	0.37 (1.1)	0.31 (0.43)	7 (20)
2010	2.6 (4.0)	4.2 (7.0)	0.16 (0.27)	0.33 (0.53)	4 (6)
2011	2.5 (4.2)	3.6 (6.4)	0.18 (0.25)	0.27 (0.45)	11 (61)
2012	2.1 (2.4)	2.4 (3.0)	0.13 (0.30)	0.18 (0.29)	10 (170)
OVERALL	**2.6 (4.2)**	**3.6 (7.3)**	**0.20 (1.1)**	**0.29 (0.53)**	9 **(170)**
Annual Average Compliance Limits	*10*	*10*	*1.5*	*1*	*200*
Monthly Average Compliance Limits	*15*	*15*	*2.3*	*1*	

Notes:
1. Based on annual average values during the discharge period (from September 16 to April 30). Values in parentheses represent maximum monthly average values during the discharge period.
2. Based on annual geometric mean density during the discharge period (from September 16 to April 30). Values in parentheses represent maximum monthly geometric mean density during the discharge period.

Over the review period (i.e. 2007 – 2012), there were no non-compliance events for BOD_5, TSS, TAN, TP and *E. coli*. The Arthur WWTP has historically achieved full nitrification, even in the winter months. Although a maximum monthly average effluent TAN concentration of 1.1 mg/L was recorded in 2009, since 2010, the Arthur WWTP have been able to consistently provide a high level of nitrification with monthly average effluent TAN concentrations ranging from 0.10 mg/L to 0.30 mg/L.

3.3.2 Wells St. SPS

The Wells St. SPS is located on Wells St., approximately 675 m south of Highway 6. The pumping station is equipped with the following:

- Two submersible pumps (one duty, one standby), each with a rated capacity of 16 L/s (1,382 m3/d);
- One wet well with a liquid volume of approximately 120 m^3; and,
- One standby diesel generator.

Wastewater from the Wells St. SPS is pumped through a 150 mm diameter forcemain that is 1 km in length. It is discharged into the Preston St. trunk sewer at the intersection of Preston St. and Highway 6.

The Wells St. SPS service area includes Wells St. E. and Smith St. between Wells and Preston St. It receives predominately industrial flows from industry located in the west part of Arthur. There have been no recorded bypass flows at the Wells St. SPS over the review period (2007 to 2014).

Details regarding the historic flows to the Wells St. SPS are presented in Appendix H.

3.3.3 Frederick St. SPS

The Frederick St. SPS is located near the intersection of Frederick and Francis streets. The pumping station is equipped with the following:

- Two submersible pumps (one duty, one standby), each with a rated capacity of 58.4 L/s (approximately 5,045 m^3/d);
- One reinforced wet well, measuring approximately 5.3 m x 5.3 m x 6.2 m (deep);
- Providing a total storage volume of approximately 174 m^3; and,
- One 60 kW standby diesel generator with 450 L fuel tank.

The Frederick St. SPS receives the majority of wastewater flow from the village of Arthur, including the central, southern, and eastern portions of the system. Flows are predominately a mix of residential and commercial wastewater. From the Frederick St. SPS, raw wastewater is pumped directly to the treatment plant via a 250 mm diameter forcemain.

Over the review period (2007 to 2014), there have been several recorded bypass events at the Frederick St. SPS. Bypasses occur during periods of high flow, primarily caused by heavy rainfall and/or snow melt. The bypass of the Frederick St. SPS is located in MH-175, on Frederick St. immediately in front of the pumping station. During a bypass event, periods of high flow cause the raw wastewater level to rise in the wet well and in the collection system immediately upstream of the wet well, including at MH-175. When the bypass level is reached, raw wastewater will automatically flow over the bypass weir located in MH-175, which trips an alarm and begins a timer. Bypass flow is discharged to the Conestogo River.

Details regarding the historic flows to the Frederick St. SPS are presented in Appendix H.

4. DEVELOPMENT AND EVALUATION OF ALTERNATIVE SOLUTIONS FOR THE ARTHUR WWTP

4.1 Alternative Solutions

A number of planning alternatives to address the wastewater treatment capacity issues for the community of Arthur were considered, including:

1. The "Do Nothing" option.
2. The "Limit Community Growth" option.
3. Optimize operational practices at existing treatment system to accommodate future flows and loads.
4. Reduce wastewater flows through water efficiency and sewer rehabilitation.
5. Decommission the existing plant and build a new plant to service the community on the existing site.
6. Decommission the existing plant and build a new plant to service the community at a new location.
7. Maintain the existing plant and build a new plant on a new site to service new growth.
8. Expand the existing plant to service existing and proposed growth in the community.

A description of each of the above servicing alternatives is provided below.

4.1.1 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. Under the County's Official Growth Plan, there is planned growth in the community of Arthur.

4.1.2 Limit Community Growth

This alternative would involve limiting growth in the community such that the capacity of the WWTP is not exceeded. Based on historic flows, the existing annual ADF capacity of the WWTP has been exceeded over the review period. As a result, there is no wastewater treatment capacity available to service growth within the community of Arthur.

Optimize Existing Treatment Process This alternative would involve modifying and optimizing operational practices at the existing treatment system to accommodate future flows and loads.

Based on the results of a field testing program, optimization of the existing treatment process may allow for an increase in the existing ADF capacity of the biological portion of the treatment system without the need for the construction of additional tankage (Hydromantis, 2007). Equipment upgrades to the aeration and RAS pumping systems may be required.

The hydraulic capacity of components of the existing infrastructure, such as the headworks, secondary clarifiers, effluent transfer pumping station and forcemain, will be exceeded due to the projected increase in peak flows to the WWTP. Optimization alone would not be sufficient to provide adequate hydraulic treatment capacity of all unit processes at future design flows.

4.1.3 Reduce Wastewater Flows through Water Efficiency and Sewer Rehabilitation

This alternative would include the implementation of programs to reduce wastewater flows through water efficiency and sewer rehabilitation.

Expanded water conservation programs, including water metering and public education, would be used to maintain and possibly reduce future water consumption. A reduction in sewage flow could be accomplished by water conservation measures such as the installation of plumbing fixture retrofit kits, and the replacement of high water use fixtures.

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 amount of extraneous flow that could be eliminated through sewer rehabilitation and the costs associated with such work are uncertain. Although a reduction in wastewater flows can be achieved through water efficiency and sewer rehabilitation programs, the flow reduction cannot be quantified. As such, there is still the possibility that increased growth will result in flows exceeding the existing rated capacity of the plant.

4.1.4 Decommission the Existing Plant and Construct a New Plant on the Existing Site

This alternative involves the construction of a new tertiary mechanical WWTP on the existing site to service the existing community and any forecasted growth. A new activated sludge plant with effluent filtration would be sized to accommodate the increased wastewater flows associated with growth in the community, and would provide treatment including nitrification, non-toxic disinfection, and tertiary effluent polishing. The existing WWTP would be decommissioned. The existing Holding Ponds would be retained for effluent storage, and the existing outfall could be retained for effluent discharge to the Conestogo River.

The Township's sludge digestion and biosolids storage requirements would also be reviewed to ensure that the new WWTP is capable of meeting those needs.

4.1.5 Decommission the Existing Plant and Construct a New Plant on a New Site

This alternative would involve the construction of a new tertiary mechanical WWTP on a new site to service the existing community and any forecasted growth. A new activated sludge plant with effluent filtration would be sized to accommodate the increased wastewater flows associated with growth in the community, and would provide treatment including nitrification, non-toxic disinfection, and tertiary effluent polishing. The existing WWTP would be decommissioned. The existing Holding Ponds would be retained for effluent storage.

A site for the new WWTP would need to be selected based on available land within the community, as well as 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.

This alternative includes an assessment of potential outfall locations, including utilizing and/or modifying the existing outfall or constructing a new outfall discharging into the Conestogo River. Utilizing the existing outfall would require effluent pumping to convey the treated effluent from the new site to the existing outfall. The Township's sludge digestion and biosolids storage requirements would also be reviewed to ensure that the new WWTP is capable of meeting those needs.

4.1.6 Upgrade Existing Plant and Construct a New Plant for New Growth

This alternative would retain the existing WWTP to meet future effluent requirements at its existing rated capacity of 1,465 m^3/d. Upgrades to the existing WWTP would be completed to address aging infrastructure and to provide additional process redundancy where possible. The existing plant infrastructure would be re-used where possible.

In addition, this alternative would involve the construction of a new activated sludge plant with effluent filtration on a new site to service the forecasted growth in the community. A new activated sludge plant providing treatment including nitrification, non-toxic disinfection, and tertiary effluent polishing would be constructed to accommodate additional wastewater flows.

The existing Holding Ponds would be retained for effluent storage from both WWTPs.

A site for the new WWTP would need to be selected based on available land within the community, as well as access to the collection system infrastructure and suitable effluent discharge locations. The collection system would need to be modified to convey a portion of the wastewater to the new WWTP.

This alternative includes an assessment of potential outfall locations, including utilizing and/or modifying the existing outfall or constructing a new outfall discharging into the Conestogo River. The Township's sludge digestion and biosolids storage requirements would also be reviewed to ensure that the upgraded plant and new plant are capable of meeting those needs.

4.1.7 Expand and Upgrade the Existing Arthur WWTP

This alternative would expand the existing WWTP to provide capacity for the existing community and any forecasted growth. The expanded plant would be sized to accommodate the increased wastewater flows associated with growth in the community, and would utilize an activated sludge process providing treatment including nitrification, non-toxic disinfection, and tertiary effluent polishing. Expanded sludge digestion and biosolids storage capability would also be provided. Existing plant infrastructure would be re-used where possible. The existing Holding Ponds would be retained for effluent storage.

4.2 Evaluation of Alternative Solutions

4.2.1 Short-Listing of Alternative Solutions

A preliminary evaluation was conducted to determine if the alternative solutions developed were capable of meeting the study objectives. Only those alternatives that satisfy the project objectives were considered for further evaluation.

Alternative 1 (Do Nothing) and Alternative 2 (Limit Growth in the Community) would not provide servicing capacity for planned growth in the community. As a result, these alternatives do not satisfy the study objectives and were not considered further.

Alternative 3 (Optimize Existing Treatment Process) may provide additional servicing capacity for a portion of the planned growth in the community; however, the increase in peak flows would exceed the hydraulic capacity of components of the existing infrastructure. Optimization alone would not be sufficient to provide adequate treatment capacity at future design flows; however, it may reduce the scale of required upgrades to the existing plant. Therefore, this alternative would not satisfy the study objectives and was not considered further as a stand-alone solution. Optimization of the existing treatment process should be considered for implementation in conjunction with other alternatives to potentially reduce the capital costs associated with plant expansion.

Alternative 4 (Reduce Wastewater Flows) would be able to achieve a reduction in wastewater flows through water efficiency and sewer rehabilitation programs; however, there is still the possibility that increased growth will result in flows exceeding the existing rated capacity of the plant. Therefore, this alternative would not satisfy the study objectives and was not considered further as a stand-alone solution. Water efficiency and extraneous flow reduction should be considered for implementation in conjunction with the preferred alternative.

Alternative 5 (Construction of a New Plant on Existing Site), Alternative 6 (Construction of a New Plant on a New Site), Alternative 7 (Upgrade Existing Plant and Construct New Plant for Growth) and Alternative 8 (Expand and Upgrade the Existing Arthur WWTP) would satisfy all of the study objectives. Therefore, these alternatives were considered in further detail.

A summary of the preliminary evaluation of alternative solutions is presented in Table 4.1.

Table 4.1 Evaluation of Alternative Solutions

Alternative	Will Alternative Satisfy All Project Objectives?		Could Alternative be Part of Solution?
	Yes	No	Yes
1. Do Nothing		X	
2. Limit Community Growth		X	
3. Optimize Existing Treatment Process		X	X
4. Reduce Wastewater Flows		X	X
5. Construction of a New Plant on Existing Site	X		
6. Construction of a New Plant on a New Site	X		
7. Upgrade Existing Plant and Construction of a New Plant for New Growth	X		
8. Expand and Upgrade the Existing Plant	X		

4.2.2 Evaluation of Feasible Alternatives

An evaluation of the feasible alternatives was conducted based on their impacts on the natural environment, social environment, and economic environment.

4.2.3 Cost Estimates

A conceptual level cost evaluation was conducted to determine relative costs of the feasible alternatives. The estimated relative capital costs, annual operation and maintenance (O&M) costs, and overall life cycle costs for each feasible option are shown in Table 4.2. The "open" circles represent the lowest cost, while the "black" circles represent the highest cost.

Table 4.2 Costs Comparison of Feasible Alternatives Solutions

Alternative	Capital Cost	Annual O&M Cost	25-Yr Life Cycle Cost
1. Construction of a New Plant on Existing Site	◑	○	◔
2. Construction of a New Plant on a New Site	●	◑	◑
3. Upgrade Existing Plant and Construction of a New Plant for Growth	◑	●	◕
4. Expand and Upgrade the Existing Plant	○	○	○

Notes:
○ ◔ ◑ ◕ ●
Least expensive → Most expensive

4.2.4 Comparison of Alternative Solutions

The advantages and disadvantages of each feasible alternative, based on impacts on the natural, technical, social, and economic environment, are summarized in Table 4.3.

Table 4.3 Comparison of Feasible Alternative Solutions

Alternative	Natural Environment		Technical Environment		Social Environment		Economic Environment		Relative 25-Year Life Cycle Cost
	Advantages	Disadvantages	Advantages	Disadvantages	Advantages	Disadvantages	Advantages	Disadvantages	
1. Construction of a New Plant on Existing Site	Construction limited to existing property.	Construction may be necessary on currently undisturbed areas of the site.	Flexibility with respect to selecting treatment technologies for the New Plant.	Difficult construction staging to maintain treatment of wastewater in Arthur during construction.	Construction can be completed on existing land further away from residential.	Significant construction activity on existing property.	Only one plant for staff to operate and maintain.	No use of existing treatment plant infrastructure, increasing capital costs. Expensive construction staging.	◔
2. Construction of a New Plant on a New Site	Portion of existing site could be recovered.	Land required for new treatment plant. Construction at multiple sites within the community. New outfall location needed.	Flexibility with respect to selecting treatment technologies for the New Plant.	Additional collection system components requiring maintenance.	Construction can be completed on land further away from residential.	Significant construction activity at multiple sites within the community.	Only one plant for staff to operate and maintain.	No use of existing treatment plant infrastructure, increasing capital costs. Land acquisition costs and increasing capital costs. May have increased pumping and energy costs (O&M) from a new site.	◑
3. Upgrade Existing Plant and Construction of a New Plant for Growth	No construction or disturbance at current site.	Land required for new treatment plant. Construction at multiple sites within the community. New outfall location needed	Flexibility with respect to selecting treatment technologies for the New Plant.	Additional collection system components requiring maintenance.	Less construction activity on the existing site due to the utilization of the Existing Plant. Construction can be completed on land further away from residential.	Significant construction activity at multiple sites within the community.	Continued use of Existing Plant infrastructure; thereby minimizing capital costs.	Two plants for staff to operate and maintain. Land acquisition costs and increasing capital costs. May have increased pumping and energy costs (O&M) from a new site.	◕
4. Expand and Upgrade the Existing Plant	Construction limited to existing property.	Construction may be necessary on currently undisturbed areas of the site.	Some flexibility with respect to selecting treatment technologies for the expansion of the Existing Plant.	Significant upgrades to the Existing Plant needed to meet more stringent effluent limits.	Less construction activity on the existing site due to the utilization of the Existing Plant. Construction can be completed on existing land further away from residential.	Significant amount of construction activity on existing property due to the expansion of the Existing Plant.	Continued use of Existing Plant infrastructure; thereby greatly minimizing capital costs. Only one plant for staff to operate and maintain.	Construction staging may increase capital costs.	○

Notes:
○ ◔ ◑ ◕ ●
→
Least expensive Most expensive

4.3 Selection of the Recommended Preferred Solution

The preferred alternative solution to meet the study objectives is **Alternative 8 – Expand and Upgrade the Existing Plant**. The preferred solution includes the following components.

- Expansion and upgrading of the existing plant to provide wastewater servicing capacity for growth in the community. The expanded plant would include nitrification, non-toxic disinfection, and tertiary effluent polishing.
- An assessment of sludge digestion and biosolids storage requirements for the Township, and provision of expanded sludge digestion and biosolids storage at the expanded plant.
- Retaining the existing effluent Holding Ponds and upgrading the effluent pumping station and/or forcemain capacity as required.

In addition to having the lowest relative 25-year life cycle cost, this option offers the following advantages relative to the other alternatives.

Expand and Upgrade Existing Plant vs. Constructing a New Plant

- Treatment at the existing Arthur WWTP would allow for the continued use of existing infrastructure, which results in capital cost savings and less impact of natural environment which would result from siting a new plant on a new property.
- Utilizing existing tankage and buildings will result in less impact on the natural and social environment during construction due to a smaller construction footprint, a shorter construction period, and less truck traffic within the community.

Maintaining Treatment Facilities at the Existing Site vs. Servicing at a New Site

- No land acquisition is required, resulting in capital cost savings.
- Less impact on environment during construction as only one site will be disturbed, as opposed to two separate sites.

5. EFFLUENT LIMITS FOR EXPANDED AND UPGRADED ARTHUR WWTP

5.1 Future Effluent Limits

Table 5.1 presents the recommended future design effluent objectives and limits for the expanded Arthur WWTP that have been agreed to with MOECC as part of the Class EA for two design flows (1,860 m^3/d and 2,300 m^3/d). Further information about the development of the effluent limits is contained within the Assimilative Capacity Study Technical Memorandum (XCG, 2013) and subsequent correspondence with the MOECC. These documents can be found in Appendix D.

Table 5.1 Future Design Effluent Objectives and Compliance Limits for Phases 1 and 2

Parameter	Phase 1 Capacity (1,860 m^3/d) Proposed Values		Phase 2 Capacity (2,300 m^3/d) Approved Values	
	Objective Concentration	Compliance Limit	Objective Concentration	Compliance Limit
BOD_5	6 mg/L	10 mg/L	5 mg/L	10 mg/L
TSS	6 mg/L	10 mg/L	5 mg/L	10 mg/L
TP	0.21 mg/L	0.25 mg/L	0.17 mg/L	0.25 mg/L
TAN	0.6 mg/L	3.5 mg/L (1) 2.8 mg/L (2)	0.5 mg/L	3.5 mg/L (1) 2.8 mg/L (2)
E. coli (3)	-	100 cfu/100 mL	-	100 cfu/100mL
pH	-	6 - 8	-	6 - 8

Notes:
1. For discharge during January, February, March, April, May, November, and December.
2. For discharge during October.
3. Based on a monthly geometric mean.

5.2 Seasonal Effluent Discharge Restrictions

Based on the results of the Assimilative Capacity Study, the Arthur WWTP will only be permitted to discharge to the Conestogo River during the months of October through May. The actual allowable effluent flow rate will depend on the effluent TAN concentration and the flow rate in the Conestogo River. Table 5.2 presents the ratio of river flow to allowable plant effluent flow as a function of effluent TAN for each month from October through May. Table 5.3 presents the maximum allowable daily effluent flow from the Arthur WWTP. Details regarding the development of these discharge tables and flows can be found in Appendix D.

Table 5.2 Allowable River Flow to Effluent Flow Ratio Table

Month	TAN (mg/L)					
	≤0.65	>0.65 - 1.0	>1.0 - 1.5	>1.5 - 2.0	>2.0 - 2.8	>2.8 - 3.5
January	0.9	0.9	1.7	2.7	4.7	5.8
February	0.7	0.7	0.7	0.9	1.8	2.6
March	1.0	1.0	1.8	2.9	4.9	6.0
April	2.3	4.2	7.5	10.7	15	18.8
May	3.5	5.7	11.4	15.3	22.9	45.8
October	1.4	1.7	3.8	4.8	9.5	- (1)
November	1.4	1.4	1.6	2.5	4.1	5.5
December	1.4	2.4	4.3	6.5	10.4	13

Notes:
1. Proposed ECA TAN effluent limit for October is 2.8 mg/L.

Table 5.3 Maximum Daily Effluent Flow from the Arthur WWTP

Month	Allowable Max Daily Flow (m^3/d)
January	5,000
February	5,000
March	5,500
April	3,200
May	1,300
October	1,400
November	4,600
December	3,800

.

6. DEVELOPMENT AND EVALUATION OF ALTERNATIVE DESIGN CONCEPTS FOR THE ARTHUR WWTP

The expansion of the Arthur WWTP was identified as the preferred alternative to provide wastewater treatment capacity for the community of Arthur (see Section 4). The previous sections met the requirements of Phase 1 and Phase 2 of the Class EA process. Phase 3 of the Class EA process involves the selection of the preferred design concept.

The following section provides a review of available treatment alternatives applicable to the Arthur WWTP. For the purposes of developing the alternative design concepts, the following assumptions were made:

- Upgrades developed based on a design ADF capacity of 2,300 m^3/d (Phase 2, or year 2031, conditions). Options for phasing-in the capacity increase were developed for the preferred design concept and are presented in Section 7.
- The process will be required to provide tertiary level treatment to meet the design effluent TP limits.
- Although the proposed TAN concentration limit is 2.8 mg/L for October and 3.5 mg/L for all other months, conceptual designs will be based on achieving the objecting effluent TAN of 0.5 mg/L to ensure that effluent TAN concentrations will not limit the allowable effluent discharge rate.
- All process tankage will be located on the existing site owned by the Township.
- New headworks will be provided for all alternatives.
- Existing infrastructure will be reused, where possible.

6.1 Preliminary Treatment

The existing inlet works have reached the end of their useful life. As a result, new inlet works are required. This will involve the construction of a new headworks building to replace the existing grit channels, comminutor and manually raked bar screen. New influent flow metering will also be provided.

6.2 Secondary Treatment

Upgrades to the Arthur WWTP secondary treatment process will include the application of some form of the activated sludge process. The activated sludge process is a robust, well-proven process for treating wastewater under widely varying environmental conditions due to its operational flexibility. The activated sludge process is one of the most widely used secondary treatment processes. There are many variations of the activated sludge process, but all consist essentially of an aerated biological reactor followed by a solids separation process. Additional solids and phosphorus removal can be accomplished by providing downstream tertiary treatment.

The following secondary treatment processes were investigated as potential treatment alternatives for the Arthur WWTP:

- Option 1 - Extended Aeration - Secondary Clarifier Expansion.
- Option 2 - Extended Aeration - Twin Existing Plant.

- Option 3 - Integrated fixed-film/activated sludge (IFAS).
- Option 4 - Membrane Bioreactor (MBR).

A description and proposed site plan configuration of each design alternative is presented in the Technical Memorandum entitled Evaluation of Alternative Design Concepts that is provided in Appendix E.

6.3 Tertiary Treatment

Based on the conceptual level design basis, the maximum design effluent flow from the Arthur WWTP is 5,500 m^3/d. Based on historic performance, the existing tertiary filters are expected to provide adequate effluent quality at the maximum design effluent flow. Therefore, expansion of current filtration facilities is not required.

6.4 Chemical Addition

The chemical feed system at the Arthur WWTP consists of a 23 m^3 chemical storage tank, 450 L day tank, and two chemical metering pumps (one duty and one standby), each rated for 250 L/d. The coagulant addition point is immediately upstream of the secondary clarifier. Provisions exist to dose alum upstream of the tertiary filters. The Arthur WWTP currently uses alum as the precipitant. Currently, alum is added upstream of the secondary clarifiers.

Based on full-scale testing, implementation of dual point alum addition at the Arthur WWTP will enhance phosphorus removal and, in conjunction with tertiary treatment, will allow the Arthur WWTP to consistently meet the future effluent TP objectives.

In a Memorandum to the MOE dated January 6, 2014, XCG provided responses to MOE comments on the Assimilative Capacity Study (see Appendix D). In the memorandum, XCG indicated that effluent pH adjustment may be required to achieve non-toxic effluent concentrations of un-ionized ammonia. The potential addition of pH adjustment should be re-evaluated during preliminary design. If required, it is not anticipated that this will significantly impact capital and O&M costs. Further, pH adjustment would be applicable to all treatment options being considered for the Arthur WWTP and would impact all options equally.

6.5 Disinfection

The UV system was replaced in 2013 and has adequate capacity to meet the future discharge requirements at the proposed effluent flows; therefore, no upgrades to the UV system are required.

6.6 Effluent Storage and Conveyance

Based on preliminary hydraulic analyses, the existing conveyance system (forcemain and pumps) has insufficient capacity to transfer design peak flows to the Holding Ponds. A new 350 mm forcemain will be required to convey future peak flows to and from the Holding Ponds. The pumps will require replacement with pumps sized for the future design peak instantaneous flow.

According to the CofA, the existing capacity of the Holding Ponds is approximately 340,000 m^3. Based on the projected storage requirement of approximately 246,000 m^3, no additional storage capacity is required. It is recommended that the condition of the lagoon cells be assessed as part of the preliminary design and detailed design of the plant expansion to determine if any rehabilitation of the existing lagoon cells is required.

6.7 Sludge Management

6.7.1 Sludge Digestion

The existing digesters do not have sufficient capacity to treat the projected future maximum month sludge generation rate for any of the secondary treatment options. In order to meet the design requirements, existing sludge storage tankage could be converted to digester volume. The number of tanks that require conversion will be based on the solids retention time provided in the secondary treatment process, and the effective feed WAS concentration.

Piping would be provided to allow waste sludge to be directed to either the first or second stage, so that individual stages could be taken offline for maintenance if required. Provision for decanting from the digester would also be provided. The existing aeration system in the existing sludge storage tanks may require upgrades for operation as 1st or 2nd stage aerobic digesters.

Design options that could be considered during the preliminary design phase include providing a means to equalize the addition of digester supernatant to the liquid treatment train to reduce the shock loading impact.

6.7.2 Biosolids Storage

The following biosolids storage alternatives were investigated as possible design concepts for the expanded Arthur WWTP:

- Alternative A - Liquid biosolids storage in on-site storage tanks.
- Alternative B - Geotextile dewatering and cake storage in an on-site facility.

Both on-site liquid biosolids storage and geotextile dewatering and cake storage are feasible options for implementation at the Arthur WWTP. A description and proposed site plan configuration of each design alternative is presented in the Technical Memorandum entitled Evaluation of Alternative Design Concepts that is provided in Appendix E.

6.8 Evaluation of Treatment Alternatives

6.8.1 Evaluation Methodology

The evaluation criteria described in Table 6.1 were used to evaluate the design alternatives. The construction and operation phases were each evaluated considering the impacts on the natural environment, social/cultural/community environment, technical environment and cost (economic environment). For the purposes of the evaluation, all evaluation criteria were assumed to be equally weighted.

An information matrix was prepared to present information on each design alternative. The information included impacts associated with each alternative, potential mitigation measures to reduce the predicted impacts, and the net impacts (i.e. those impacts which remain after mitigation).

An evaluation matrix was prepared where a score between 1 and 4 was assigned to each alternative for each evaluation criteria, as follows:

- Score of 1 – Does not meet criterion/negative impact/highest cost.
- Score of 2 – Meets some aspects of the criterion/potential for negative impact.
- Score of 3 – Meets most aspects of the criterion/little to no negative impact.
- Score of 4 – Meets criterion objectives/positive impact/lowest cost.

For each alternative, a total score was calculated as the sum of the individual criteria scores. The alternative design concepts were ranked according to the total scores. The alternative design concept with the highest total score was selected as the preferred alternative design concept.

6.8.2 Comparison of Secondary Treatment and Biosolids Storage Options

An information matrix that qualitatively evaluates each secondary treatment option based on the evaluation criteria is presented in Table 6.2 and Table 6.3 for the construction and operation phases respectively.

As outlined in Section 6.7.2, both on-site liquid biosolids storage and geotextile dewatering and cake storage are feasible options for implementation at the Arthur WWTP. Table 6.4 presents a comparison of the advantages and disadvantages of each of the alternative biosolids storage concepts.

Table 6.1 Evaluation Criteria

Group	Criteria	Definition
Construction Phase		
Natural Environment	Effect on surface waters	This criterion refers to the effects of the construction of the alternative design concept on the surface water quality, quantity and aquatic ecosystems.
	Disruption of terrestrial features	This criterion refers to the temporary disruption or displacement of terrestrial features during construction activities.
Social/Cultural/ Community Environments	Disruption of adjacent residential, community and recreational features (noise, dust, odour, traffic)	This criterion addresses the potential temporary nuisance impacts on adjacent land owners and residents as a result of construction.
Technical Environment	Constructability	This criterion addresses the ability to maintain the performance of the treatment process during construction.
Economic Environment	Capital costs of construction	This criterion provides an estimate of the capital cost of the alternative.
Operation Phase		
Natural Environment	Effect on surface waters	This criterion refers to the effects of operation of the alternative on surface water quality.
Social/Cultural/ Community Environments	Disruption of adjacent residential, community and recreational features (noise, dust, odour, traffic)	This criterion addresses the potential nuisance impacts (noise, odour, traffic, visual intrusion) on adjacent land owners and residents as a result of the operation of the facility at the re-rated capacity with operation of the design alternative.
Technical Environment	Performance and experience in similar climates and size	The criterion refers to the performance and experience of operating other WWTPs similar in size and design to the alternative design concept, in comparable climates as the Arthur area.
	Operating requirements	This criterion refers to the operational complexity of the alternative in terms of operator attention and staffing requirements.
	Compatibility with existing infrastructure	This criterion refers to the compatibility of the alternative with existing infrastructure in terms of the application/use of existing equipment and ability for retrofit.
	Ability to consistently meet effluent criteria	This criterion refers to the ability for the alternative to consistently be able to meet the WWTP C of A effluent criteria.
Economic Environment	Annual operating costs for processes that vary between the alternatives	This criterion addresses the cost of operation of the alternative. The alternatives were scored for this criterion based on the estimated annual operating costs of processes that vary between the alternatives. Processes that are similar between the alternatives and the labour at the WWTP were assumed constant.

Table 6.2 Comparison of Secondary Treatment Options During the Construction Phase

Evaluation Criterion	Alternative 1 Expand Secondary Clarifiers	Alternative 2 Twin Existing EA Plant	Alternative 3 IFAS	Alternative 4 MBR
Natural Environment				
Effect on surface waters	All construction impacts can be mitigated through good construction techniques.	All construction impacts can be mitigated through good construction techniques.	All construction impacts can be mitigated through good construction techniques.	All construction impacts can be mitigated through good construction techniques.
Disruption of terrestrial features	Medium construction footprint.	Large construction footprint.	Medium construction footprint.	Smallest construction footprint.
Social/Cultural/Community Environments				
Disruption of Adjacent Residential, Community and Recreational Features	Minor noise and dust on adjacent land owners and residents during construction activities.	Minor noise and dust on adjacent land owners and residents during construction activities.	Minor noise and dust on adjacent land owners and residents during construction activities.	Minor noise and dust on adjacent land owners and residents during construction activities. Potential for shortest construction duration.
Technical Environment				
Constructability	Current process could be maintained while additional secondary clarifiers are constructed. Tying in the secondary clarifiers may result in minor constructability issues. Retrofitting aeration system, if necessary, can be accomplished by taking only ½ of aeration capacity offline at a time.	Current process could be maintained while additional treatment train is constructed. Tying in the additional train may result in minor constructability issues. Retrofitting aeration system, if necessary, can be accomplished by taking only ½ of aeration capacity offline at a time.	Retrofits to the existing aeration basins to IFAS tanks could be done one at a time. Construction could be targeted during expected low flow times. The new secondary clarifier would be constructed while the current process is maintained. Tying in the secondary clarifier may result in minor constructability issues.	No new tankage is required. The new membrane building would be constructed, and membranes commissioned, prior to converting the existing secondary clarifier to equalization storage or liquid biosolids storage.

Table 6.3 Comparison of Secondary Treatment Options During the Operation Phase

Evaluation Criterion	Alternative 1 Expand Secondary Clarifiers	Alternative 2 Twin Existing EA Plant	Alternative 3 IFAS	Alternative 4 MBR
Natural Environment				
Effect on surface waters	Negligible impacts as future design effluent limits can be met.	Negligible impacts as future design effluent limits can be met.	Negligible impacts as future design effluent limits can be met.	Negligible impacts as future design effluent limits can be met. Potentially provides highest level of treatment, particularly in terms of TSS and TP, of all options considered.
Social/Cultural/Community Environments				
Disruption of adjacent residential, community and recreational features (noise, dust, odour, traffic)	Low disruption anticipated. Solution unlikely to increase potential for odours.	Low disruption anticipated. Solution unlikely to increase potential for odours.	Low disruption anticipated. Solution unlikely to increase potential for odours with proper mixing.	Low disruption anticipated. Solution unlikely to increase potential for odours.
Technical Environment				
Performance and experience in similar climates and size	Very good experience/performance. Proven treatment process with long history of application in similar climates.	Very good experience/performance. Proven treatment process with long history of application in similar climates.	Relatively new technology. Limited experience in Ontario (demonstrations at Lakeview, Highland Creek, and full scale experience at Peterborough WWTPs).	Relatively new technology. Limited experience in Ontario (Port McNicoll, Creemore, and Komoka WWTPs).
Operational complexity/familiarity of Operations staff with process	Low complexity. Operations staff familiar with processes involved in treatment by EA.	Low complexity. Operations staff familiar with processes involved in treatment by EA.	Medium complexity. Flow through process with relatively simple operational control requirements. Operations staff do not have experience operating IFAS process.	High complexity. Membranes represent a barrier to flow through the plant, requiring complex control of permeate pump operation. Membranes have intensive maintenance requirements. Operations staff do not have experience operating MBR process.
Operating requirements/Operation time usage	Low operating requirements.	Low operating requirements.	Limited additional operating requirements relative to EA solutions.	Highest operating requirements compared to the other alternatives.
Compatibility with existing infrastructure	Good compatibility with existing infrastructure. Need only expansion of secondary clarifier.	Good compatibility with existing infrastructure. Need only to expand aeration and secondary clarification volumes.	Good compatibility with existing infrastructure. Need only to retrofit aeration tanks with IFAS technology, and construct additional clarifier capacity.	Good compatibility with existing infrastructure. Existing secondary clarifier is not required, however this tankage could potentially be reused for flow equalization volume and/or liquid biosolids storage. Effluent filters not required, but will likely be retained to polish water stored in the lagoon.
Ability to consistently meet effluent requirements	Able to consistently meet effluent criteria. High required MLSS concentration provides little room for process flexibility/increased treatment capacity.	Able to consistently meet effluent criteria. Additional aeration and clarifier capacity provide process flexibility in case of variation in influent loading.	Able to consistently meet effluent criteria. Reduced risk for washout of nitrifying bacteria during cold / wet weather months. Additional process flexibility in case of variation in loading.	Able to consistently meet effluent criteria. Reduced risk for washout of nitrifying bacteria during cold / wet weather months. Potential for improved effluent quality, especially in terms of TSS and TP, over other alternatives. Potential to 'over treat' effluent that will be sent to storage lagoon.

Table 6.4 Biosolids Storage Design Alternatives – Advantages and Disadvantages

	Biosolids Storage Alternative A Liquid Biosolids Storage	Biosolids Storage Alternative B Geotextile Dewatering and Cake Storage
Advantages	Simple process Operations Staff are familiar liquid biosolids handling equipment and storage	Lower capital costs Smaller footprint requirement Smaller haulage costs as a result of decreased volume of biosolids Dewatered cake may be landfilled when land application is not possible
Disadvantages	Higher capital costs Large tank sizing and footprint requirements Increased haulage costs due to increased volume of biosolids	More complex operation and control requirements More equipment is required Caution must be exercised in the control of leachate and stormwater run-off Large volume of centrate or filtrate must be treated in the liquid treatment train

6.8.3 Evaluation Results

For the purposes of evaluating the design options for the expanded Arthur WWTP, each of the four secondary treatment options was evaluated in combination with each of the two biosolids storage alternatives, resulting in a total of eight Design Options, namely:

- Option 1A - Construct New Secondary Clarifier with new Liquid Biosolids Storage.
- Option 1B - Construct New Secondary Clarifier with new Geotextile dewatering and Cake Storage.
- Option 2A - Twin Existing EA Plant with new Liquid Biosolids Storage.
- Option 2B - Twin Existing EA Plant with new Geotextile dewatering and Cake Storage.
- Option 3A - Retrofit Existing EA to IFAS with new Liquid Biosolids Storage.
- Option 3B - Retrofit Existing EA to IFAS with new Geotextile dewatering and Cake Storage.
- Option 4A - Retrofit Existing EA to MBR with new Liquid Biosolids Storage.
- Option 4B - Retrofit Existing EA to MBR with new Geotextile dewatering and Cake Storage.

Conceptual Level Costing

Conceptual level life cycle cost analyses were conducted for each secondary treatment option in combination with each of the two biosolids storage options. For the purposes of developing conceptual level cost estimates, it was assumed that all design options include:

- New preliminary treatment consisting of flow metering, mechanically cleaned bar screens with standby manual bar screen, vortex grit separators and headworks building complete with odour control and all appurtenances.
- Decommissioning of the existing headworks.
- Upgraded blower capacity and all appurtenances.

- Construction of new conveyance system to the effluent storage lagoon consisting of new forcemain, upgraded effluent pumps and all appurtenances.
- Additional standby power and increased electrical service.
- An allowance for modifications to the existing sludge storage tanks to aerobic digester volume, including modifications to diffusers, piping, blower and pump capacity.

Conceptual level life cycle cost analyses were conducted for the Arthur WWTP Upgrade Options based on an inflation rate of 3 percent and an interest rate of 5 percent and are presented in Table 6.5. Capital costs estimates were based on a conceptual level of design and are generally considered to be accurate to -25% to +40%. Actual costs will depend on site specific factors such as soil and groundwater conditions, the engineering design applied, construction conditions at the time of tendering, and the extent of additional upgrades to the works that may be included in the final design. The costs presented include all equipment and appurtenances, replacement, maintenance, chemical usage, energy consumption (prorated based on historic average cost per unit of wastewater treated, and experience at other similar facilities), a 30 % allowance for contingency and a 12% allowance for engineering and approvals. 240 day on-site biosolids storage period and land applications of biosolids were assumed for all alternatives in order to assess the effect of the relative biosolids disposal costs on annual O&M costs. Detailed capital and O&M cost estimates are included in Appendix E.

Preliminary Evaluation of Design Options

Table 6.6 presents the results of the evaluation of the Arthur WWTP design options.

Table 6.5 Conceptual Level Cost Estimate for Arthur WWTP Design Options

Parameter	Option 1A Secondary Clarifier w/ Liquid Storage	Option 1B Secondary Clarifier w/ Cake Storage	Option 2A Twin EA Plant w/ Liquid Storage	Option 2B Twin EA Plant w/ Cake Storage	Option 3A IFAS w/ Liquid Storage	Option 3B IFAS w/ Cake Storage	Option 4A MBR w/ Liquid Storage	Option 4B MBR w/ Cake Storage
Capital Costs:								
Liquid Treatment	**$11,200,000**	**$11,200,000**	**$12,500,000**	**$12,500,000**	**$12,400,000**	**$12,400,000**	**$18,900,000**	**$18,900,000**
Sludge Management	$5,100,000	$2,300,000	$5,100,000	$2,300,000	$5,100,000	$2,300,000	$4,300,000	$2,300,000
Total Capital Cost (1)	**$16,300,000**	**$13,500,000**	**$17,600,000**	**$14,800,000**	**$17,500,000**	**$14,700,000**	**$23,200,000**	**$21,200,000**
Annual O&M Costs:	**$422,000**	**$405,000**	**$422,000**	**$405,000**	**$427,000**	**$410,000**	**$551,000**	**$533,000**
25-Year Net Present Value O&M Cost(2)	$10,550,000	$10,125,000	$10,550,000	$10,125,000	$10,675,000	$10,250,000	$13,775,000	$13,325,000
25-Year Life Cycle Cost(2)	**$26,850,000**	**$23,625,000**	**$28,150,000**	**$24,925,000**	**$28,175,000**	**$24,950,000**	**$36,975,000**	**$34,525,000**

Notes:

1. All costs are conceptual level opinions of probable costs and are considered to be accurate to within -25 to +40 percent and are exclusive of HST.
2. Includes a 30% allowance for contingency and 12% allowance for approvals, permits and engineering.
3. Based on interest rate of 5%, and inflation rate of 3%.

Table 6.6 Summary of Evaluation of Options

Evaluation Criterion	Option 1A	Option 1B	Option 2A	Option 2B	Option 3A	Option 3B	Option 4A	Option 4B
Construction Phase								
Natural Environment								
Effect on surface water quality	3	3	3	3	3	3	3	3
Disruption of terrestrial features	2	3	2	3	2	3	2	4
Social/Cultural/Community Environments								
Disruption of adjacent residential, community and recreational features	3	3	3	3	3	3	3	3
Economic Environment								
Capital costs of construction	3	4	3	4	3	4	2	1
Technical Environment								
Constructability	3	3	4	4	3	3	4	4
Operation Phase								
Natural Environment								
Effect on surface waters	3	3	3	3	3	3	4	4
Social/Cultural/Community Environments								
Disruption of adjacent residential, community and recreational features	3	3	3	3	3	3	3	3
Economic Environment								
Annual Operating Costs	3	4	3	4	3	4	1	2
Technical Environment								
Performance and experience in similar climates and size	4	3	4	3	3	2	3	2
Operational complexity /familiarity of Operations staff with process	4	3	4	3	2	2	1	1
Operating requirements / Operation time usage	4	4	4	4	4	4	2	2
Compatibility with existing infrastructure	4	4	4	4	4	4	4	4
Ability to consistently meet effluent requirements	2	2	3	3	3	3	4	4
Total Score	**41**	**42**	**43**	**44**	**39**	**41**	**36**	**37**

6.8.4 Recommended Preferred Secondary Treatment Alternative

Based on Table 6.6, Option 2B - Twin Existing EA Plant with new Geotextile dewatering and Cake Storage was ranked the highest with a score of 44. Option 2A - Twin Existing EA Plant with Liquid Biosolids Storage was ranked second highest with a score of 43.

All of the liquid treatment train design concepts could be successfully implemented at the Arthur WWTP; however, liquid treatment train Alternative 2 - Twin Existing EA Plant provides more process flexibility and redundancy than Alternative 1 - Expand Secondary Clarifiers, and is based on a secondary treatment process with a long history of application in Ontario as compared to Alternative 3 - IFAS, and Alternative 4 - MBR. As a result, Alternative 2 - Twin Existing EA Plant was selected as the preferred liquid treatment train design alternative.

As noted above, two biosolids storage alternatives were considered for each liquid treatment train option, namely Alternative A - Liquid Biosolids Storage and Alternative B - Geotextile Dewatering and Cake Storage. Alternative B has lower capital, O&M and 25-year lifecycle costs than Alternative A due to the reduced biosolids storage and haulage requirements. However, Alternative A utilizes a biosolids storage option that has a long history of application in Ontario and is the current means of biosolids storage at the Arthur WWTP, while Alternative B is based on a relatively unproven biosolids dewatering system, with only one other full-scale installation in Ontario that is similar to that considered for the upgraded and expanded Arthur WWTP. Based on these considerations, the final evaluation and selection of a biosolids storage option will be completed as part of the preliminary design phase of this project.

Therefore, Option 2A/B - Twin Existing EA Plant with new Liquid Biosolids Storage or Geotextile Dewatering and Cake Storage is recommended for implementation for the expansion of the Arthur WWTP to a design ADF capacity of 2,300 m^3/d.

Subsequent to the selection of the preferred design concept (Option 2A/B), the potential to phase-in construction of the Arthur WWTP upgrades and expansion was investigated in detail. In addition to developing a phased-in construction plan, the sludge management options were re-evaluated and additional options considered. The results of these analyses are presented in Section 7.

7. PHASING-IN CONSTRUCTION OF PREFERRED DESIGN CONCEPT

As noted in Section 6.8.4, the preferred design concept to provide additional wastewater servicing for the community of Arthur to the year 2031 is to twin the existing extended aeration package plant to provide treatment up to 2,300 m^3/d. A preliminary evaluation of existing treatment capacity indicated that an interim capacity of 1,860 m^3/d could be achieved by upgrading only some of the unit processes. Therefore, the Township wishes to implement the preferred design concept in two phases, with the rated plant ADF being 1,860 m^3/d in Phase 1, and 2,300 m^3/d in Phase 2.

The following sub-sections present the liquid treatment train and sludge management upgrades and modifications required for both Phase 1 and Phase 2. Details regarding liquid treatment train upgrade requirements are presented in Appendix F, and sludge management requirements are presented in Appendix G.

7.1 Liquid Treatment Train Upgrades

The following is a summary of requirements for the implementation of a phased increase to the Arthur WWTP:

Preliminary Treatment

- Preliminary treatment consists of grit removal, comminution, and manual screens. At the Phase 1 ADF, there are no recommended changes to preliminary treatment processes. Peak flow through preliminary treatment would be restricted to 6,450 m^3/d through operation of a new equalization tank. The equalization tank would become the new aeration and clarification capacity for the Phase 2 upgrade.
- As part of the Phase 2 upgrades, a new headworks system would be constructed. Details can be found in the Evaluation of Alternative Treatment Design Concepts report (Appendix E).

Secondary Treatment

- Secondary treatment consists of aeration and clarification. At the Phase 1 ADF, peak flow through the secondary treatment would be restricted to 6,450 m^3/d through operation of an equalization tank.
- The existing package extended aeration plant has sufficient biological treatment capacity to achieve the required level of treatment of Phase 1 flows. Should there be periods of adverse secondary effluent quality, all secondary effluent will be directed to the storage lagoons.
- The preferred solution to achieve Phase 2 plant capacity is to twin the existing extended aeration package plant. Tankage for the twin plant will be constructed in Phase 1 and used as equalization volume. When required, the equalization tank will be converted to an extended aeration plant to achieve Phase 2 capacity.

Tertiary Filtration / Chemical Addition / UV Disinfection

- The capacity of existing tertiary filtration, UV disinfection, and chemical addition processes is sufficient to treat the Phase 2 ADF capacity of 2,300 m^3/d. There are no required modification to these processes to treat projected Phase 1 flow.

Effluent Storage and Conveyance

- The existing conveyance system consists of a 2.56 km forcemain and transfer pumps. Phase 1 peak flows would be restricted to approximately 6,450 m^3/d through operation of an equalization tank. There is insufficient capacity in the conveyance system to transfer projected equalized peak flows.
- Additional conveyance capacity can be provided by replacing the entire 860 m length of existing 200 mm diameter pipe with 350 mm diameter pipe. It is anticipated that the existing transfer pumps may have sufficient capacity required via minor modifications (i.e. new impellers). This should be confirmed during preliminary design. If required, the existing pumps may need to be replaced.
- For Phase 2 capacity, additional conveyance capacity would be added by upgrading the remaining 1,100 m of 250 mm diameter pipe to 350 mm diameter pipe, and through the installation of new conveyance pumps.
- The existing capacity of the Holding Ponds is approximately 340,000 m^3. Based on the projected storage requirement at the Phase 2 ADF capacity (approximately 246,000 m^3), there is no additional storage capacity required at either the Phase 1 or Phase 2 plant capacities.
- Minor changes to the projected peak flows and/or provision of equalization at the Frederick St. SPS may impact the required onsite equalization and effluent conveyance system upgrades. These should be confirmed during preliminary design.

A process flow diagram (PFD) of the proposed Phase 1 plant operation is presented in Figure 7.1, and a PFD of the proposed Phase 2 plant operations is presented in Figure 7.2. An overview of the site layout, complete with proposed Phase 1 and Phase 2 upgrades, is presented in Figure 7.3. The configurations and layouts as presented may be subject to minor changes upon refinement of the design basis, confirmation of equalization volume (if any) to be provided at the Frederick St SPS (see Section 8), and other minor changes during preliminary design.

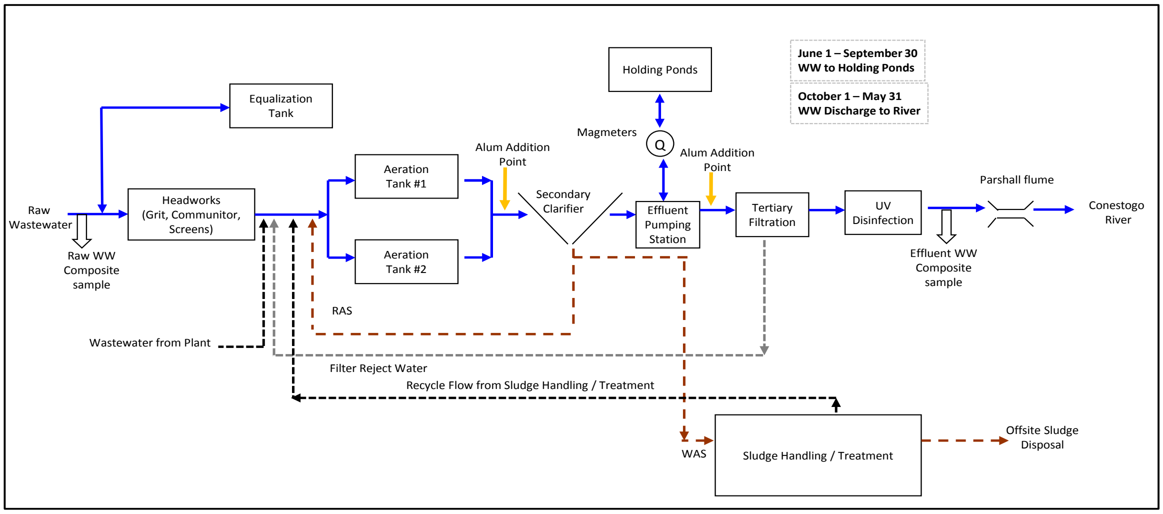


Figure 7.1 Arthur WWTP Phase 1 Process Flow Diagram

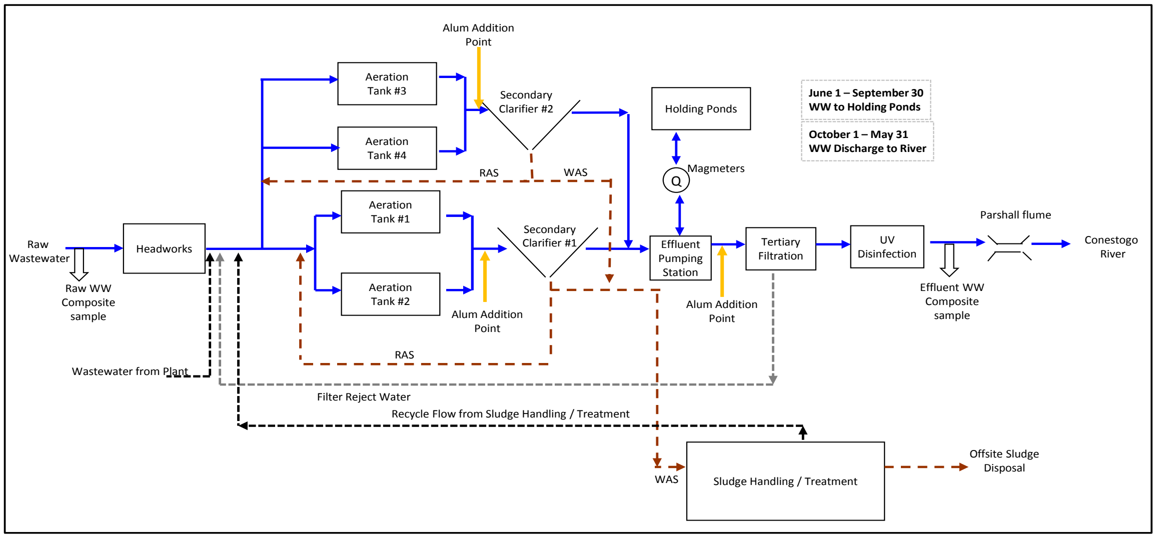


Figure 7.2 Arthur WWTP Phase 2 Process Flow Diagram

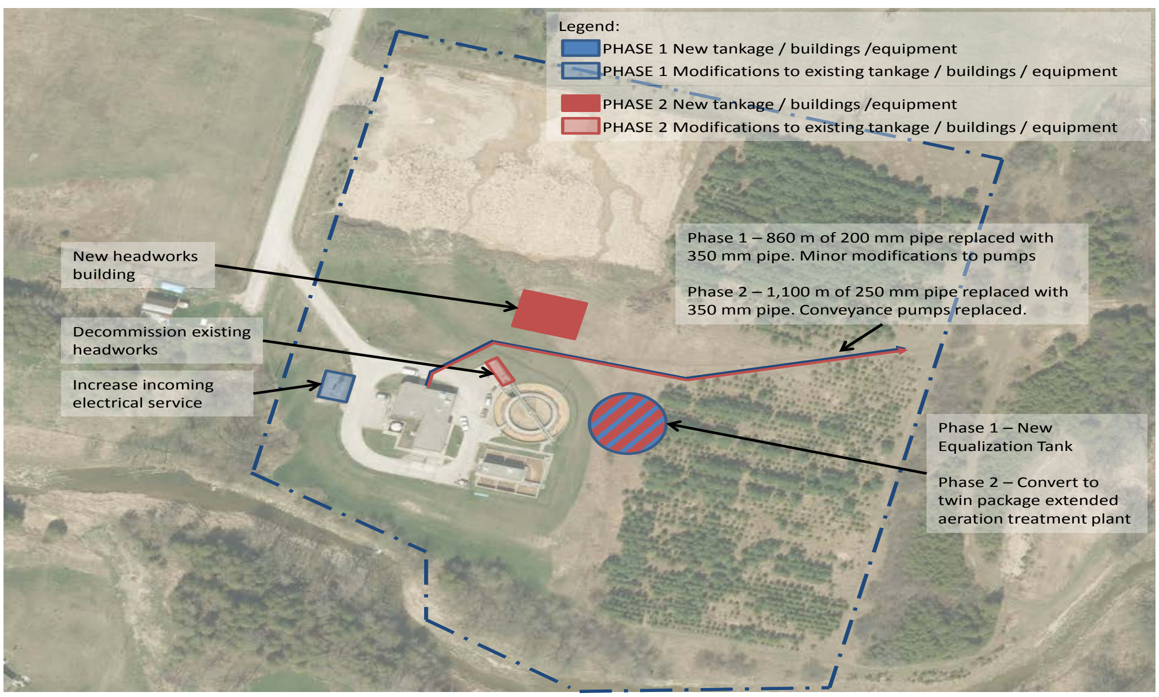


Figure 7.3 Arthur WWTP Phased ADF Increase Site Layout

7.2 Sludge Management Upgrades

There are several options for future management of biological sludge produced at the Arthur WWTP. Two options were previously considered as part of the Class EA:

- Option A: Onsite aerobic digestion, with onsite storage and seasonal land application of liquid biosolids.
- Option B: Onsite aerobic digestion, with onsite storage of biosolids using geotextile tubes. Dewatered cake is land applied seasonally.

With respect to both Option A and Option B, it is important to note that the existing aerobic digestion facilities require expansion to provide adequate stabilization of projected maximum month sludge flows for both Phase 1 and Phase 2 capacities.

The previous evaluation of alternative treatment design concepts (see Section 6) found that, while the estimated capital cost of Option B was lower than Option A, the technology used in Option B is relatively unproven on the scale required at Phase 2 flows. As such, the selection of a preferred alternative for sludge management for a design ADF of 2,300 m^3/d (Phase 2 flows) was deferred to the preliminary design phase (see Section 6.8.4).

In addition to the options above, the following options were considered as part of the evaluation of options for Phase 1:

- Option C: Onsite aerobic digestion, with liquid biosolids storage onsite in available storage tanks and excess biosolids shipped to Mount Forest WWTP for storage. Liquid biosolids are land applied seasonally.
- Option D: Liquid sludge is shipped to the Lystek regional processing facility located in Dundalk, Ontario. A sub-option would involve periodic dewatering and disposing of the cake at the Lystek facility.

With respect to Option C, it is assumed sludge must be fully stabilized before being stored onsite or at the Mount Forest WWTP. With respect to Option D, biological solids are not required to be stabilized before disposal at the Lystek facility.

An evaluation of the available biosolids storage volume at the Mount Forest WWTP that could be used for the storage of Arthur WWTP biosolids was conducted. Results of the analysis indicate that there is an estimated 1,367 m^3 of storage available at current conditions, and only 743 m^3 when the Mount Forest WWTP is operating at its rated capacity. As such, Mount Forest WWTP does not have sufficient storage capacity to accommodate all the biosolids from the Arthur WWTP and, as such, Option C will require the construction of liquid biosolids storage tanks at the Arthur WWTP. Although the construction can be phased-in, this option results in an overall capital cost that is comparable to that for Option A.

Table 7.1 provides an overview of the required upgrades to achieve the Phase 1 and Phase 2 capacities in the solids treatment train at the Arthur WWTP. Details regarding the development of these upgrade requirements are provided in Appendix G.

Table 7.1 Summary of Upgrades Required to Increase Arthur WWTP Solids Treatment Train Capacity

Phase	Upgrade	Option A	Option B	Option C	Option D
Phase 1	Digester Allowance	• Conversion of two existing sludge holding tanks to aerobic digesters. • Upgrades include increased blower capacity and increased sludge transfer pump size.	• Conversion of two existing sludge holding tanks to aerobic digesters. • Upgrades include increased blower capacity and increased sludge transfer pump size.	• Conversion of two existing sludge holding tanks to aerobic digesters. • Upgrades include increased blower capacity and increased sludge transfer pump size.	• No upgrades required.
	Biosolids Storage	• Construction of two new sludge holding tanks, each with a volume of 1,650 m^3 for a total volume of 3,300 m3/d.	• Construction of a Geotube dewatering facility.	• Construction of one new sludge holding tank with a volume of 1,650 m^3.	• No upgrades required.
Phase 2	Digester Allowance	• No additional upgrades required.	• No additional upgrades required.	• No additional upgrades required.	• No upgrades required.
	Biosolids Storage	• No additional upgrades required.	• No additional upgrades required.	• Construction of one new sludge holding tank with a volume of 1,650 m^3.	• No upgrades required.

At the Phase 1 plant capacity, the recommended preferred sludge management strategy is Option D - Liquid biosolids shipped to the Lystek regional processing facility located in Dundalk, Ontario. Under this option, all biosolids produced at the Arthur WWTP would be hauled to the Lystek regional processing facility located in Dundalk, Ontario. Although this option was found to have the greatest estimated yearly O&M costs, there are no required capital costs for its implementation. As such, it was found to be the most economically favourable solution over a short time period (i.e. 5 years). Further, implementation of Option D in the short term does not restrict possible sludge management strategies in the future.

At the Phase 2 plant capacity, Option A, B, and D all represent viable sludge management alternatives. As such, the final evaluation and selection of a biosolids management strategy should be completed at part of the preliminary design of the Phase 2 plant upgrade. Because the Mount Forest WWTP will have very little available storage volume available for Arthur WWTP biosolids, Option C provides no advantage over Option A at Phase 2 design flows. As a result, this option was not considered to be a feasible option.

7.3 Impact on Project Costs

Implementation of a phased plant expansion allows for the deferral of approximately $8 million dollars in capital costs associated with the liquid treatment train at the Arthur WWTP, and deferral of up to $5.1 million dollars in capital costs associated with the sludge digestion / storage upgrades.

A summary of conceptual level capital costs for each phase of construction is presented in Table 7.2.

Table 7.2 Summary of Conceptual Level Cost Estimates at the Arthur WWTP for Liquid Treatment Train Upgrades

Treatment Process	Phase 1	Phase 2
General/Miscellaneous	$340,000	$569,000
Headworks	$0	$3,020,000
Storage Lagoon Conveyance Upgrades	$695,000	$1,275,000
Blowers, Standby Power, and Other Common Upgrades	$681,000	$0 (2)
Equalization Tank	$1,674,000	$0
Secondary Treatment	$0	$809,000
Sub Total	$3,390,000	$5,673,000
Contingency (30%)	$1,017,000	$1,702,900
Engineering (12%)	$407,000	$681,000
Liquid Treatment Train Total(1)	**$4,814,000**	**$8,056,000**

Notes:
1. All costs are conceptual level opinions of probable costs and are considered to be accurate to within -25 to +40 percent and are exclusive of HST.
2. Assumed increase in blower capacity provided in Phase 1 is adequate for Phase 2 demand.

The estimated increase to operation and maintenance costs associated with operation of the liquid treatment train at the Phase 1 and Phase 2 design capacities are $48,000/year and $89,000/year, respectively. O&M cost increases are primarily due to increased flow and decreased effluent TP requirements.

Although sludge management Option D - Liquid Sludge Haulage to Lystek Facility has the highest O&M costs of the options considered, it has the lowest 5-year net present value due to the fact that no capital expenditures are required. Details related to the financial assessment of interim sludge management costs are provided in Appendix G.

As part of the Phase 2 upgrades, the capital cost associated with solids (sludge) treatment upgrades may vary from zero dollars for Option D to $5.1 million for Option A.

8. UPGRADES TO THE WELLS ST SPS AND FREDERICK ST SPS

The Arthur wastewater collection system consists of a gravity sewer network with two SPSs:

- The Wells St. SPS.
- The Frederick St. SPS.

Each pumping station has a forcemain which discharges near the treatment plant. Over the review period (2007 – 2015), bypasses of the Frederick St. SPS have occurred during peak flow periods. As such, the Township wishes to evaluate the existing capacity of both pumping stations and determine if any upgrades and/or expansions are required to the study's design year of 2031.

Figure 8.1 presents the locations and catchment areas of both the Wells St SPS and Frederick St SPS.

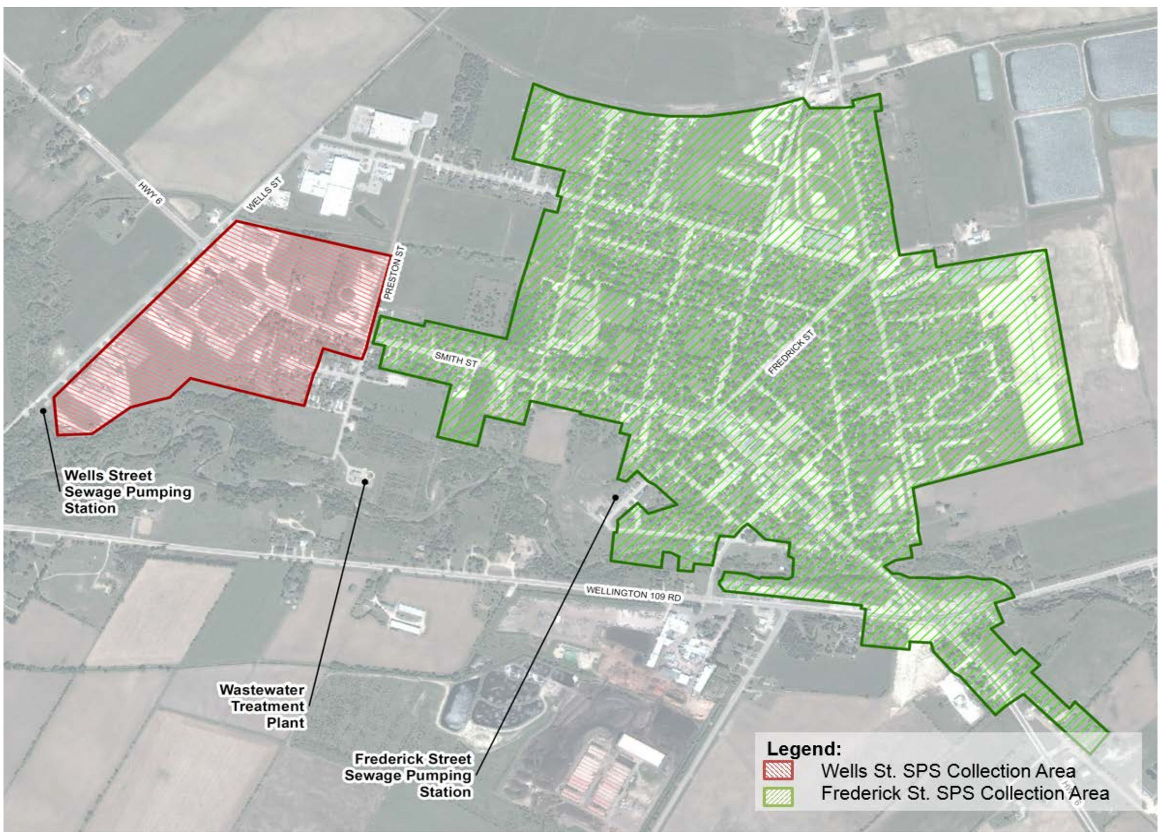


Figure 8.1 Location and Catchment Areas of the Wells St SPS and Frederick St SPS

The following sub-sections summarize the results of the assessment. Details are provided in Appendix H.

8.1 Wells St. SPS

The Wells St. SPS is located on Wells St., approximately 675 m south of Highway 6. The pumping station is equipped with the following:

- Two submersible pumps (one duty, one standby), each with a rated capacity of 16 L/s (1,382 m^3/d).
- One wet well with a liquid volume of approximately 120 m^3.
- One standby diesel generator.

Wastewater from the Wells St. SPS is pumped through a 150 mm diameter forcemain that is 1 km in length. It is discharged into the Preston St. trunk sewer at the intersection of Preston St. and Highway 6. The CofA for the Wells St. SPS can be found in Appendix A.

The Wells St. SPS service area includes Wells St. E. and Smith St. between Wells and Preston St. It receives predominately industrial flows from industry located in the west part of Arthur.

There have been no recorded bypasses at the Wells St. SPS over the review period (2007 - 2014). Further, there is limited expected growth in the Wells St. SPS catchment area, and the capacity of the existing pump is sufficient to handle future projected peak flows. As such, there are no required upgrades to the Wells St. SPS.

8.2 Frederick St. SPS

The Frederick St. SPS is located near the intersection of Frederick and Francis streets. The pumping station is equipped with the following:

- Two submersible pumps (one duty, one standby), each with a rated capacity of 58.4 L/s (approximately 5,045 m^3/d).
- One reinforced wet well, measuring approximately 5.3 m x 5.3 m x 6.2 m (deep), providing a total storage volume of approximately 174 m^3.
- One 60 kW standby diesel generator with 450 L fuel tank.

The Frederick St. SPS receives the majority of wastewater flow from the village of Arthur, including the central, southern, and eastern portions of the system. Flows are predominately a mix of residential and commercial wastewater. From the Frederick St. SPS, raw wastewater is pumped directly to the treatment plant via a 250 mm diameter forcemain. The CofA for the Frederick St. SPS can be found in Appendix A.

There have been several bypasses recorded at the Frederick St. SPS over the review period (2007 - 2014). An estimation of future flows to the Frederick St. SPS was generated based on existing measured flows from established developments and projected growth flow from future developments. Based on this evaluation, the minimum required future capacity of the Frederick St. SPS is approximately 110 L/s. Details can be found in Appendix H.

An overview of the required expansion to the Frederick St. SPS is presented in Figure 8.2. The need for equalization at the Frederick St. SPS will be evaluated during preliminary design of the Phase 1 and Phase 2 plant expansion. Figure 8.2 shows there is space available onsite if equalization at the Frederick St. SPS is required in the future.

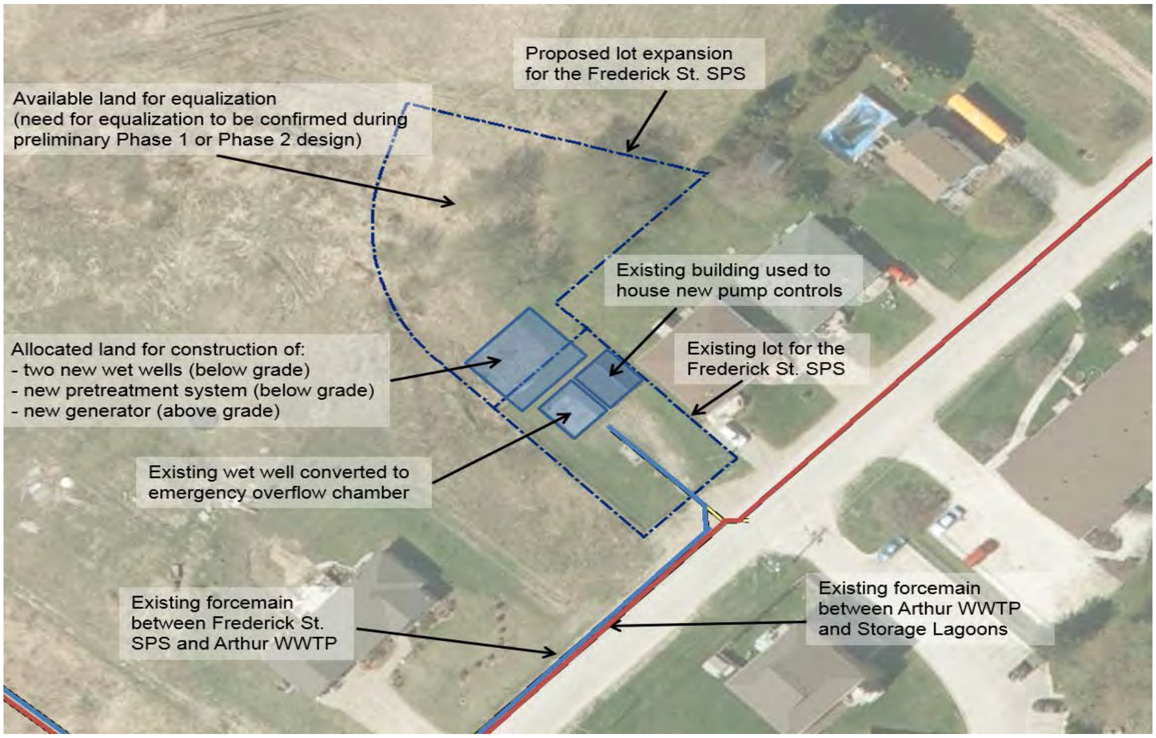


Figure 8.2 Preferred Alternative Design Concept Layout for the Frederick St. SPS

Table 8.1 presents the estimated capital costs associated with the expansion of the Frederick St. SPS. The estimated cost does not include an allowance for a new equalization tank at the Frederick St. SPS. The impacts of providing equalization on the required upgrades to the Arthur WWTP is discussed in Section 8.3.

Table 8.1 Summary of Conceptual Level Cost Estimates for Expansion of the Frederick St. SPS

Item	Estimated Cost
General/Miscellaneous	$140,000
Site Works	$610,000
Sewage Pumping Station	$1,196,000
Allowance for Land Purchase	$75,000
Subtotal	$2,021,000
Contingency (30%)	$606,300
Engineering (12%)	$242,520
Estimated Total Capital Costs(1)(2)	**$2,900,000**

Notes:
1. All costs are conceptual level opinions of probably costs and are considered to be accurate to within -25 to +40 percent exclusive of HST.
2. Estimated total capital costs are rounded up to the nearest hundred thousand.

8.3 Impact of Providing Equalization at Frederick St. SPS on Design of WWTP Upgrades

Under the proposed phased expansion of the Arthur WWTP, equalization would be provided at the WWTP to attenuate peak flows at the Phase 1 rated capacity (1,860 m^3/d). At the Phase 2 capacity (2,300 m^3/d), the equalization tank would be converted to an extended aeration plant to increase the biological treatment capacity of the liquid treatment train. Additional details regarding phased expansion of the Arthur WWTP are available in Section 7 and Appendix F.

It is possible, however, that equalization could be provided at the Frederick St. SPS rather than at the Arthur WWTP. Due to the ability of equalization volume at the Frederick St. SPS to attenuate peak flows to the Arthur WWTP, this could impact the required upgrades at the Arthur WWTP.

Conceptual level cost estimations for upgrades at both the Arthur WWTP and Frederick St. SPS have been developed assuming that, during Phase 1 of the WWTP expansion, an equalization tank will be constructed at the Arthur WWTP and that the conveyance system between the treatment plant and Holding Ponds will be upgraded as required. No allowance was provided to construct additional equalization at the Frederick St. SPS. Based on the design peak flows developed as part of this study, the provision of equalization volume at the Frederick St. SPS in place of conveyance system upgrades will not reduce estimated capital costs. In spite of this, this evaluation should be updated during preliminary design of the Phase 1 upgrades, once design flows have been refined, to determine if providing equalization at the Frederick St. SPS can offset capital costs associated with upgrades to the secondary effluent pumping system.

At Phase 2 capacity flows, it is possible that the addition of equalization volume at the Frederick St. SPS may reduce capital upgrades required at the treatment plant. This should be further evaluated during preliminary design of the Phase 2 plant expansion using an updated and finalized flow design basis.

Equalization at the Frederick St. SPS may be provided through construction of an above grade bolted steel tank or a below grade tank. Assuming the acquisition of additional land as identified by the Township, this is expected to be the most cost-effective solution.

9. PUBLIC CONSULTATION PROCESS

Public and agency consultation is an important component of the Class EA process. A vital component of the public consultation 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 Class EA process.

9.1 Notifications

Members of the public and those on the project mailing list were provided with project notifications at key points in the Class EA process. These notifications were also published in local newspapers. Direct mail outs of project notifications were also sent to those on the project mailing list. In addition, all property owners within 500 m of the property boundary of both the WWTP and the lagoons were sent all project notifications.

The Notice PIC # 3 and the Notice of Completion were sent via Canada Post delivery to all residents/business/property owners in the Town of Arthur. In addition, letters were sent to all property owners with a primary address outside the Town of Arthur.

The following provides details on: the Notice of Commencement; the Notice of PICs; and the Notice of Completion.

9.1.1 Notice of Commencement

The Notice of Commencement for the Class EA was placed in the following publications:

Publication	Date Notice of Commencement Published
Arthur Enterprise News	November 14 and 21, 2012
Wellington Advertiser	November 16 and 30, 2012

Background information on the Arthur WWTP was provided, along with information on the goal of the study, the Class EA process and opportunities for public input. Questions or comments on the study were invited and contact information for the Township of Wellington North and the consulting team project managers was noted.

The Notice of Commencement newspaper advertisement is provided in Appendix I. This notice was also posted on the Township's web site.

In addition, a letter and attached Notice of Commencement were mailed to those on the project mailing list and to property owners within 500 m of the property boundary of the WWTP and lagoons on November 16, 2012. Examples of these letters are provided in Appendix I.

9.1.2 Notice of Public Information Centres

Three Public Information Centres (PICs) were held to provide an opportunity for members of the public to obtain information on the Class EA 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 (see Section 9.2).

The first PIC was held on Tuesday, March 19, 2013. The newspaper notice for the PIC is included in Appendix I. This notice was also posted on the Township's web site.

The Notice of PIC was placed in the following publications:

Publication	Dates PIC Notice Published
Arthur Enterprise News	March 6 and 13, 2013
Wellington Advertiser	March 8 and 15, 2013

In addition, a letter of notification for the PIC was mailed to those on the project mailing list and to property owners within 500 m of the property boundary of the WWTP and lagoons on March 6, 2013. Examples of these letters are provided in Appendix I.

The second PIC was held on Tuesday, June 10, 2014. The newspaper notice for the PIC is included in Appendix I. This notice was also posted on the Township's web site.

The Notice of PIC was placed in the following publications:

Publication	Dates PIC Notice Published
Arthur Enterprise News	May 28 and June 4, 2014
Wellington Advertiser	May 30, 2014

In addition, a letter of notification for the PIC was mailed to those on the project mailing list and to property owners within 500 m of the property boundary of the WWTP and lagoons on May 28, 2014. Examples of these letters are provided in Appendix I.

The third PIC was held on Wednesday, March 30, 2016. The newspaper notice for the PIC is included in Appendix I. This notice was also posted on the Township's web site.

The Notice of PIC was placed in the following publications:

Publication	Dates PIC Notice Published
Arthur Enterprise News	March 16 and 23, 2016
Wellington Advertiser	March 18 and 25, 2016

A letter of notification for the PIC was mailed to those on the project mailing list on March 16, 2016. In addition, the Notice PIC # 3 was sent via Canada Post delivery to all residents/business/property owners in the Town of Arthur on March 16, 2016. Letters were also sent to all property owners with a primary address outside the Town of Arthur on March 16, 2016. Examples of these letters are provided in Appendix I.

9.1.3 Notice of Completion

The Notice of Completion was placed in the following publications:

Publication	Dates Notice of Completion Published
Arthur Enterprise News	August 17 and 24, 2016
Wellington Advertiser	August 19 and 26, 2016

The Notice of Completion advised members of the public of the opportunity to review and provide comments on the ESR. A period of 30 calendar days was provided for the public review of the ESR. Contact information for the Township and consulting team project managers was noted. Copies of the ESR were available for review and comment at the Township of Wellington North Clerk's Office. The Notice of Completion newspaper advertisement is provided in Appendix I. This notice was also posted on the Township's web site.

The Notice of Completion was mailed to those on the project mailing list on August 17, 2016. In addition, the Notice of Completion was sent via Canada Post delivery to all residents/business/property owners in the Town of Arthur on August 17, 2016. Letters were also sent to all property owners with a primary address outside the Town of Arthur on August 17, 2016. Examples of these letters are provided in Appendix I.

9.2 Public Information Centres

As noted in Section 9.1.2, three PICs were held to provide an opportunity for members of the public to obtain information on the Class EA 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 project.

9.2.1 Public Information Centre # 1

The first PIC was held from 5:00 p.m. to 7:00 p.m. on Tuesday, March 19, 2013 at the Arthur Community Centre in Arthur, 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 Township and consultant representatives, were available to provide and discuss information on the Class EA, and to receive public comments and input.

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

- Purpose of the Study.
- Why We are Here.
- Class EA Study Process.
- General Plant Overview.
- Existing Site Layout.
- ADF Projections to WWTP.
- Opportunity Statement.
- Wastewater Treatment Alternatives.
- Evaluation of Alternatives.
- Comparison of Feasible Alternative Solutions.
- Preferred Alternative.
- What Will Happen Next (including Contact Information for Township and Consulting Team Project Managers).

The PIC materials were also posted on the Township of Wellington North web site.

Table 9.1 summarizes the comments received. A total of 10 people provided their name and contact information on the Attendance Sheet for the PIC. Two completed Comment Sheets were submitted.

Table 9.1 Summary of PIC # 1 Comments and Responses

Comment Received	Response to Comment
Please provide your comments on the alternatives for providing additional capacity at the Arthur WWTP.	
• reasonable set of comments	• comment noted
• thought population projections for Arthur in the 2030s low • ability to expand is a must	• comment noted • population projections are based on information provided by the County of Wellington and the Township of Wellington North
Please provide your comments on the evaluation of alternatives for providing additional capacity at the Arthur WWTP.	
• logical	• comment noted
Please provide your comments on the recommended preferred alternative for providing additional capacity at the Arthur WWTP.	
• expanding existing treatment plant seems like only feasible alternative	• comment noted
Please provide any additional comments.	
• Address reducing flow to plant? • Infiltration? • Low flow toilet/shower heads program? • Storm water exaggerating volumes? • Who addresses other inputs to the river from agriculture?	• comments noted

Copies of the Comment Sheet, display boards and Handout are provided in Appendix I. Appendix I also contains the PIC Attendance Sheet and submitted Comment Sheets.

9.2.2 Public Information Centre # 2

The second PIC was held from 6:00 p.m. to 8:00 p.m. on Tuesday, June 10, 2014 at the Arthur Community Centre in Arthur, 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 Township and consultant representatives, were available to provide and discuss information on the Class EA, and to receive public comments and input.

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

- Purpose of the Study.
- Why Are We Here.
- Class EA Process.
- General Plant Overview.
- Preferred Solution.

- Alternative Design Concepts for the Preferred Solution (4 alternatives).
- Alternative 1 – Additional Clarifier Capacity.
- Alternative 2 – Twin Existing Package Treatment Plant.
- Alternative 3 – Integrated Fixed-Film Activated Sludge with Additional Clarifier Capacity.
- Alternative 4 – Membrane Bioreactor.
- Biosolids Storage Options.
- Evaluation of Alternatives – Construction Phase Evaluation Criteria.
- Evaluation of Alternatives – Operation Phase Evaluation Criteria.
- Evaluation of Alternatives – Conceptual Level Cost Estimates.
- Evaluation of Alternatives – Conceptual Level Cost Estimates.
- Evaluation of Alternatives – Overall Evaluation.
- Recommended Preferred Alternative.
- What Will Happen Next (including Contact Information for Township and Consulting Team Project Managers).

The PIC materials were also posted on the Township of Wellington North web site.

Table 9.2 summarizes the comments received. A total of 28 people provided their name and contact information on the Attendance Sheet for the PIC. One completed Comment Sheet was submitted. There was also e-mail correspondence from the individual who completed the Comment Sheet.

Table 9.2 Summary of PIC # 2 Comments and Responses

Comment Received	Response to Comment
Please provide your comments on the alternatives for providing additional capacity at the Arthur WWTP.	
• no concern	• comment noted
Please provide your comments on the evaluation of the alternatives for providing additional capacity at the Arthur WWTP.	
• increased capacity of the treatment plant will impact the lagoons • there is currently an environmental impact of the lagoons because of their sub-standard design • how will the municipality address the leakage of the current lagoons, now and in the future?	• it is recommended that the conditions of the lagoons be assessed as part of the preliminary design and detailed design of the plant expansion which will follow the completion of the Class EA • it was recommended that the individual providing the comments keep in touch with the Township with respect to the assessment of the lagoons
Please provide your comments on the recommended preferred alternative for providing additional capacity at the Arthur WWTP.	
• the expansion of the sewage plant should not proceed before the issues with the lagoon design and leakage have been addressed • with the expansion of the plant, the utilization of the lagoons will increase and the moisture problems on our side of the fence will be worse than it is now	• see above response regarding assessment of the condition of the lagoons

Table 9.2 Summary of PIC # 2 Comments and Responses

Comment Received	Response to Comment
Please provide any additional comments.	
• recommended plan should address all environmental impacts • the recommendation to increase the capacity of the sewage plant should include changes to the existing sewage lagoons to avoid further environmental impact • this plan does not address the sub-standard design of the existing lagoons • no setbacks from adjacent property lines • no means of leak detection • no collection system for leakage • leakage drains directly to the Conestoga River • leakage has made a section of our back field too wet to farm • we are owners of the farm land adjacent to the existing lagoons • in the past we have brought this issue to the attention of the municipality but no changes have been made • this is the time to correct the problems, before the capacity of the treatment plant increases and causes further environmental problems	• see above response regarding assessment of the condition of the lagoons

Copies of the Comment Sheet, display boards and Handout are provided in Appendix I. Appendix I also contains the PIC Attendance Sheet, submitted Comment Sheet and e-mail correspondence.

9.2.3 Public Information Centre # 3

The third PIC was held from 6:00 p.m. to 8:00 p.m. on Wednesday, March 30, 2016 at the Arthur Community Centre in Arthur, 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 Township and consultant representatives, were available to provide and discuss information on the Class EA, and to receive public comments and input.

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

- Purpose of the Study.
- What Has Changed Since PIC # 2 (June 2014).
- Why Are We Here.
- Class EA Study Process.
- General Plant Overview.
- Image Showing Location of Arthur WWTP and Pumping Stations.
- Preferred Solution.

- Preferred Design Alternative.
- Image of Preferred Design Alternative.
- Impact of Recent Flow Data.
- Phased Expansion: Summary of Liquid Treatment Train Upgrades.
- Phased Expansion: Review of Biosolids Management Options.
- Phased Expansion: Conceptual Costs of Biosolids Management Options – Phase 1.
- Phased Expansion – Preferred Biosolids Management Option.
- Phased Expansion – Summary of Conceptual Level Capital Cost Estimates.
- Phased Implementation of Preferred Alternative.
- Location of Existing Sewage Pumping Stations.
- Wells St. Sewage Pumping Station.
- Frederick St. Sewage Pumping Station.
- Frederick St. Sewage Pumping Station Expansion.
- What Will Happen Next (including Contact Information for Township and Consulting Team Project Managers).

The PIC materials were also posted on the Township of Wellington North web site.

Table 9.3 summarizes the comments received. A total of 22 people provided their name and contact information on the Attendance Sheet for the PIC (including the Mayor, three Councillors, two staff, a GRCA representative and two couples). Three completed Comment Sheets were submitted.

Table 9.3 Summary of PIC # 3 Comments and Responses

Comment Received	Response to Comment
Please provide your comments on the proposed phasing of the WWTP expansion, as presented on the display boards.	
• I believe either will be good; time to get started	• comment noted
• Makes sense	• comment noted
• I was pleasantly surprised to see that this project is designed to give Arthur an additional 20 years approximately of capacity	• comment noted
Please provide your comments on the four options for the management of biosolids at the Arthur WWTP.	
• Option D is best	• comment noted – this is the recommended preferred option
• I agree that Option D makes the most sense	• comment noted – this is the recommended preferred option
Please provide your comments on the recommended preferred alternative for the management of biosolids at the Arthur WWTP during Phase 1 of the expansion of the plant.	
• Back up options in place	• comment noted
• I agree that Option D makes the most sense	• comment noted – this is the recommended preferred option
Please provide any additional comments.	
• Planning only to 2031 seems short	• comment noted
• I realize that the project has a lot of hurdles to clear before it can proceed but at least the process is underway; the sooner it is complete the better	• comment noted

Copies of the Comment Sheet, display boards and Handout are provided in Appendix I. Appendix I also contains the PIC Attendance Sheet, submitted Comment Sheet and e-mail correspondence.

9.3 Project Mailing List and Web-site Postings

A project mailing list was also maintained throughout the Class EA process. The mailing list was developed at the Notice of Commencement stage and names were added to the project mailing list in response to requests. A copy of the project mailing list is provided in Appendix I.

In addition, key project information such as notifications, PIC materials (i.e., display boards, comment sheet, handout) and the ESR were posted on the Township's web site.

9.4 Agency and Stakeholder Consultation

Federal, provincial and municipal agencies were consulted during the course of the Class EA process. The following agencies were included in the agency consultation for the project:

Federal

- Aboriginal Affairs and Northern Development Canada (AANDC).

Provincial

- Ministry of Aboriginal Affairs.
- Ministry of the Environment.
- Ministry of Natural Resources.
- Ministry of Agriculture, Food and Rural Affairs.
- Ministry of Tourism, Culture and Sport.
- Ministry of Municipal Affairs and Housing.
- Ministry of Transportation.
- Grand River Conservation Authority.
- Infrastructure Ontario.

Municipal

- Township of Wellington North (Mayor, Councillors, Roads Superintendent, CAO/Clerk, Business Economic Manager, Director of Recreation, Parks and Facilities, Chief Building Official, Senior Planner).
- Arthur and District Chamber of Commerce.

The following utilities were also included on the project mailing list and received project notifications: Hydro One Networks Inc.; Wellington North Power Inc.; Rogers Cable; Bell Canada; Canadian Pacific Railway; CN Great Lakes; Union Gas; Enbridge Gas Distribution Inc.; and Ontario Power Generation Inc.

Additions to the mailing list were made upon request.

The project mailing list contains a complete list of agencies and stakeholders contacted during the Class EA process, and is provided in Appendix I. Table 9.4 provides a summary of comments received from agencies and stakeholders, along with the response to these comments. Appendix I contains copies of correspondence received from agencies and stakeholders.

9.5 Aboriginal Consultation

9.5.1 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 with these agencies is documented in Table 9.4 and included in Appendix I.

The Notice of Commencement, Notice of PIC # 1 and 2 were sent to AANDC and the Ontario Ministry of Aboriginal Affairs (MAA) on November 16, 2012, March 6, 2013 and May 28, 2014. The Notice of PIC # 3 and the Notice of Completion were sent to MAA on March 6, 2016 and August 17, 2016.

Table 9.4 Summary of Agency and Stakeholder Comments

Date	Contact	Comment	Response to Comment
Federal			
November 26, 2012	Allison Berman Regional Expert for Ontario Consultation and Accommodation Unit Aboriginal Affairs and Northern Development Canada	• responding to request for information concerning consultation with Aboriginal and First Nation communities in the vicinity of the project. • provided the information regarding potentially affected Aboriginal communities: Aboriginal Community Information (contact information); Treaties, Claims and Negotiations; and Litigation • provided information for First Nation communities within a 100 km radius of the project	• comments noted • information on Mississaugas of the New Credit and Six Nations of the Grand River was provided by the Consultation and Accommodation Unit – these First Nations have been contacted by the Township • no response required
Provincial			
April 13, 2016	Joseph Muller Heritage Planner Ministry of Tourism, Culture and Sport	• see June 20, 2014 below	• Cultural Heritage Impact Assessment (CHIA) undertaken (LRA Heritage, 2014) and report provided to MTCS • Joseph Muller provided a response on September 16, 2014 indicating that the Cultural Heritage Evaluation was fine • Township response to Joseph Muller provided on April 28, 2016 (see Appendix I) • Township of Wellington North response noted that the Cultural Heritage Evaluation will be updated to include the Frederick Street sewage pumping station site and that the updated report will be provided to the Ministry • Township provided the addendum to the CHIA report to MTCS on August 5, 2016
March 31, 2016	Joseph Muller Heritage Planner Ministry of Tourism, Culture and Sport	• was unable to attend Public Information Centre No. 3 and requested the PIC materials	• a link to the PIC materials was provided on March 31, 2016
June 20, 2014	Joseph Muller Heritage Planner Ministry of Tourism, Culture and Sport	• thank you for PIC materials • under the EA process, the proponent is required to determine a project's potential impact on cultural heritage resources • advise MTCS whether an archaeological assessment and/or a heritage impact assessment will be completed for your project, and provide them to MTCS before issuing a Notice of Completion • your project may impact archaeological resources and you may screen the project with the MTCS Criteria for Evaluating Archaeological Potential to determine if an archaeological assessment is needed • MTCS checklist Screening for Impacts to Built Heritage and Cultural Heritage Landscapes helps determine whether your project may impact cultural heritage resources • if your project will impact heritage resources, MTCS recommends that a Heritage Impact Assessment be prepared by a qualified consultant • reference to MTCS guidance that outlines scope of Heritage Impact Assessments • Heritage Impact Assessment and Archaeological Assessment reports and their recommendations are to be addressed and incorporated into EA projects	• Cultural Heritage Impact Assessment undertaken (LRA Heritage, 2014) and report provided to MTCS • the Cultural Heritage Impact Assessment concluded the following: o the Arthur WWTP is not listed or designated under the *Ontario Heritage Act* nor has it been identified by the Township of Wellington North as a property of interests o Nith River is o it has been determined that the property does not have sufficient cultural heritage value to warrant designation o the property does not qualify as a significant cultural heritage landscape, apart from its relationship to the Conestogo River (which is designated as a Canadian Heritage River) o there are no heritage resources identified in the Grand River heritage river inventory within the Arthur WWTP site o a review of proposed design alternatives indicates that no negative impacts to the recreational use of the site (trails) are anticipated o recommend that the recreational trail use of the site be considered in the design process and that this long-term use be maintained
April 11, 2013	Heather Levecque Manager, Consultation Unit Aboriginal Relations and Ministry Partnerships Division Ministry of Aboriginal Affairs	• as a member of the government review team, MAA identifies First Nations and Métis communities who may have an interest in the area of your project • you should be aware that many First Nations and/or Métis communities either have or assert rights to hunt and fish in their traditional territories • 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	• no response required • First Nations noted in letter have been contacted by the Township

Table 9.4 Summary of Agency and Stakeholder Comments

Date	Contact	Comment	Response to Comment
		• the project appears to be located in an area where First Nations may have existing or asserted rights or claims in Ontario's land claims process or litigation • contacts provided for Six Nations of the Grand River Territory, Haudenosaunee Confederacy and Mississaugas of the New Credit First Nation	
April 10, 2013	Joseph Muller Heritage Planner Ministry of Tourism, Culture and Sport	• thank you for PIC materials • see comments from previous letter • the consideration of cultural heritage resources is included within the evaluation of alternatives by review of the archaeology/built heritage/cultural heritage landscapes screening documents • if identified/potential resources are flagged, please incorporate their evaluation within the final EA report • if not, please include the completed screening document in the final report • this documentation confirms that due diligence was followed in the EA process	• comments noted • no response required • completed screening document to be included in final EA report
April 2, 2013	Fred Natolochny Supervisor Resource Planning Grand River Conservation Authority	• in follow up to PIC # 1 which was attended by Mark Anderson from our office • GRCA staff would request future notification and information through the EA process • there are no concerns with the preferred alternatives 3 through 8 provided on the handout • should alternatives 5, 6, 7 or 8 be selected as the preferred plan, a permit may be required from our office should any works or development occur within an area regulated by the GRCA • direct any questions or comments to Nathan Garland	• comments noted • no response required • Fred Natolochny added to project mailing list
February 12, 2013	Barbara Slattery EA/Planning Coordinator Ministry of the Environment	• has been directed to update briefing materials, including the Arthur WWTP Class EA • previous MOE briefing note suggested that the town examine I/I improvements • asking whether XCG Consultants Ltd. can advise on whether an I/I study was completed, whether any capital improvements were made as a result, and/or whether this may be part of the current Schedule C Class EA	• XCG Consultants Ltd. provided an e-mail response on February 12, 2013 • response noted that the Plant Manager has been asked if he can provide any information on what actions have been taken by the Township • also noted the Master Plan Study of Arthur Water Supply and Sanitary Sewage Systems completed by Triton Engineering; can provide MOE with a copy if they do not have one in their files
February 7, 2013	Jane Glassco Guelph District Manager Ministry of the Environment	• contacted Barry Trood at the Township of Wellington North to inquire as to the status of the Assimilative Capacity Study (ACS) being undertaken as part of the Class EA • in responding to the XCG response, Jane noted that the contacts at the Guelph District office are Cam Hall and Amy Shaw	• XCG Consultants Ltd. provided an e-mail response on February 7, 2013, advising of the status of the ACS • response noted that the intent is to meet with representatives from MOE West Central Region once the ACS is completed and submitted to discuss the findings and the proposed effluent limits that would apply to an expanded Arthur WWTP • Cam Hall and Amy Shaw were added to the project contact list
January 4, 2013	Joseph Muller Heritage Planner Ministry of Tourism, Culture and Sport (MTCS)	• it is the mandate of MTCS to conserve, protect and preserve the heritage of Ontario • under the EA process, a determination of the undertaking's impact on these cultural heritage resources must be carried out and forwarded to MTCS • response included two checklists – Criteria for Determining Archaeological Potential and Screening for Impacts to Built Heritage and Cultural Heritage Landscapes • determinations that no heritage resources are impacted and no technical studies are warranted should be documented and summarized as part of the EA process, and incorporated into the final EA report • please continue to circulate MTCS through the review process for this EA project	• comments noted • checklists will be completed and provided to MTCS once a preferred alternative has been identified

Table 9.4 Summary of Agency and Stakeholder Comments

Date	Contact	Comment	Response to Comment
December 25, 2012	Lisa Myslicki Environmental Advisor Environmental Management Infrastructure Ontario (IO)	• 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 • IO is obligated to complete due diligence for any realty activity on IO managed lands and this should be incorporated into all project timelines • 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 and Ministry of the Environment standards • 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 takings are suggested as part of any alternative these should be appropriately mapped and quantified within EA report documentation • 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 • IO is required to follow the MOI Class Environmental Assessment Process for Realty Activities Not Related to Electricity Projects (MOI Class EA) • 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 • 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 • 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	• Township of Wellington North provided a response to IO on January 3, 2013 • the Township response indicated that there are no provincial government lands either on-site or within 500 m of the Arthur WWTP and associated lagoons • as per IO's request, IO was removed from the project mailing list
December 4, 2012	Thomas Lewis Scientist West Central Region Ministry of the Environment	• Schedule C projects require preparation of an Environmental Study Report (ESR) once the preferred design has been determined and design work has progressed to the point where details of any environmental protection measures to be incorporated in the construction package have been finalized • the final ESR is expected to contain a complete record of all activities associated with the planning of the project and shall include: o correspondence o copies of notices, letters, bulletins relating to public consultation o memoranda to file explaining the proponent's rationale in developing stages of the project o copies of reports prepared by consultants and others	• no response required

Table 9.4 Summary of Agency and Stakeholder Comments

Date	Contact	Comment	Response to Comment
		• you are advised to provide notification directly to the Aboriginal communities who may be affected by the project and provide them with an opportunity to participate in any planned public consultation sessions and comment on the project	
November 21, 2012	Sandra Cooke Senior Water Quality Supervisor Grand River Conservation Authority	• received notice of commencement letter • GRCA is interested in being a commenting agency as we do own and operate the downstream reservoir • if you require any assistance, data, etc., please do not hesitate to contact me or have your consultants contact me	• no response required
November 19, 2012	Barbara Slattery EA/Planning Coordinator Ministry of the Environment	• received notice of commencement letter • we concur that it is appropriate to be following the requirements for Schedule C projects • Schedule C projects require preparation of an Environmental Study Report once the preferred design has been determined and design work has progressed to the point where details of any environmental protection measures to be incorporated in the construction package have been finalized • proponents are advised to determine potentially affected Aboriginal communities who may be affected by the project and provide them with an opportunity to participate in any planned public consultation sessions and comment on the project • the Township has complied with its current approval and submits annual reports on the plant's performance • we have noted back to the Township that based on corresponding high flows into the plant during wet weather events, it is suggested that this sewershed has some I/I issues which we assume will be considered as part of this EA study given that some work on this matter had been undertaken in 2009/2010 • as this study progresses, it would be appropriate to involve ministry staff to assist and review technical reports (i.e., assimilative capacity studies) being undertaken to assess viability of alternatives	• no response required
Utilities			
November 20, 2012	Matthew Aston Manager of Operations Wellington North Power Inc. (WNP)	• in April 2012, WNP installed a 500 KVA 4,160Y2400-600Y347V pad-mount transformer to service the electrical needs of this property • this installation represented a $40,000 investment by WNP in this property • please note that any increase in electrical service capacity require for this site would be the responsibility of the owner • WNP only supplies transformation up to 500KVA • kindly add WNP to the mailing list for this project	• no response required • WNP are already on the mailing list • added Matthew Aston to the mailing list, in addition to Judy Rosebrugh
Public and Stakeholders			
August 13, 2013	Keith Hehn Plant Manager Golden Valley Farms Inc.	• correspondence relative to the issue of increasing average daily flow (ADF) to sanitary sewer • Golden Valley Farms Inc. is requesting a 15% increase of flow each year over next three year period, with an overall capacity to 360 m^3/day by the year 2016	• meeting held with the Town, XCG and Golden Valley Farms on July 17, 2013 • XCG provided detailed written response to the Township on August 28, 2013 • Township held ongoing discussions with Golden Valley Farms Inc.
January 3, 2013	James Coffey Dave Martin Eastridge Landing	• advised of development plans for the next phase of Eastridge Landing subdivision in Arthur • will be submitting our Phase 3 draft plan sometime in January 2013 • this next phase will consist of 103 proposed lots which will include a mix of single detached homes, semis and townhouses • would like to inform you of our future needs for adequate sewage allocations, so that we can proceed with servicing our next phase	• comments noted

Table 9.4 Summary of Agency and Stakeholder Comments

Date	Contact	Comment	Response to Comment
		• anticipate that the proposed draft plan will be split into two phases with the first servicing being 47 lots which could take place as soon as late 2013 or early 2014 • our Eastridge Landing site has progressed steadily over the last five years and to date we have seen the construction of 31 new homes • wish to be kept informed on the progress of your current EA for the Arthur WWTP	
November 27, 2012	Dave Stack Arthur, Ontario	• interested in being part of the study – information and meetings	• response provided on November 27, 2012 • response noted that there will be two public information centres through the course of the Class EA study • noted that he is on mailing list and will receive notifications • invited stakeholder to bring any other items to the attention of the Township
November 26, 2012	T.A. Normet	• wants to be involved and kept informed of the environmental study process • as part of the process to site new wastewater treatment facilities, the deficiencies of the existing storage lagoons must be addressed • during the past ten or more years the field adjacent to the existing lagoons could not be worked because of the surface wetness of the area • the surface wetness in this field results from two sources: o surface runoff from the berm; and o leakage when the lagoon is full • a number of years ago, I brought this to the attention of the municipality • some minor repairs were done on the northeast corner of the lagoon • this work resulted in no change to the site conditions • the visible deficiencies of the site, that I am aware of, are the following: o no buffer to contain surface runoff from the site o no ditch to catch leakage from the lagoon o no monitoring to determine if there is leakage o no adequate fencing to control site access • a study for increasing the capacity of the system must address concerns with the existing wastewater treatment facilities	• responses provided November 27 and 29, 2012 • response noted that there will be two public information centres through the course of the Class EA study • noted that he is on mailing list and will receive notifications • invited stakeholder to bring any other items to the attention of the Township • noted that the Notice of Commencement had been posted on the Township web site with additional notices and information to be posted as the study progresses
November 21, 2012	Benjamin R. Austin	• want to express concern at any expansion and would like to inquire as to what consultations will be taken with the public before any expansion would happen • on warmer days, when the wind is blowing in a north easterly direction, we already experience a foul odour from the treatment plant • before you suggest the smell is All Treats farm, it is not; the days we notice a smell, the rest of the town is fine; when All Treats are cycling their “crop” the entire town reeks • my concerns are three fold: 1. what studies/facts are available for the odours we are smelling; I’d like to ensure there are no ill side effects as my children’s safety is my paramount concern; I am also concerned about any runoff from the plant to the river behind it, as my son likes to go fishing back there 2. what would be done to prevent any odours from the surrounding houses if an expansion were to take place; right now, it is occasional; how do we prevent this from being regular or permanent 3. resale value of my home; I hate to jump right away to money, but it is a very real concern; if an expansion were to take place and a smell was always present, my house value would drop, and I could quickly find myself in a situation where my mortgage is worth more than the value of the house; I don’t want to see this happen	• response provided on November 21, 2012 • response noted that there will be two public information centres through the course of the Class EA study • noted that he is on mailing list and will receive notifications • invited stakeholder to bring any other items to the attention of the Township

9.5.2 Responses to Agency Contacts

Notice of Commencement

One response to the Notice of Commencement mailing was received from AANDC. A November 26, 2012 e-mail was forwarded to the Township by Ms. Allison Berman, Regional Expert for Ontario, Consultation and Accommodation Unit. In her response, Ms. Berman provided information on: potentially affected Aboriginal communities; community contacts; treaties, claims and negotiations; and litigation. These comments are noted in Table 9.2 and the AANDC e-mail is included in Appendix I.

Notice of PIC # 1

No responses were received following the Notice for PIC # 1.

Notice of PIC # 2

No responses were received following the Notice for PIC # 2.

Notice of PIC # 3

No responses were received following the Notice for PIC # 3.

9.5.3 Aboriginal Contacts

All project notices, including the Notice of Commencement (November 16, 2012), Notice of PICs (March 6, 2013, May 28, 2014 and March 16, 2016) and Notice of Completion (August 17, 2016), were sent to the following First Nations:

- Mississaugas of the New Credit.
- Six Nations of the Grand River (Director and Manager – Lands and Resources Department).
- Six Nations Haudenosaunee Confederacy Council.

The contact information for these First Nations is provided on the project mailing list included in Appendix I. In addition, all correspondence to these First Nations is included in Appendix I.

No responses were received from these First Nations during the Class EA process.

10. PREFERRED DESIGN CONCEPT

10.1 Description of Preferred Design Concept for the Arthur WWTP

The preferred alternative for wastewater treatment capacity in the community of Arthur is to expand and upgrade the existing Arthur WWTP to provide treatment capacity to service projected growth in the community.

Phase 3 of the Class EA process evaluated alternative design concepts to implement the preferred alternative selected. Based on the evaluation undertaken and documented in this ESR, the preferred design concept for wastewater treatment includes:

- New preliminary treatment consisting of flow metering, mechanically cleaned bar screens with standby manual bar screen, vortex grit separators and headworks building complete with odour control and all appurtenances.
- Decommissioning of the existing headworks.
- Twin existing package extended aeration plant.
- Upgraded blower capacity and all appurtenances.
- Construction of new conveyance system to the effluent storage lagoon consisting of new forcemain, upgraded effluent pumps and all appurtenances.
- Providing Geotextile dewatering and cake storage or liquid biosolids storage (with final evaluation and selection to be completed during preliminary design).
- Additional standby power and increased electrical service.

A preliminary evaluation of existing treatment capacity indicated that an interim capacity of 1,860 m^3/d could be achieved by upgrading only some of the unit processes. Therefore, the Township wishes to implement the preferred design concept in two phases, with the rated plant ADF being 1,860 m^3/d in Phase 1, and 2,300 m^3/d in Phase 2.

Four sludge management options were considered as part of this study. As part of Phase 1, the preferred sludge management strategy is Option D - Liquid sludge shipped to the Lystek regional processing facility located in Dundalk, Ontario. No capital upgrades are required for this option. At the Phase 2 plant capacity, Option A (onsite aerobic digestion, with onsite storage and seasonal land application of liquid biosolids), B (onsite aerobic digestion, with onsite storage of biosolids using geotextile tubes, and dewatered cake land applied seasonally), and D (liquid sludge shipped to the Lystek regional processing facility located in Dundalk, Ontario) all represent viable sludge management alternatives. As such, the final evaluation and selection of a biosolids management strategy should be completed at part of the preliminary design of the Phase 2 plant upgrade.

Figure 10.1 presents the preferred alternative design concept layout for the Arthur WWTP. The site layout will be finalized during the preliminary and detailed design stage.

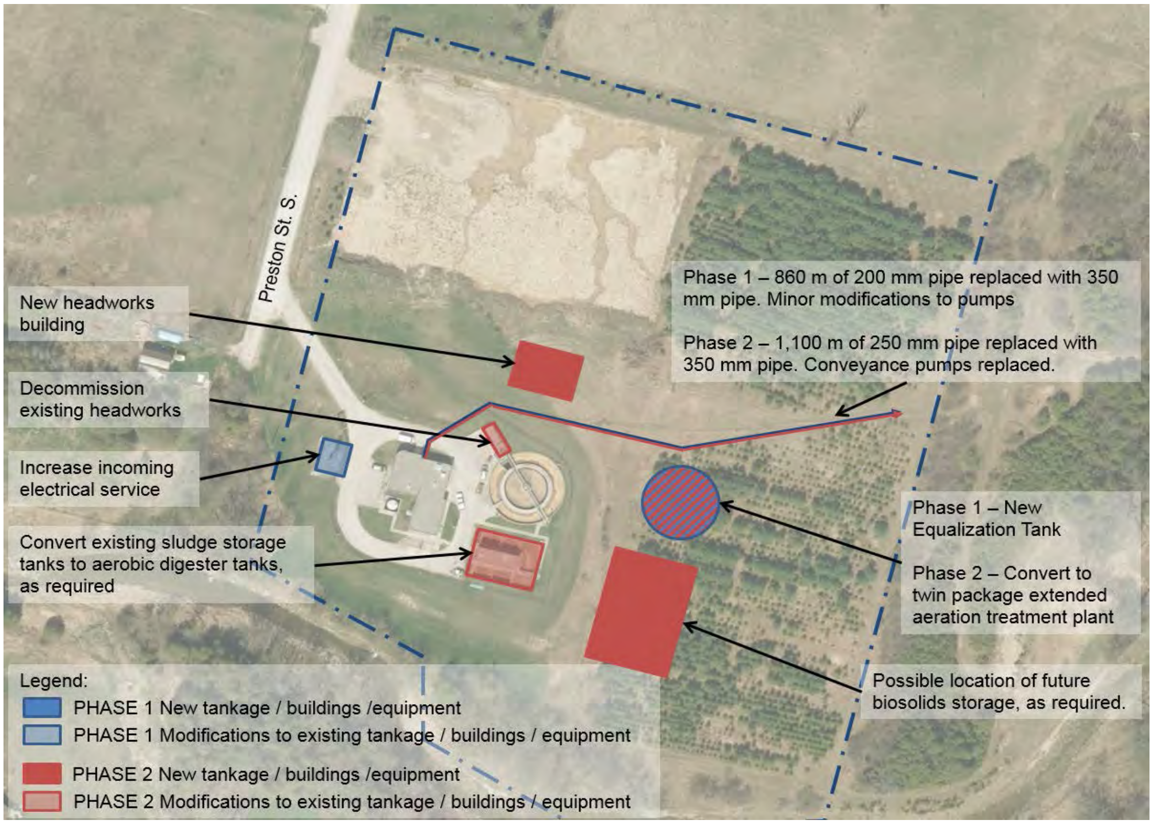


Figure 10.1 Preferred Alternative Design Concept Layout for the Arthur WWTP

10.2 Description of Preferred Design Concept for the Frederick St. SPS

Due to capacity limitations at the Frederick St. SPS, an upgrade and expansion is required. Based on an evaluation of historic and projected flows, the minimum required future capacity of the Frederick St. SPS is approximately 110 L/s. Details can be found in Appendix H.

An overview of the required expansion to the Frederick St. SPS is presented in Figure 10.2. The need for equalization at the Frederick St. SPS will be evaluated during preliminary design of the Phase 1 and Phase 2 plant expansion. Figure 10.2 shows there is space available onsite if equalization at the Frederick St. SPS is required in the future.

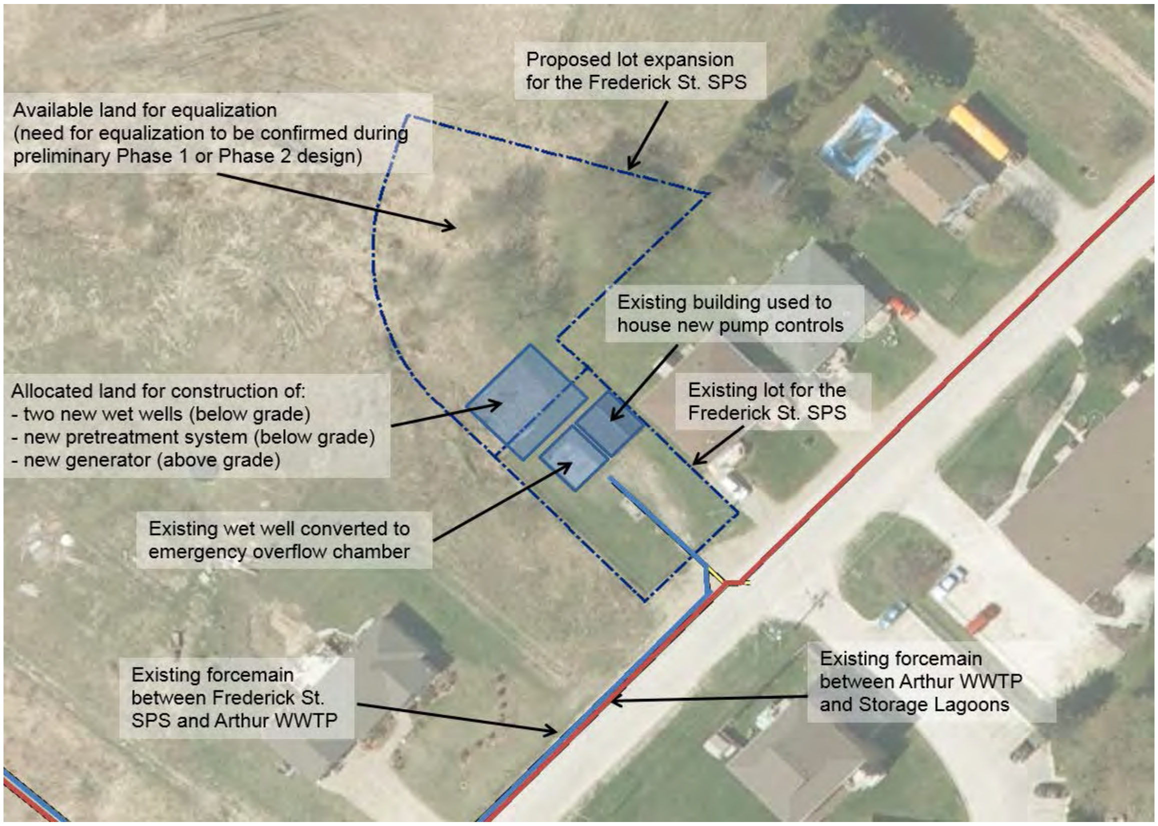


Figure 10.2 Preferred Alternative Design Concept Layout for the Frederick St. SPS

10.3 Stand-by Power

Additional stand-by power may be required for the expanded Arthur WWTP. The location of the additional stand-by power supply will be on the current WWTP. The final location will be determined during the detailed design stage. An allowance for stand-by power has not been included in preliminary cost estimates.

10.4 Opinion of Probable Cost

The estimated capital cost of the proposed expansion and upgrades to the Arthur WWTP and Frederick St. SPS are presented in Table 10.1.

Table 10.1 Cost of Preferred Design Concept for Upgrades

Item	Estimated Capital Cost	
	Phase 1	Phase 2
Liquid Treatment Train Upgrades at Arthur WWTP	$4.8M	$8.1M
Solids Treatment Train Upgrades at Arthur WWTP	$0 (2)	$0 to $5.1M (3)
Sub-Total for Arthur WWTP (both Phases)	$12.9M to $18.0M	
Frederick St. SPS Upgrades	$2.9M (4)	
Total Estimated Cost	**$15.8M to $20.9M**	

Notes:

All costs are conceptual level opinions of probably costs and are considered to be accurate to within -25 to +40 percent exclusive of HST.

1. The preferred sludge management option for Phase 1 (Option D - Lystek) has no associated capital costs.
2. Phase 2 solids treatment train upgrade costs will depend on final section of preferred Phase 2 sludge management option, either Option A, B, or D.
3. Assumes no equalization provided at Frederick St SPS. Should equalization be provided, this could impact the required upgrades, and associated costs, at both the Frederick St. SPS and Arthur WWTP.

These costs are based on a conceptual level of design and are generally accepted to be accurate to within a range of -25 to + 40%.

10.5 Confirmation of Class EA Schedule

The proposed project will increase the rated capacity of the Arthur WWTP from 1,465 m^3/d to 2,300 m^3/d; hence, it is a Schedule C undertaking under the Municipal Class EA (2000, as amended in 2007, 2011 and 2015).

10.6 Additional Approval Requirements

Prior to construction of the preferred design, the following additional approvals will be required:

- Site plan approval and building permit.
- Certificate of Approval under the Ontario Water Resources Act for construction of works.
- Permit-to-Take-Water, if required for site dewatering.
- ECA (Air and/or Noise) for any new or modified air and/or noise emissions.

10.7 Potential Environmental Impacts during Construction and Proposed Mitigating Measures

Construction will have some potential short-term environmental impacts including noise, vibration, dust and traffic. During construction, mitigating measures will be employed wherever possible to minimize impacts, some of which may include:

- Preparing and following a sediment and erosion control plan.
- Limiting construction activities to normal working hours, Monday to Friday.
- Maintaining muffling devices on construction vehicles and heavy equipment.
- Developing and adhering to an approved traffic management plan which minimizes local traffic disruptions during the construction period.

- Performing excavation in an orderly and efficient manner to minimize disturbances from noise, vibration and dust.

A preconstruction public meeting could be held to inform the public of the scale of the proposed construction, the schedule, and to receive comments. If deemed appropriate based on the public response, a Public Liaison Committee (PLC) could be formed. This PLC, if formed, would meet on a regular basis with the Township, the Township's consultant and the construction contractor to discuss the progress of the project, identify any concerns related to the construction, and discuss possible mitigation.

10.8 Potential Impacts from Operation and Proposed Mitigating Measures

The effluent limits proposed for the expanded and upgraded Arthur WWTP were developed based on the MOECC Water Management Policies in consultation with the MOECC and are intended to be protective of water quality and receiving water environment. The following mitigation measures are proposed to address potential impacts during operation of the WWTP.

10.8.1 Air Emissions

The Township has not received any odour complaints regarding the WWTP. New tankage at the WWTP site will not be located any closer to any sensitive receivers than the current tankage. Figure 10.3 demonstrates that sensitive receivers are outside the 100 m separation distance between existing and proposed buildings and tankage as recommended by MOECC under Guideline D-2: Compatibility between Sewage Treatment and Sensitive Land Use.

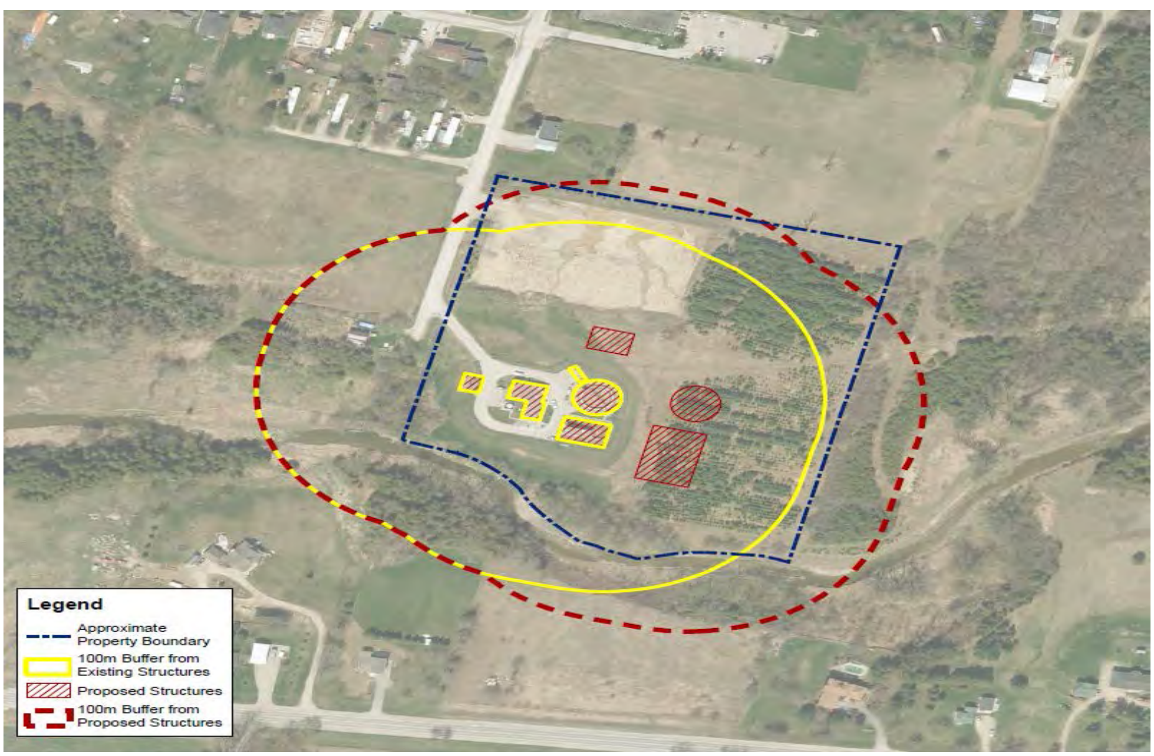


Figure 10.3 100 m Separation Distance from Existing and Proposed Buildings and Tankage at the Arthur WWTP

10.8.2 Noise

The existing significant noise sources at the Arthur WWTP include the blowers and diesel generator. This equipment is currently housed within a building, which minimizes off-site noise impacts.

During preliminary design, any new noise sources will be identified and mitigation measures will be implemented to minimize off-site impacts. A noise impact assessment following the NPC-233 reporting guideline will be completed as part of the Environmental Compliance Approval (ECA) submission for the expanded facility.

10.9 Monitoring Program

The monitoring program specified in the ECA for the expanded plant will confirm that the effluent limits are met and the receiving water is protected.

10.10 Accidents and Malfunctions

Potential malfunctions and accidental events related to project construction and operations activities were considered during the course of the assessment. The events considered include hazardous material spills, breaks in the collection system or outfalls, failures of the effluent treatment or odour control systems, transportation accidents, fires and explosions. It has been determined that such events are unlikely to occur due to project pre-planning, system redundancy, emergency response planning and the on-going implementation of monitoring and maintenance procedures. Contingency measures are in place at the facilities to address accidents or malfunctions. Nonetheless, should accidents or malfunctions occur, the effects would generally be temporary while corrective action is taken.

10.11 Completion of Class EA

The Township has determined through a Schedule C Class EA that the most cost conscious and environmentally sound approach to providing wastewater services for the Township up to 2031 is to expand and upgrade the existing Arthur WWTP to treat flows up to 2,300 m^3/d and expansion of the Frederick St. SPS.

This ESR will be placed on the public record for a period of 30 days, after which time any comments or requests from stakeholders, agencies, or concerned parties will be address according to the procedures outlined in the Municipal Class EA (2000, as amended in 2007, 2011 and 2015). If concerns cannot be resolved, a request can be made to the MOE for the proponent to comply with Part II of the Environmental Assessment Act (referred to as a Part II Order), according to the procedures specified in the Municipal Class EA.

If no requests for Part II Order are received, the Township will proceed with preliminary design, detailed design and construction of the proposed works.

11. REFERENCES

Metcalf & Eddy (2003). Wastewater Engineering: Treatment and Reuse. 4th ed.

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

Ministry of North Development and Mines. Bedrock Geology of Ontario - Southern Sheet, Map 2544.

Ministry of North Development and Mines (1991). Quaternary Geology of Ontario - Southern Sheet, Map 2556.

Ministry of North Development and Mines. Physiography of Southern Ontario, Map 2715.

Municipal Engineers Association. 2000 as amended, 2007, 2011 and 2015. Municipal Class Environmental Assessment

APPENDIX A
CERTIFICATES OF APPROVAL

Ontario Ministry of the Environment / Ministère de l'Environnement

RECEIVED AUG 15 1990

Certificate of Approval (Sewage)
Certificat d'autorisation (eaux usées)

Number / Numéro 3-1256-88-908
(Attachment: Air Approvals)

W3610A
CofA File

Whereas / *Attendu que* CORPORATION OF THE VILLAGE OF ARTHUR

of / *de* XXXXX

has applied in accordance with Section 24 of the Ontario Water Resources Act for approval of:
a fait, conformément à l'article 24 de la loi sur les ressources en eau de l'Ontario, une demande d'autorisation:

An extended aeration sewage treatment plant with a rated capacity of 1465 m3/d (average flow) to be constructed at a location approximately 240 m southeast of the intersection of Duke Street and Preston Street in the Village of Arthur together with the following modifications/ improvements to the Village of Arthur sanitary sewer system:

- modification and conversion of existing waste stabilization pond to effluent holding pond;
- Construction of a new sewage pumping station at the south end of Wells Street to replace existing Wells Street Sewage Pumping Station;
- Modification and conversion of existing Frederick Street Sewage Pumping Station to a submersible pumping station.

The works will include:

A. SANITARY SEWER

STREET	FROM	TO
Wells Street	Approx. 150 m South of Highway No. 6	Wells Street Pumping Station

B. SEWAGE TREATMENT WORKS

1. Inlet Sewer

300 mm diameter sanitary sewer in Preston Street from Smith Street to the sewage treatment plant.

This Certificate of Approval supersedes previous Certificate of Approval No. 3-1256-88-897 dated October 23, 1989.

.....2

Now therefore this is to certify that after due enquiry the said proposed works have been approved under Section 24 of the Ontario Water Resources Act.
***Le présent document** certifie qu'après vérification en bonne et due forme la construction dudit projet d'ouvrages a été approuvée aux termes de l'article 24 de la loi sur les ressources en eau de l'Ontario.*

DATED AT TORONTO this 9th day of August, 1990
DATÉ À TORONTO ce jour d

Attn: Mrs. M. Ternan, Clerk, Village of Arthur
cc: Mr. B. Boyko, MOE WC, Reg. Dir.
Mr. M. Latta, MOE, Project Engineering

AUG 10 1990

2. **Grit Channels**

Two (2) manually cleaned grit channels, each measuring approximately 5.4 m long x 0.75 m wide x 0.5 m SWD, sized for a peak flow of 5045 m^3/d and equipped with a proportional weir to provide a control velocity of 0.3 m/s.

3. **Comminutor**

A weatherproof comminutor sized for a peak flow of 5045 m3/d at the downstream side of the grit channels.

4. **Bypass Screen**

A manually raked bypass screen sized for a peak flow of 5045 m3/d for screenings removal when the comminutor is out of service.

5. **Parshall Flume**

A Parshall Flume with ultra-sonic equipment to permit monitoring and transmission of flow data to a chart recorder in the control building.

6. **Aeration Tank and Air Diffusion System**

i) A two (2) cell annular ring type aeration tank with a total liquid storage volume of 1073 m3 to provide a minimum hydraulic retention time of 17.5 hours at the average flow of 1465 m3/d, measuring:

- aeration cell No. 1 - 27.95 m effective length (centreline of annulus) x 4.65 m width x 4.18 m SWD

- aeration cell No. 2 - 27.26 effective length (centreline of annulus) x 4.65 m width x 4.18 m SWD

ii) Coarse bubble air diffusion system consisting of:

- approximately 84 coarse bubble air diffusers, mounted on six (6) separate headers, in each aeration cell;

- two (2) blowers, one as standby, each rated at 486 L/s against 45 kPa discharge pressure at standard conditions.

.....3

7. Final Clarifier

One (1) 13.5 m diameter centre inlet clarifier with 3.8 m SWD, having a maximum surface settling rate of 0.41 L/m3.s and a weir loading of approximately 1.38 L/m.s at a peak flow of 5045 m3/d and equipped with:

- sludge collector mechanism including a centre support column, collector arms, gear assembly, drive unit and other accessories;
- inlet well;
- scum skimming mechanism.

8. Return Sludge and Waste Sludge Pumping

Return Sludge and waste sludge pumping system consisting of:

- one (1) sludge hopper with liquid volume of approximately 50 m3;
- two (2) variable speed submersible sludge pumps, each rated at a maximum capacity of 34 L/s for pumping either return sludge to the aeration cells or waste sludge to the digester.

9. Phosphorus Removal

Chemical storage and feeding facilities including:

- one (1) 23 m3 double FRP shell insulated tank furnished with heating tape, to be installed outside in a concrete spill containment structure, for the storage of liquid alum or ferric chloride;
- two (2) metering pumps, one as standby, each having a minimum rated output of 250 L/d, with at least 10:1 turndown capability to be installed in a chemical room;
- one (1) 450 L plastic "day tank" in the chemical room.

.....4

10. Effluent Filters

Effluent filter system consisting of:

- six (6) continuous backwash, upflow, deep bed (1000 mm) granular media filter modules with total filtration area of 27.9 m2 and a loading rate of 9.7 m/h when treating a peak flow of 6500 m3/d;

- six (6) air lift/filtrate disparsion modules;

- two (2) air compressors, each having a capacity of 38 L/s (standard) at 690 kPa pressure, mounted on approximately 300 L air receiver tank;

- two (2) wash water reject pumps, one (1) installed and one (1) kept on site as standby, each rated at 6.1 L/s against 3.5 m TDH.

11. Sludge Digestion and Storage

Sludge digestion and storage facilities consisting of:

- one (1) primary aerobic digester tank measuring approximately 9.4 m x 6.5 m x 5.0 m SWD;

- one (1) secondary aerobic digester tank measuring approximately 5.0 m x 6.5 m x 5.0 SWD;

- four (4) sludge storage tanks, each measuring approximately 6 m x 5 m x 5 m SWD.

- Coarse bubble air diffusion system including:

  - air header with approximately 48 diffusers in the primary digester tank;

  - air header with approximately 24 diffusers in the secondary digester tank;

  - air header with approximately 36 diffusers in each of the sludge storage tanks;

  - two (2) blowers, each rated at 150 L/s against 45 kPa discharge pressure at standard conditions to supply air to the digesters and sludge storage tanks;

.....5

- two (2) horizontally mounted end suction sludge transfer pumps, each rated at 38 L/s against 12 m TDH;

- two (2) horizontally mounted digester supernatant pumps, each rated at 7.5 L/s against 6 m TDH;

- one (1) submersible decant pump assembly rated at 6 L/s against 4 m TDH for installation in secondary digester;

- three (3) submersible non-clog mechanical mixers, guide rail mounted, two (2) in the primary digester and one (1) in the secondary digester, each having a minimum motor power of 1.1 kW;

- four (4) submersible non-clog mechanical mixers, guide rail mounted, one (1) in each sludge storage tank, with a minimum motor power of 2.4 kW each.

12. Disinfection

Ultraviolet irradiation system sized to treat a peak flow of 6,500 m3/d and including:

- one (1) flow channel measuring approximately 7.9 m long x 0.5 m wide x 0.9 m deep;

- two (2) banks of ultraviolet lamps in series, each bank containing 8 modules with 4 lamps per module, providing a dose of approximately 25.9 watts. sec/cm2 at 65 percent transmission;

- one (1) automatic level controller to maintain an average liquid depth of 250 mm in the flow channel;

- power control modules, control panels and other accessories.

13. Effluent Pumps

Effluent pumping systems consisting of:

- two (2) centrifugal submersible pumps installed in the effluent trough, each rated at 6 L/s against 61 m TDH to supply utility and lawn water at the plant;

.....6

Effluent Pumps (Cont)

- two (2) horizontal split case pumps, installed in the effluent pump room, each rated at 58.5 L/s against 64 m TDH to pump effluent from the plant to holding ponds from May 1 to September 15.

- one (1) wet well measuring approximately 7.8 m x 2.6 m x 1.7 m SWD for the horizontal split case pumps;

- one (1) magnetic flow meter and accessories to monitor and record the quantity of effluent pumped to the holding ponds.

14. Outfall Sewer

375 mm diameter outfall sewer from the sewage treatment plant to Conestoga River.

15. Standby Power

One (1) 160 kW standby power generating set including an automatic transfer switch and a 900 L fuel tank installed at the treatment plant.

16. Utility Buildings

Utility Buildings at the sewage treatment plant site consisting of:

- one (1) administration and control building accommodating an office, a laboratory, a lunch room, a workshop/garage, a generator room, a washroom, a storage room, a mechanical room, a blower room to house the aeration blowers and air compressors and a pump room to house the effluent pumps;

- one (1) filter building to house the effluent filters, ultraviolet disinfection facilities and the Parshall flume;

- one (1) sludge treatment building containing a blower room to house sludge digester and sludge storage tank blowers, and a pump room to house the sludge transfer pumps and the supernatant pumps.

17. Stream Gauging Station

A gauging station near the outfall to monitor and record flow in Conestoga River.

.....7

C. EFFLUENT STORAGE FACILITIES

Effluent storage facilities consisting of:

- expansion of the existing sewage lagoons to provide a minimum storage volume of 340,000 m3;

- modifications to lagoon structures and piping so that the lagoons can be used as effluent holding ponds;

- a reinforced concrete flow distribution structure;

D. WELLS STREET PUMPING STATION AND FORCEMAIN

Wells Street Pumping Station located at Wells Street approximately 675 m South of Highway No. 5, and a forcemain, consisting of:

- an oversized reinforced concrete wet well with a liquid retention volume of approximately 120 m3;

- two submersible sewage pumps, one as standby, each rated at 16 L/s @ 31 m TDH;

- weatherproof control panel mounted outside the wet well;

- 150 mm diameter forcemain from the pumping station to the existing forcemain at Wells Street approximately 150 m South of Highway No. 5;

E. FREDERICK STREET PUMPING STATION AND FORCEMAIN

Replacement of existing Frederick Street sewage pumping station with a new submersible type of pumping station, consisting of:

- one (1) reinforced concrete wet well measuring approximately 5.3 m x 5.3 m x 6.2 m deep

- two (2) submersible pumps with variable speed drives, one (1) as standby, each rated at a maximum flow of 58.4 L/s against 14 m TDH;

→ 5045 m3/d

.....8

FREDERICK STREET PUMPING STATION AND FORCEMAIN (Cont)

- one (1) 60 kW standby diesel generator set complete with a 450 L fuel tank, installed in an adjoining building measuring approximately 6 m x 4.6 m in plan;

- mechanical ventilation system;

- wet well of the existing pumping station to be retained as an overflow chamber;

- two (2) 250mm diameter forcemains, in casement, from the pumping station to the sewage treatment plant;

together with all associated accessories, piping and appurtenances in accordance with the final plans and specifications prepared by Triton Engineering Services Ltd., Consulting Engineers, at a total estimated cost, including engineering and contingencies, of THREE MILLION NINE HUNDRED AND TEN THOUSAND DOLLARS ($3,910,000.00), subject to the following terms and conditions which are considered necessary by the undersigned.

TERMS AND CONDITIONS

General

1. For the purpose of this Certificate of Approval:

(i) "the Director" means any Ministry employee within the Approvals and Engineering Division of the Ministry appointed by the Minister pursuant to Section 4 of the Ontario Water Resources Act as a Director for the purposes of Sections 6, 23, 24, 25, 26 and 27 of said Act;

(ii) "the Regional Director" means the Regional Director of the West Central Region of the Ministry of the Environment;

(iii) "the District Officer" means the District Officer of the Cambridge District Office of the Ministry of the Environment's West Central Region;

(iv) "Certificate" means a Certificate of Approval issued in accordance with Section 24 of the Ontario Water Resources Act;

(v) "Ministry" means the Ministry of the Environment for the Province of Ontario;

.....9

(vi) "Owner" means the Corporation of the Village of Arthur and includes its successors and assignees;

(vii) "average annual flow" means the total flow to the sewage works during the period of operation upon which the report is based, divided by the number of days in the period;

(viii) "average annual concentration" is the arithmetic mean of the average monthly concentrations;

(ix) "average monthly concentration" is the arithmetic mean concentration of all samples taken within a month;

(x) "average loading" is the value obtained by multiplying the average annual concentration with the average daily flow;

(xi) "DO" means Dissolved Oxygen;

(xii) "24-hour composite sample" means a sample collected over a time period of 24 consecutive hours. The sample shall be made up of at least 24 discrete samples taken approximately one hour apart with the volume of each sample being proportional to the sewage flow at the time the discrete sample is taken;

(xiii) "grab sample" means an individual sample of at least 1000 millilitres collected at a randomly selected time over a period not exceeding 15 minutes;

(xiv) "BOD_5" means total five day biochemical oxygen demand measured in an unfiltered sample;

(xv) "kg/d" means kilograms per day;

(xvi) "L" means litres;

(xvii) "L/d" means litres per day;

(xviii) "L/s" means litres per second;

(xix) "L/m.s" means litres per second per metre;

(xx) "L/m2.s" means litres per second per square metres;

.....10

(xxi) "m" means metres;

(xxii) "mm" means millimetres;

(xxiii) "m2" means square metres;

(xxiv) "m3" means cubic metres;

(xxv) "m/s" means metres per second;

(xxvi) "m3/s" means cubic metres per second;

(xxvii) "m3/d" means cubic metres per day;

(xxviii) "mg/L" means milligrams per litre

(xxix) "SWD" means side water depth;

(xxx) "TDH" means total dynamic head;

(xxxi) "watts.sec/cm2" means watts second per square centimetre;

2. The Owner shall expand the sludge storage facilities, if and when required, to provide a minimum storage capacity of six months based on the average sludge concentration attained at the site.

3. The Owner shall notify the Director and the Regional Director in writing of any of the following changes within thirty (30) days of the change occuring;

   (a) change of Owner or operating authority or both;

   (b) change of address or the address of the new Owner.

4. Requirements specified in this Certificate are minimum requirements under Section 24 of the Ontario Water Resources act, and do not abrogate the need to take all steps to avoid violating the provisions of applicable legislation.

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

6. The Owner must ensure compliance with all the terms and conditions of this certificate. Any non-compliance constitutes a violation of the Ontario Water Resources Act and is grounds for enforcement.

.....11

7. The Owner shall furnish to the Regional Director any information which the Regional Director may request pursuant to Section 31 of the Ontario Water Resources Act, and copies of any records required to be kept by this Certificate.

8. The Owner must forthwith on request permit provincial officers to carry out inspections authorized by sections 10, 10a or 10b of the Ontario Water Resources Act, section 126, 126a or 127 of the Environmental Protection Act or Section 19 or 19a of the Pesticides Act of any place, other than any room actually used as a dwelling to which this Certificate of Approval relates.

9. The Owner shall take all reasonable steps to minimize any adverse impact to surface or ground waters resulting from non-compliance with the effluent requirements specified in this Certificate including, but not limited to, such accelerated or additional monitoring as necessary to determine the nature and impact of the discharge in non-compliance.

10. The Owner shall prepare and make available for inspection by the Ministry employees upon request, a complete set of drawings within six months of substantial completion of the sewage works which drawings shall show the sewage works as constructed at that time.

    A complete set of "as constructed drawings", incorporating any amendments made from time to time, shall be kept by the owner at the Control Building of the sewage works as long as the sewage works is kept in operation.

11. The Owner shall establish a buffer zone around the sewage treatment works in accordance with the Ministry Policy 07-05. The buffer zone is defined in the letter dated October 3, 1988 and accompanying Plan No. 1, both prepared by Triton Engineering Services Ltd., and includes the area designated as hazard land between Conestoga Street on the east to approximately 175 m west of Preston Street, the area designated as public and park and marked as abandoned landfill site, the area designed as residential and marked as proposed 25 m buffer zone, all as shown in the plan.

.....12

Operation and Maintenance

12. In order to assure continuous compliance with the effluent criteria set out in condition No. 13 and generally all other Terms and Conditions of this Certificate , the owner shall ensure compliance with the following Operation and Maintenance Conditions:

   1) The Owner shall ensure that at all times, the sewage works and related equipment and appurtenances which are installed or used to achieve compliance with this Certificate are properly operated and maintained. Proper operation and maintenance includes effective performance, adequate funding, adequate operator staffing and training and adequate laboratory and process controls.

   2) The Owner shall ensure that contingency plans and procedures are established and adequate equipment and materials are available for dealing with emergency, upset conditions and equipment breakdowns in the sewage works, and spills or overflows of raw, partly treated sewage, sludge and chemicals into or out of the sewage works to prevent or minimize unacceptable gas and odour emissions or liquid discharges or both into the natural environment.

   3) The Owner shall establish notification procedures to be used to contact the Regional Director and other relevant authorities in the case of an emergency situation and the measures taken to deal with it.

   4) The Owner shall prepare an operations and maintenance manual prior to the commencement of regular operation of the sewage works and upon request shall make the manual available for inspection by Ministry personnel and shall upon request furnish a copy to the Ministry.

Performance

13. 1) The sewage treatment plant shall be designed, constructed and operated in such a manner and with such facilities that the concentrations of materials named below as effluent parameters should be achieved in the effluent from the plant. Any exceedance constitutes non-compliance with this Certificate.

.....13

Design Parameter	Average Annual Concentrations (mg/L)	Average Monthly Concentrations (mg/L)	Average Loadings (kg/
BOD5	10	15	14.65
Suspended Solids	10	15	14.65
Total Phosphorus	1	1	1.47
Total Ammonium Nitrogen	1.5	2.3	2.20

(2) The average geometric mean density of fecal coliforms in the effluent shall not exceed 200 per 100 mL. Any exceedance constitutes non-compliance with this Certificate.

(3) The effluent from the plant is to be discharged as follows unless otherwise approved in writing by the District Officer.

a) From May 1 to September 15 the effluent from the plant should be transmitted to the holding ponds for storage.

b) From September 16 to April 30, the effluent from the plant may be discharged directly to Conestoga River provided that there is adequate flow in the river.

c) From September 16 to April 30, effluent stored in the holding pond may be transmitted to the plant, filtered and then discharged to the river provided that there is adequate flow in the river.

d) Effluent from the holding pond may be discharged to Conestoga River during emergencies provided that prior written authorization has been obtained from the District Officer.

e) The Regional Director will provide data on the maximum permissible discharge rates for subsections (b) and (c) based on flow in the river. The maximum discharge rate may also be limited by the design capacity of the effluent filters which is 6500 m3/d.

(4) The flow measuring devices and recorders shall be calibrated annually to maintain an accuracy of ± 5% for primary elements and ± 2% for secondary elements.

Monitoring and Reporting

14. Grab samples of the final effluent from the plant and the pond liquid shall be collected at least once a week during the period when the effluent is being discharged to Conestoga River, and at least once a month during the period when the effluent is being transmitted to the holding ponds. In addition, a 24-hour composite sample of the plant effluent shall also be collected every six months.

.....14

Sampling and analysis shall generally comply with the Ministry Policy No. 08-06 and sampling locations shall be subject to the approval of the District Officer. All the effluent samples shall be analyzed for at least the following parameters:

pH
* Temperature
* DO
BOD_5
Suspended Solids
Total Ammonium Nitrogen
Total Kjeldhal Nitrogen
Nitrite
Nitrate
Total Phosphorus
Hydrogen Sulphide (when odour present)

*

15. When effluent from the holding pond is discharged directly to the Conestoga River with authorization from the District Officer, grab samples of the effluent (being discharged) shall be taken at least on the first and last day of the discharge period and for every 0.5 metre of draw-down in the pond cells and analyzed for at least the following parameters:

BOD5
Suspended Solids
Total Phosphorus
Total Ammonium Nitrogen
Hydrogen Sulphide

16. A 24 hour composite sample of the raw sewage shall be collected at least every month and analyzed for at least the following parameters:

BOD5
Suspended Solids
Total Kjeldhal Nitrogen
Total Phosphorus

17. Analytical results from Condition Nos. 14,15 and 16 shall be reported to the District Officer within 60 days of collection of the sample or within such longer period as the District Officer may agree.

.....15

18. (1) The Owner shall submit an annual report on a calendar basis to the Regional Director, on the performance of the sewage works.

(2) The first report referred to in Subsection (1) shall be submitted within one year and 90 days following the calendar year in which the operation of the sewage treatment facilities approved herein commenced. Each subsequent report shall cover subsequent 12 month period and shall be submitted within the first 90 days of the calendar year.

(3) Each annual report shall contain at least the following information:

(a) a tabulation of all sample results including how the sample was taken (i.e. grab, 24-hour composite or other given description);

(b) a tabulation of daily flow rates and monthly discharge volumes;

(c) tabulation of streamflow and effluent discharge rates; and, *

(d) a tabulation of volume and concentration of sludge removed from the plant site on a monthly basis.

(e) documentation of plant upsets, bypasses, equipment failures, process failures and the corrective actions taken along with an explanation of why the event occurred.

19. Three (3) years after the start-up of the sewage treatment plant, the Owner shall prepare and submit to the Regional Director a special report outlining:

(a) an assessment of the performance of the sewage works supported by the data included in the annual reports; *

(b) an evaluation of the impact of sludge stored in the holding ponds on the effluent quality.

(c) required modifications to improve the performance of the sewage works;

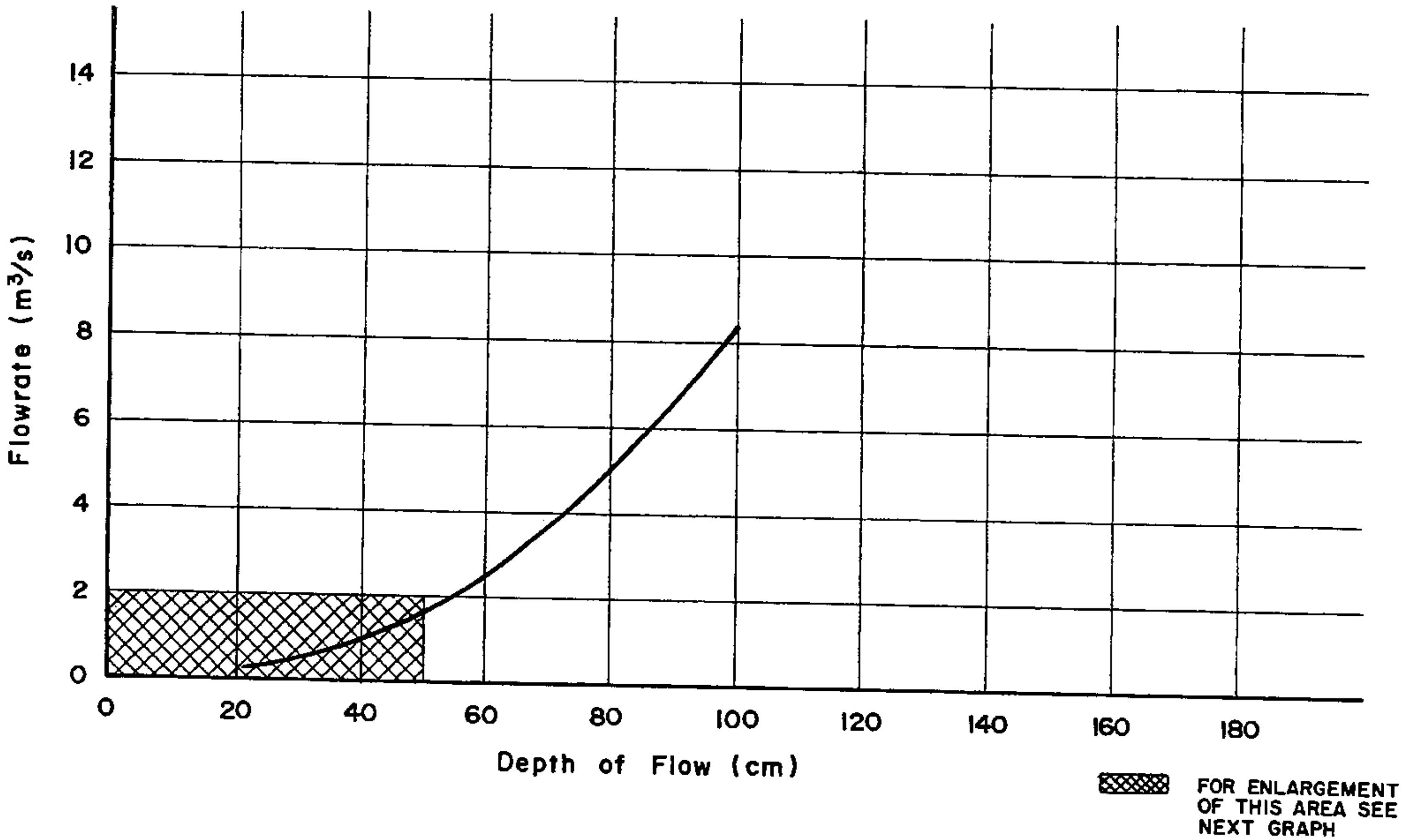
(d) recommended changes to the sampling and monitoring program.

APPENDIX B

RATING DISCHARGE CURVES

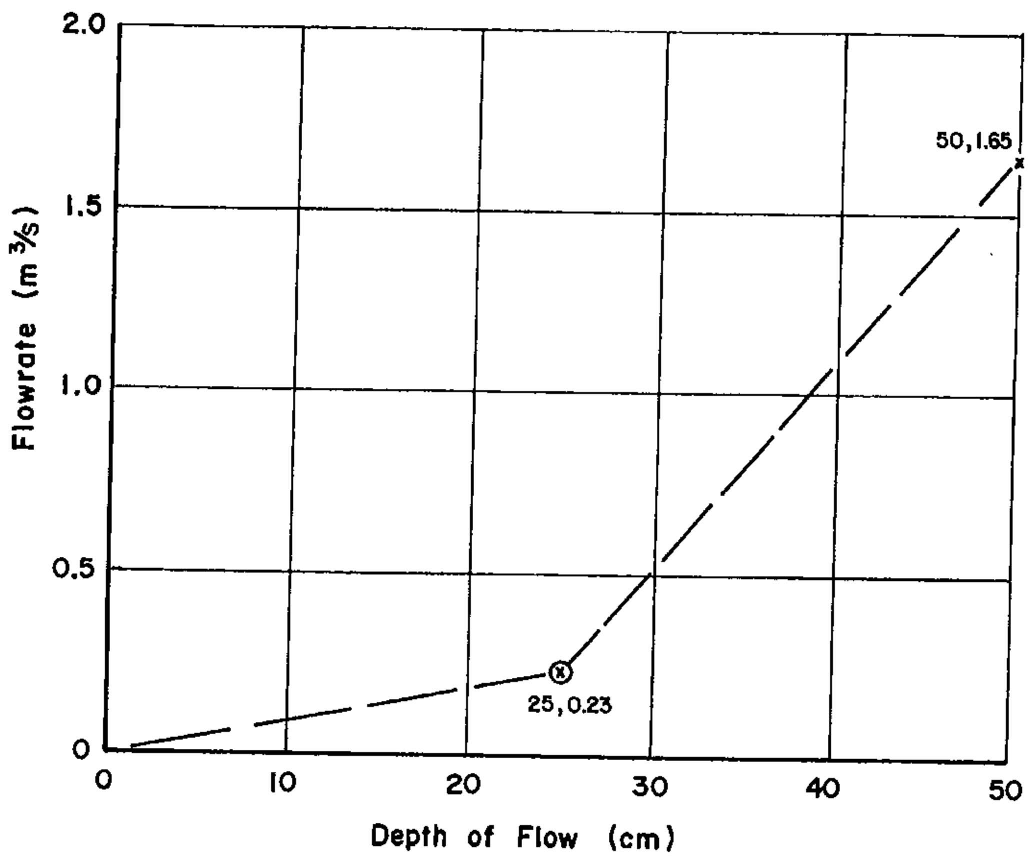
1. THEORETICAL RATING CURVE (DEPTH VS FLOW FOR THE CONESTOGO RIVER).

2. EFFLUENT DISCHARGE CURVES (TOTAL AMMONIUM NITROGEN CONCENTRATION AND STREAM FLOW VS PLANT DISCHARGE)



THEORETICAL RATING CURVE

Conestogo River at Arthur WPCP
(Cross Section 2)



Ⓧ POINT MEASURED IN THE FIELD, NOVEMBER 26, 1991

ENLARGEMENT

THEORETICAL RATING CURVE

Conestogo River at Arthur WPCP
(Cross Section 2)

Ministry of the Environment
Ministère de l'Environnement
Ontario

11 February, 1991

MEMORANDUM

To: Steve Martindale
Utilities Engineer

From: Rich Vickers
Acting Surface Water Evaluator
Technical Assessment Section

Re: Arthur WPCP Effluent Discharge Curves

Attached are the effluent discharge curves for the Arthur Water Pollution Control Plant as per condition 13.3, subsection "e" of the Certificate of Approval. The curves are for the period September 16 to April 30 when discharge is permitted as indicated in the C. of A..

You will note that the curves are supplied for effluent total ammonium nitrogen concentrations that exceed both the present average monthly and average annual C. of A. design limits. We are not encouraging non-compliance rather simply providing operational flexibility. The WPCP must be operated in such a manner that the average monthly concentrations and average annual concentrations and loadings as set out in Section 13.1 are not exceeded. This Section will not support an effluent discharge at total ammonium nitrogen concentrations greater than the maximum indicated on each graph.

The discharge curves assume an effluent BOD_5 concentration of 10 mg/L and a maximum discharge capability of approximately 8,000 m^3/day.

Note that for each month, there is a minimum total ammonium nitrogen concentration below which effluent BOD_5 concentrations become discharge limiting. Therefore, the minimum ammonium nitrogen curve must be used if actual effluent ammonium nitrogen concentrations are lower. Also, if actual effluent ammonium nitrogen concentrations are greater than a particular curve, it is recommended that the next highest concentration curve be used to determine effluent discharge rates (i.e. if effluent concentration is 6 mg/L, the 7.5 mg/L curve should be used to determine discharge rate). This will allow some conservatism due to inherent errors associated with any streamflow measurements. This is especially critical during the winter when ice build-up may interfere with stream levels and flow measurements.

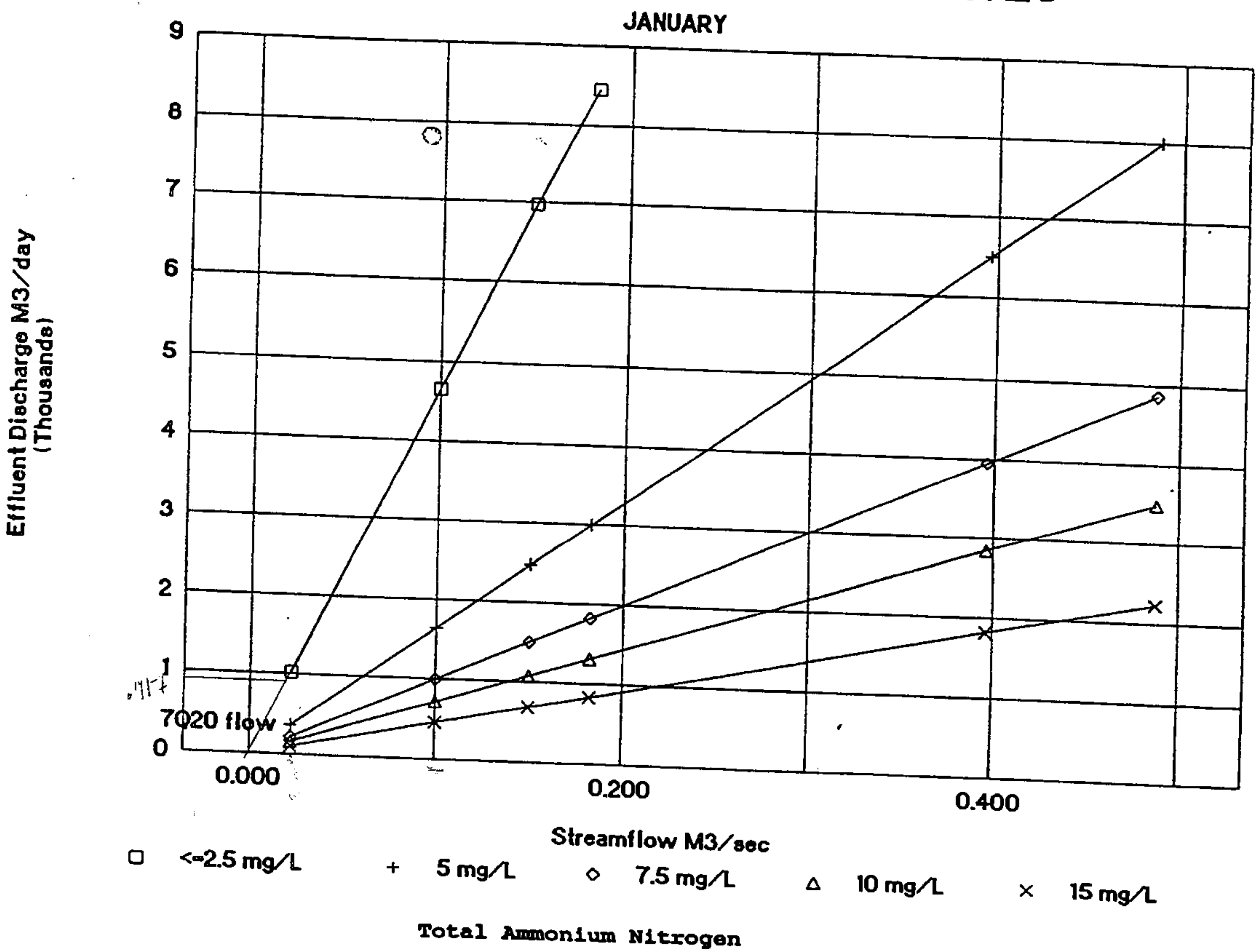
If you have any questions, please contact me.

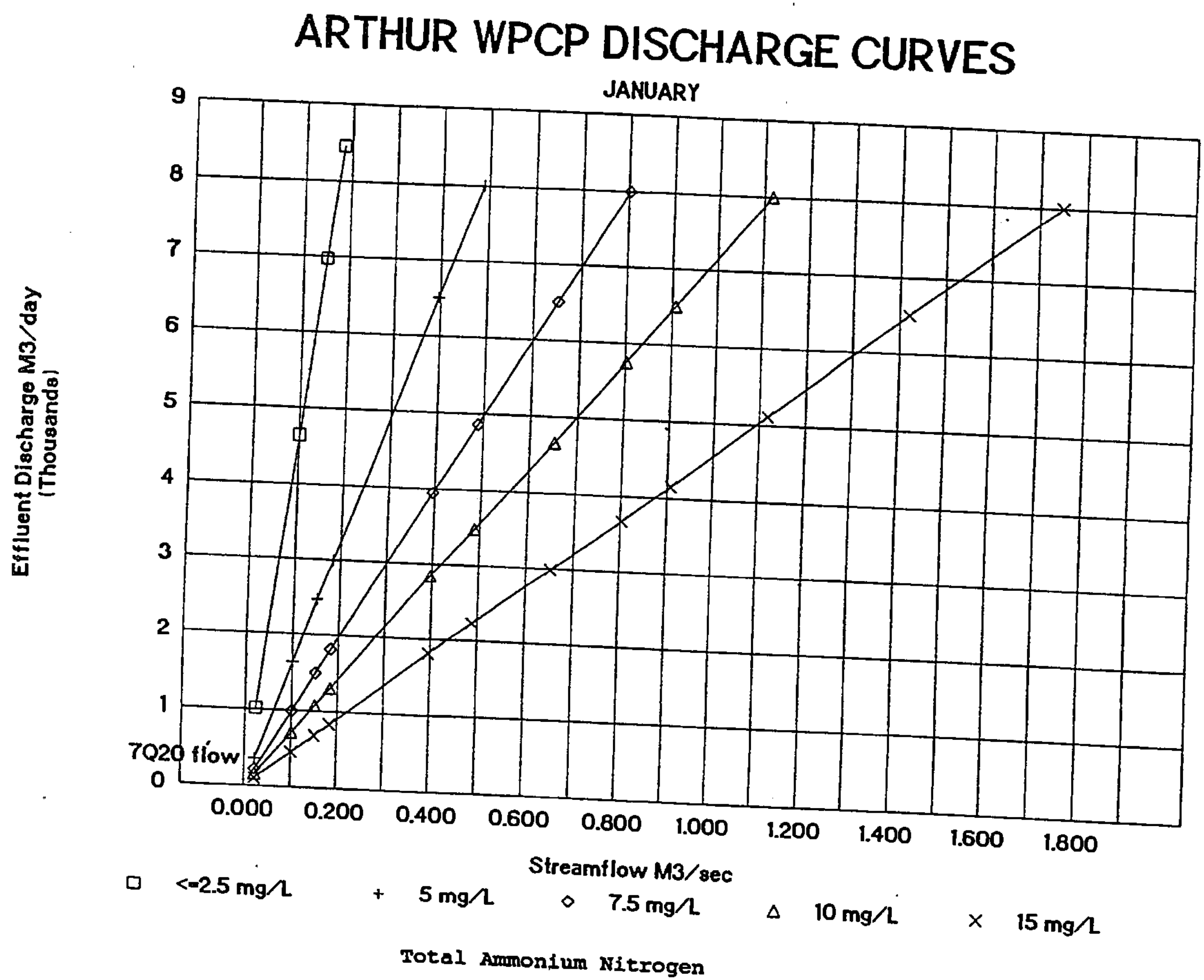
R. Vickers

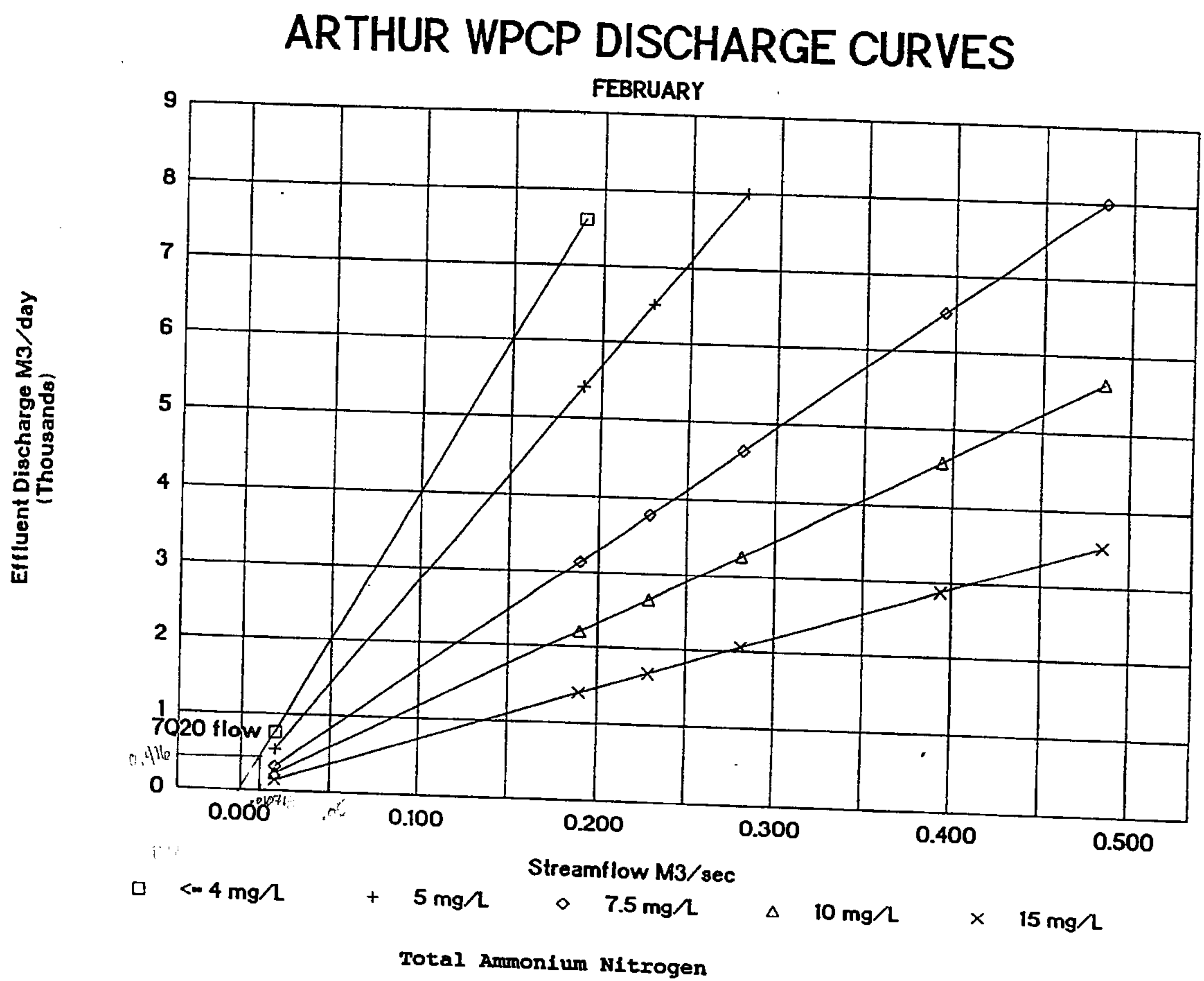
Attachments

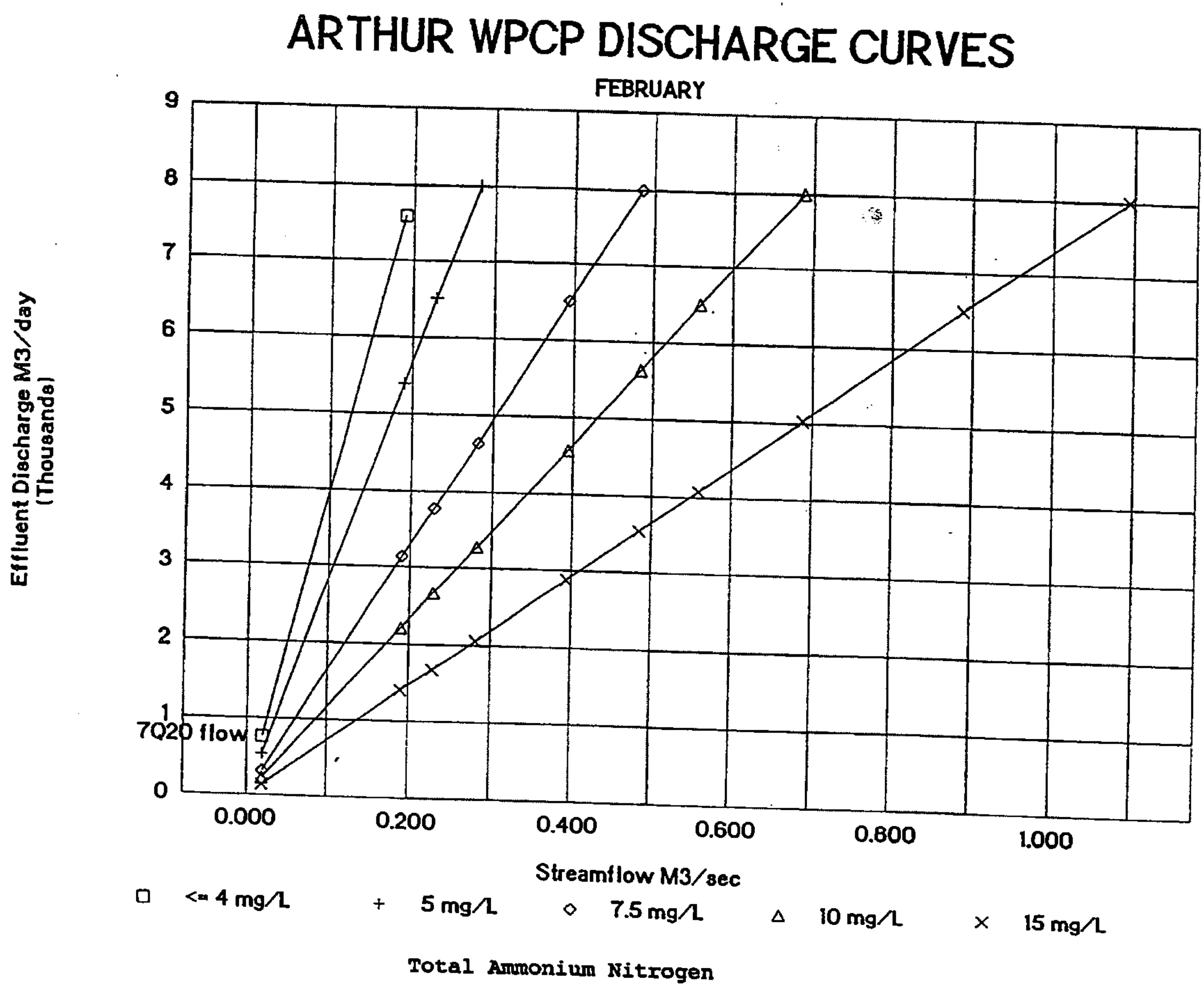
cc: L. MacDonnell, Cambridge
M. Dhalla, Approvals

ARTHUR WPCP DISCHARGE CURVES




ARTHUR WPCP DISCHARGE CURVES
JANUARY
Effluent Discharge M3/day
(Thousands)
9
8
7
6
5
4
3
2
1
7Q20 flow
0
0.000
0.200
0.400
0.600
0.800
1.000
1.200
1.400
1.600
1.800
Streamflow M3/sec
<=2.5 mg/L
5 mg/L
7.5 mg/L
10 mg/L
15 mg/L
Total Ammonium Nitrogen

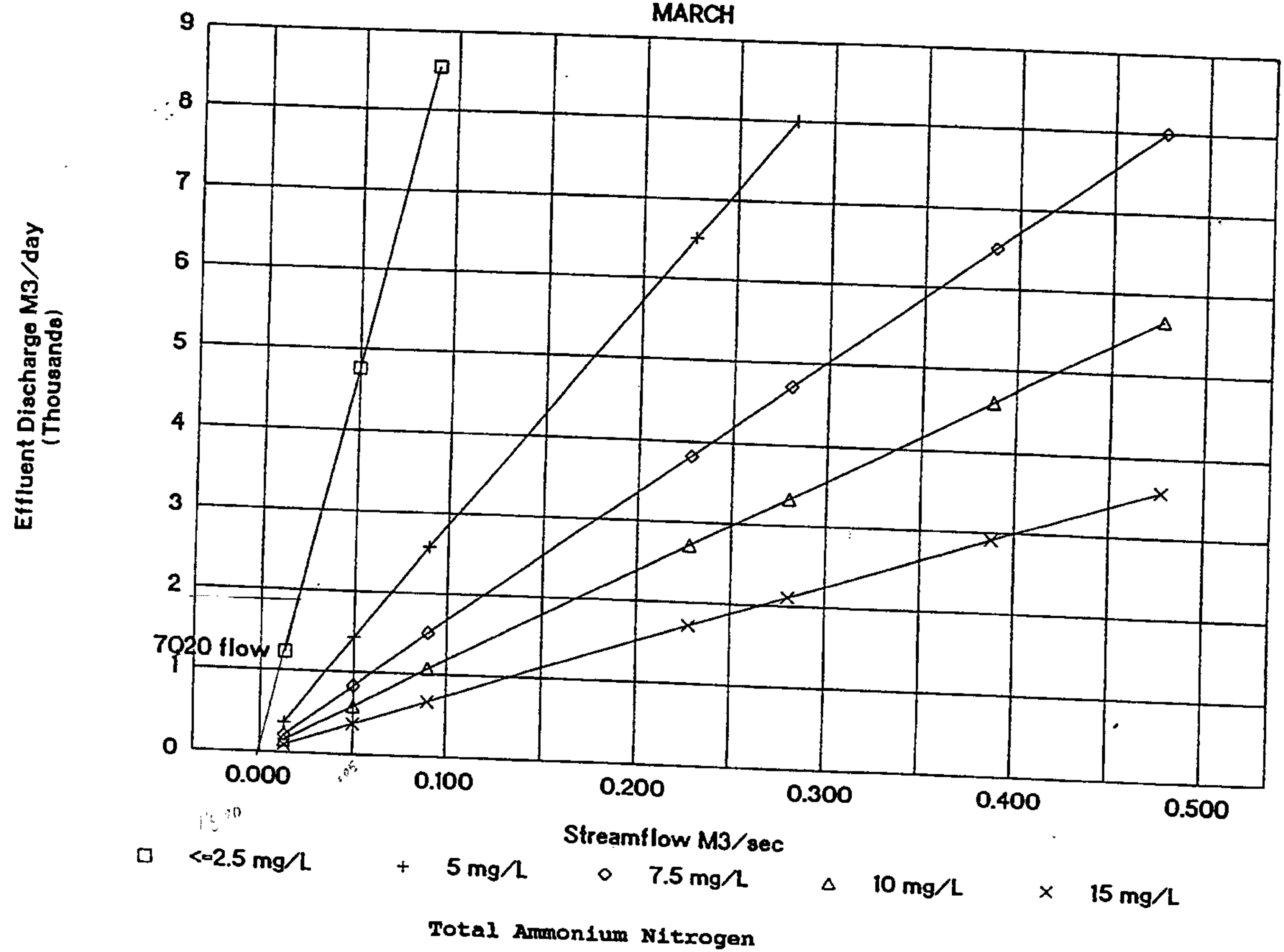

ARTHUR WPCP DISCHARGE CURVES
FEBRUARY
Effluent Discharge M3/day
(Thousands)
9
8
7
6
5
4
3
2
1
0
7Q20 flow
0.000
0.100
0.200
0.300
0.400
0.500
Streamflow M3/sec
□ <= 4 mg/L
+ 5 mg/L
◇ 7.5 mg/L
△ 10 mg/L
× 15 mg/L
Total Ammonium Nitrogen

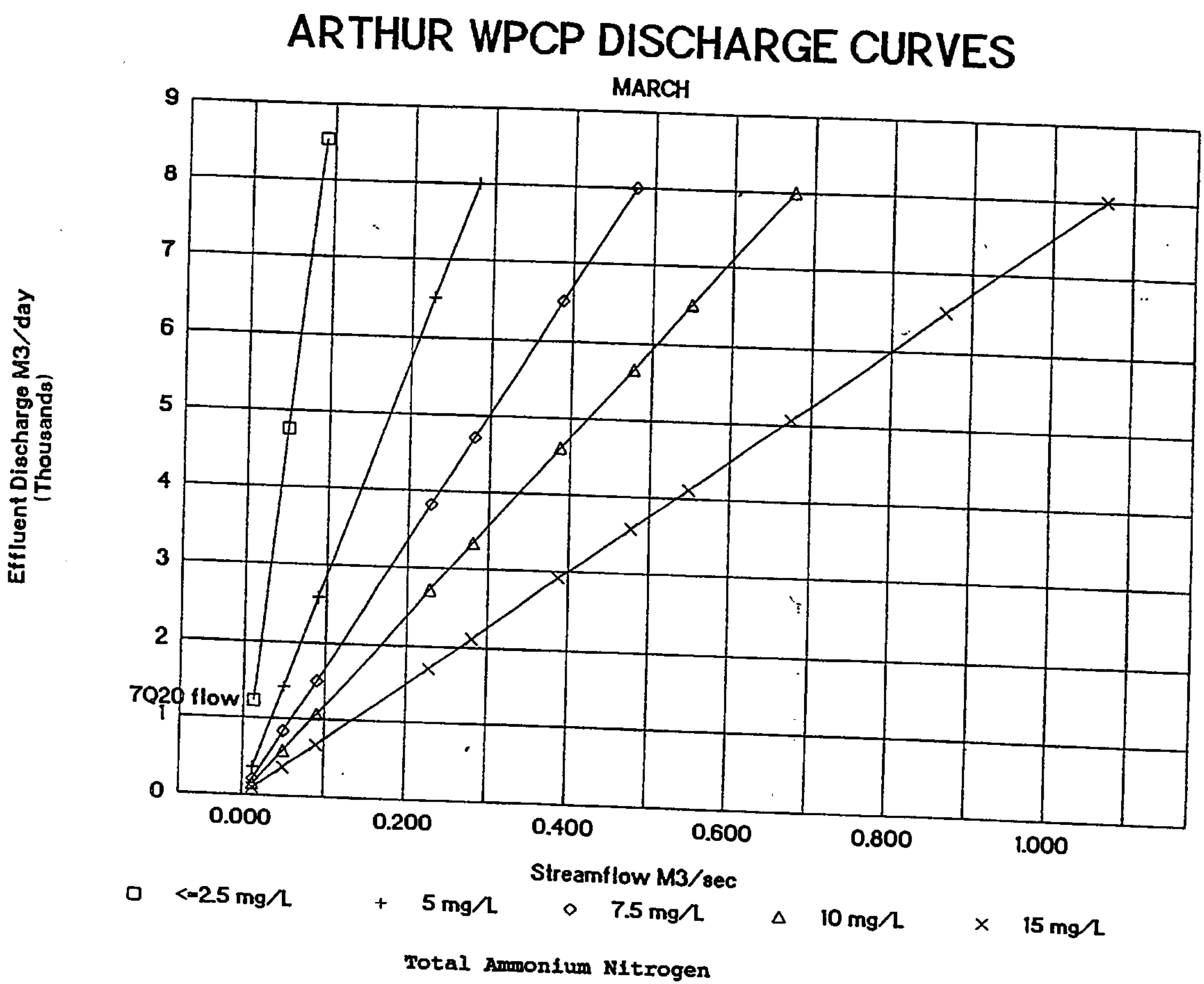


ARTHUR WPCP DISCHARGE CURVES
FEBRUARY
Effluent Discharge M3/day
(Thousands)
9
8
7
6
5
4
3
2
1
7Q20 flow
0
0.000
0.200
0.400
0.600
0.800
1.000
Streamflow M3/sec
<= 4 mg/L
5 mg/L
7.5 mg/L
10 mg/L
15 mg/L
Total Ammonium Nitrogen

ARTHUR WPCP DISCHARGE CURVES

MARCH

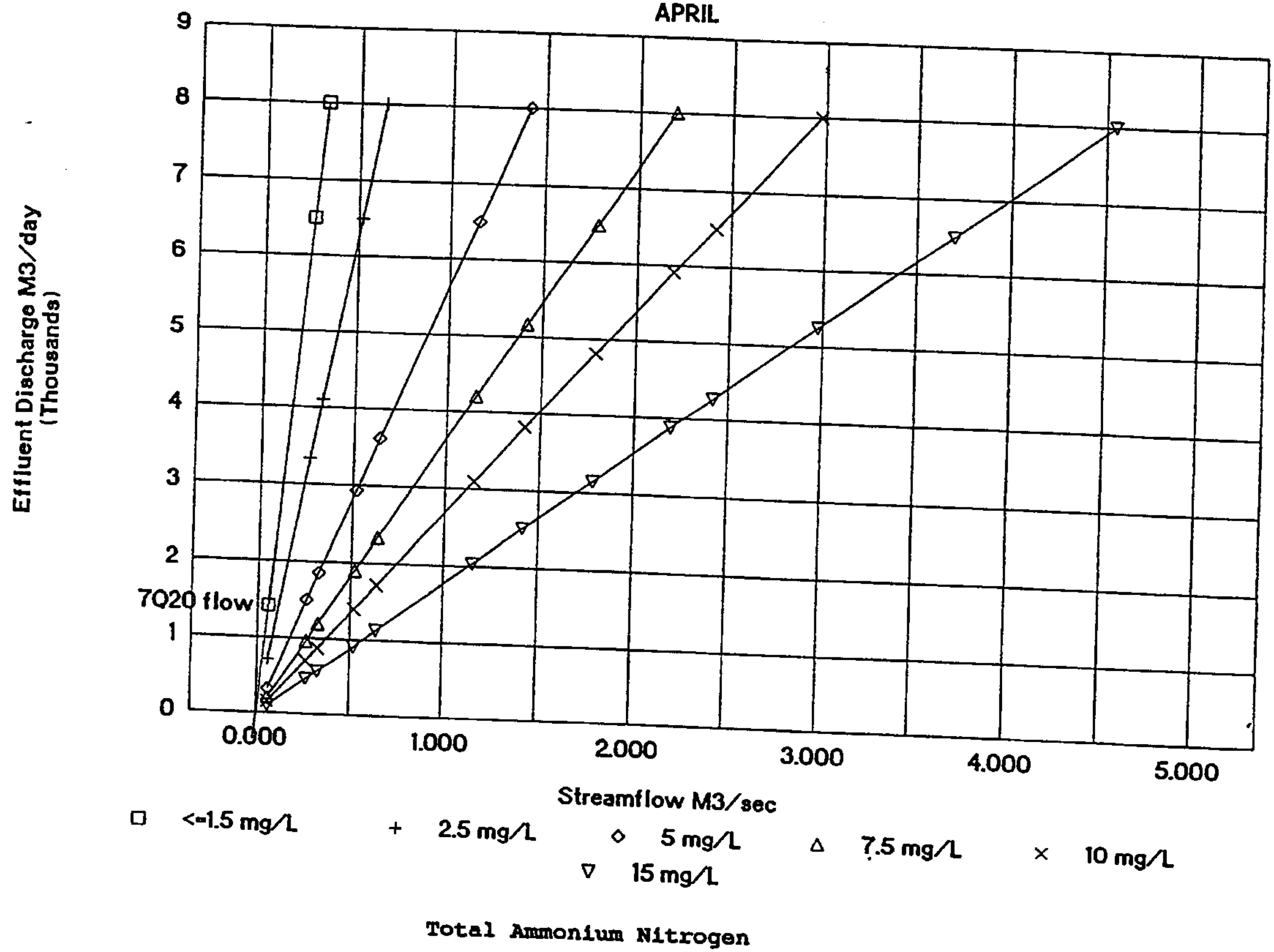




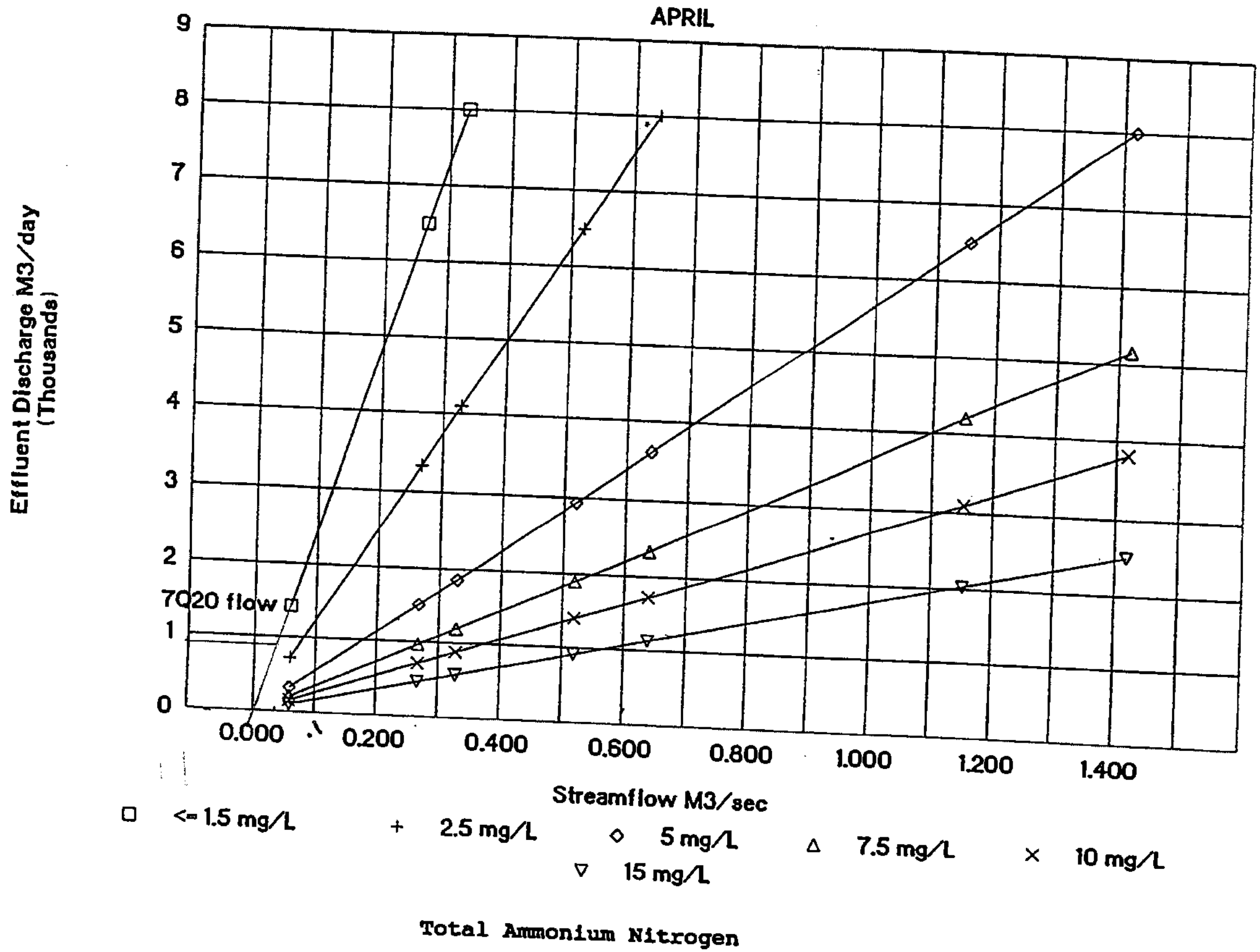
ARTHUR WPCP DISCHARGE CURVES
MARCH
Effluent Discharge M3/day
(Thousands)
9
8
7
6
5
4
3
2
7Q20 flow
1
0
0.000
0.200
0.400
0.600
0.800
1.000
Streamflow M3/sec
<=2.5 mg/L
5 mg/L
7.5 mg/L
10 mg/L
15 mg/L
Total Ammonium Nitrogen

ARTHUR WPCP DISCHARGE CURVES

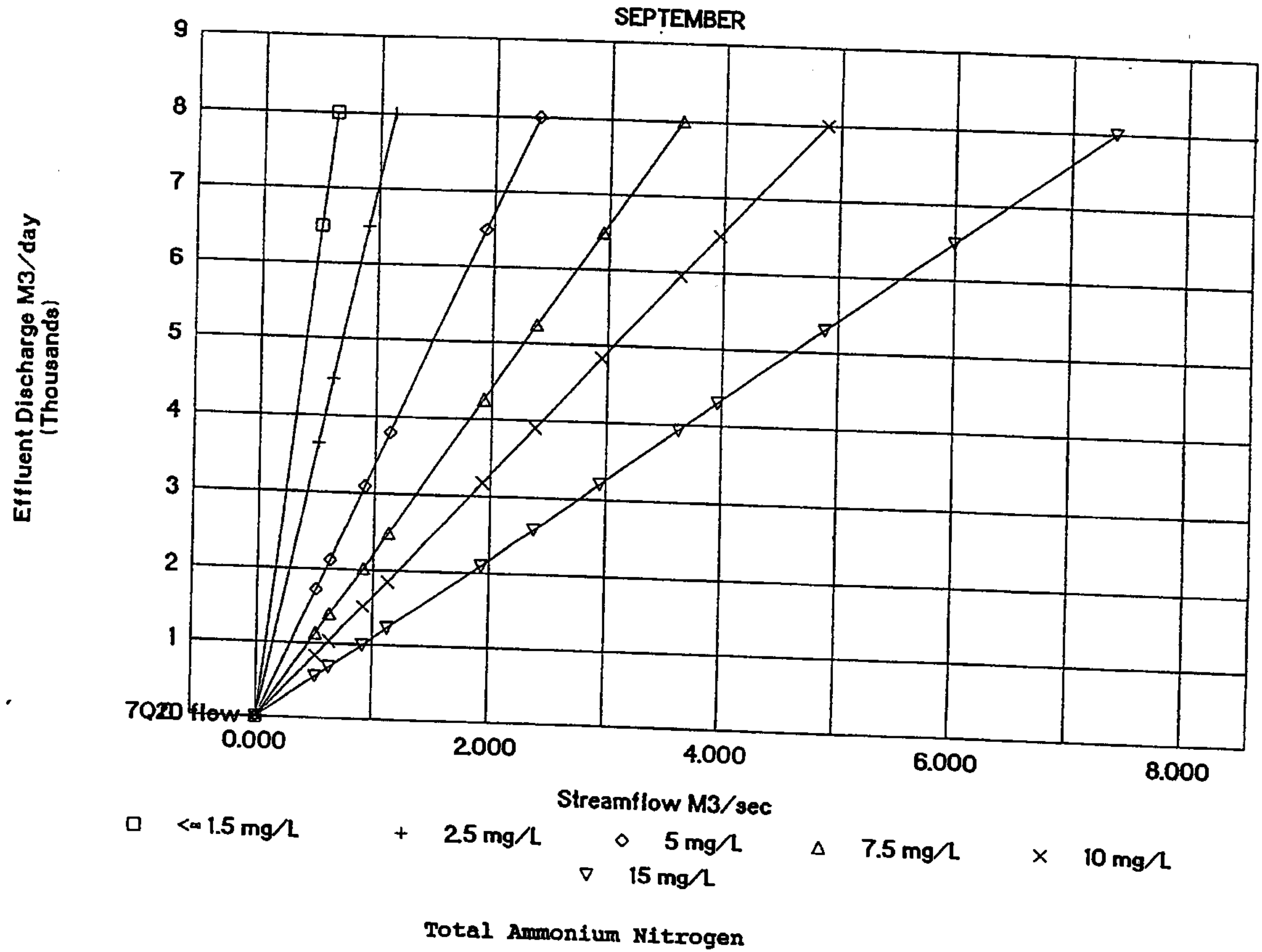
APRIL



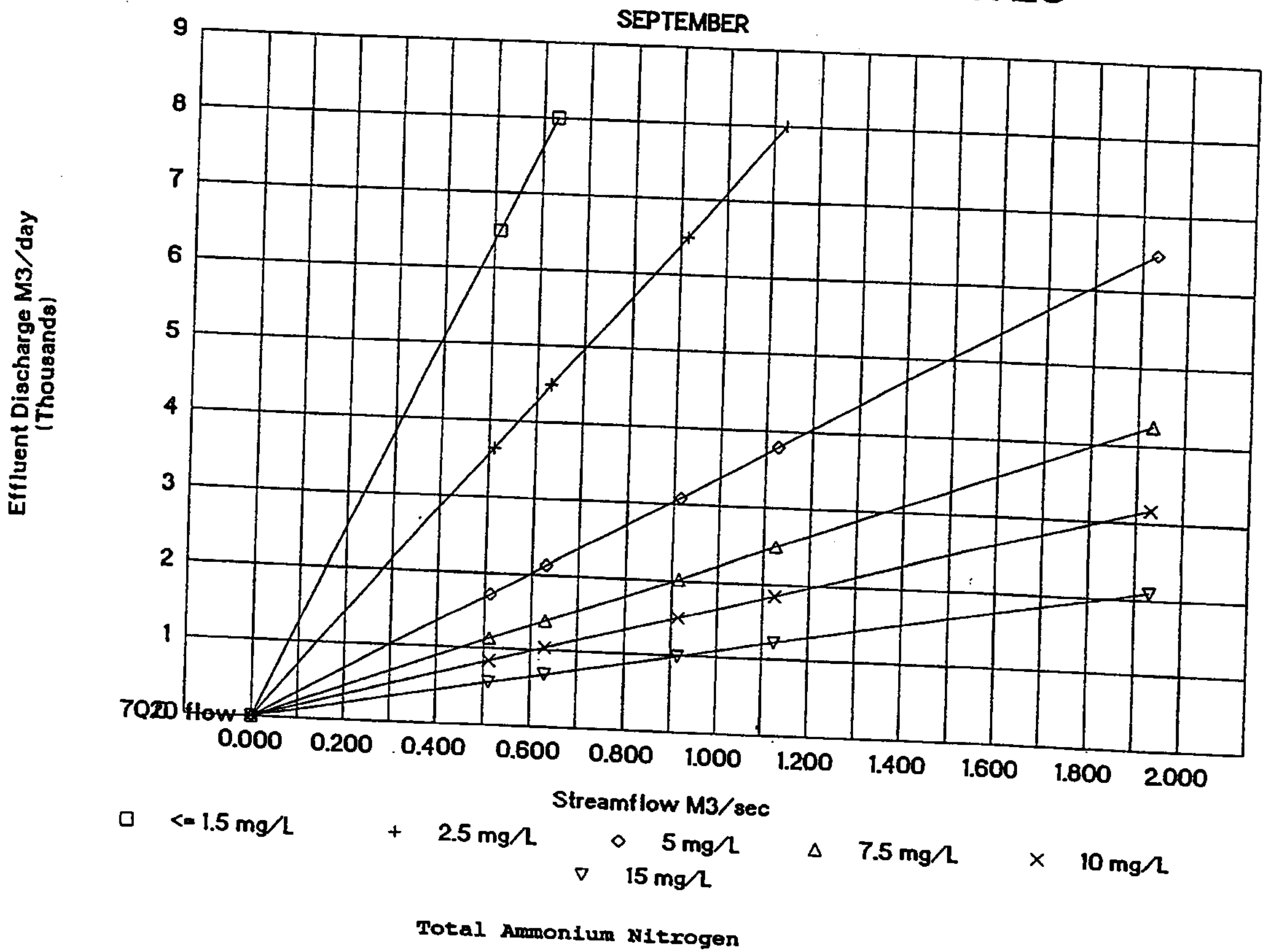
ARTHUR WPCP DISCHARGE CURVES



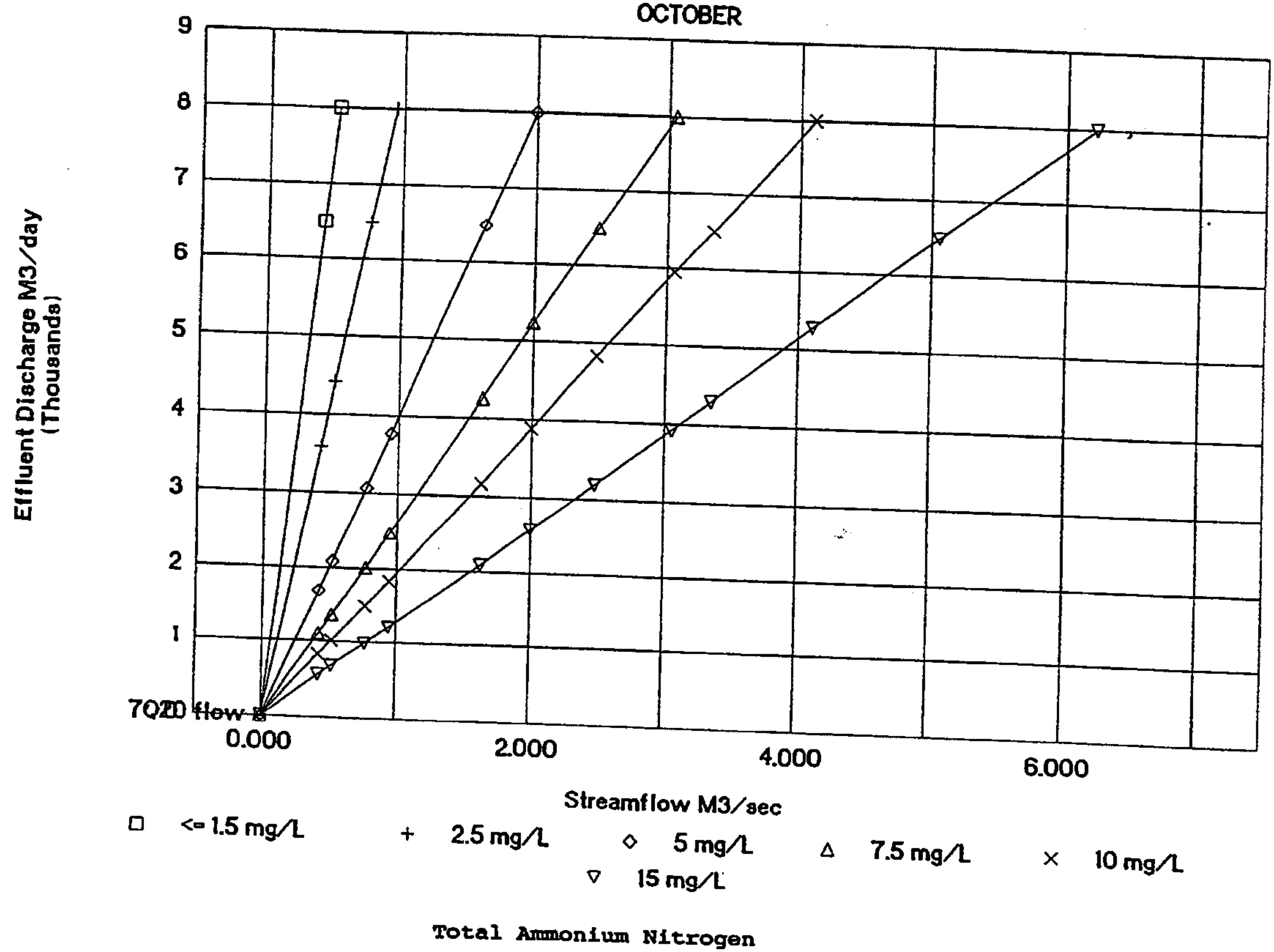
ARTHUR WPCP DISCHARGE CURVES



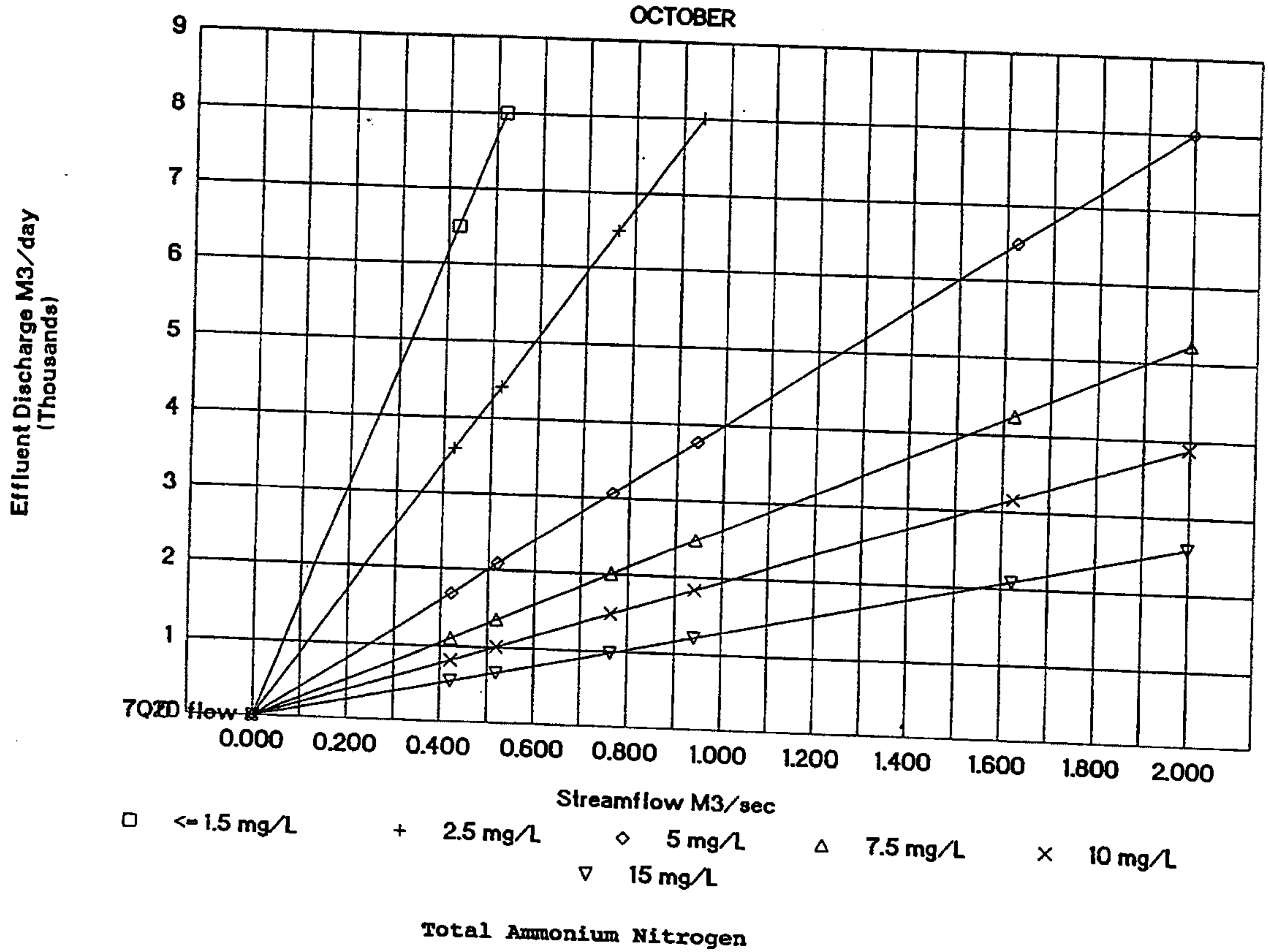
ARTHUR WPCP DISCHARGE CURVES

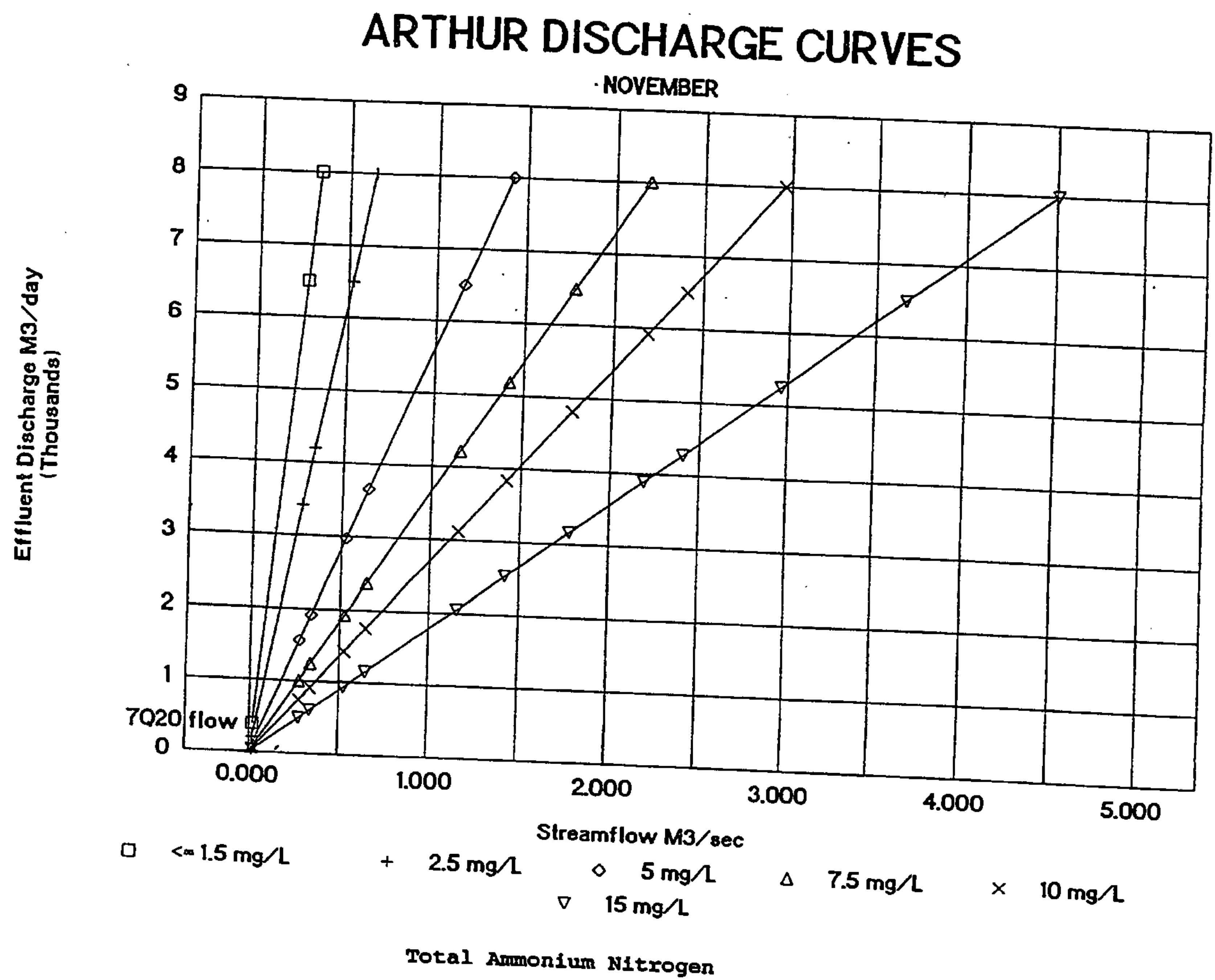


ARTHUR WPCP DISCHARGE CURVES

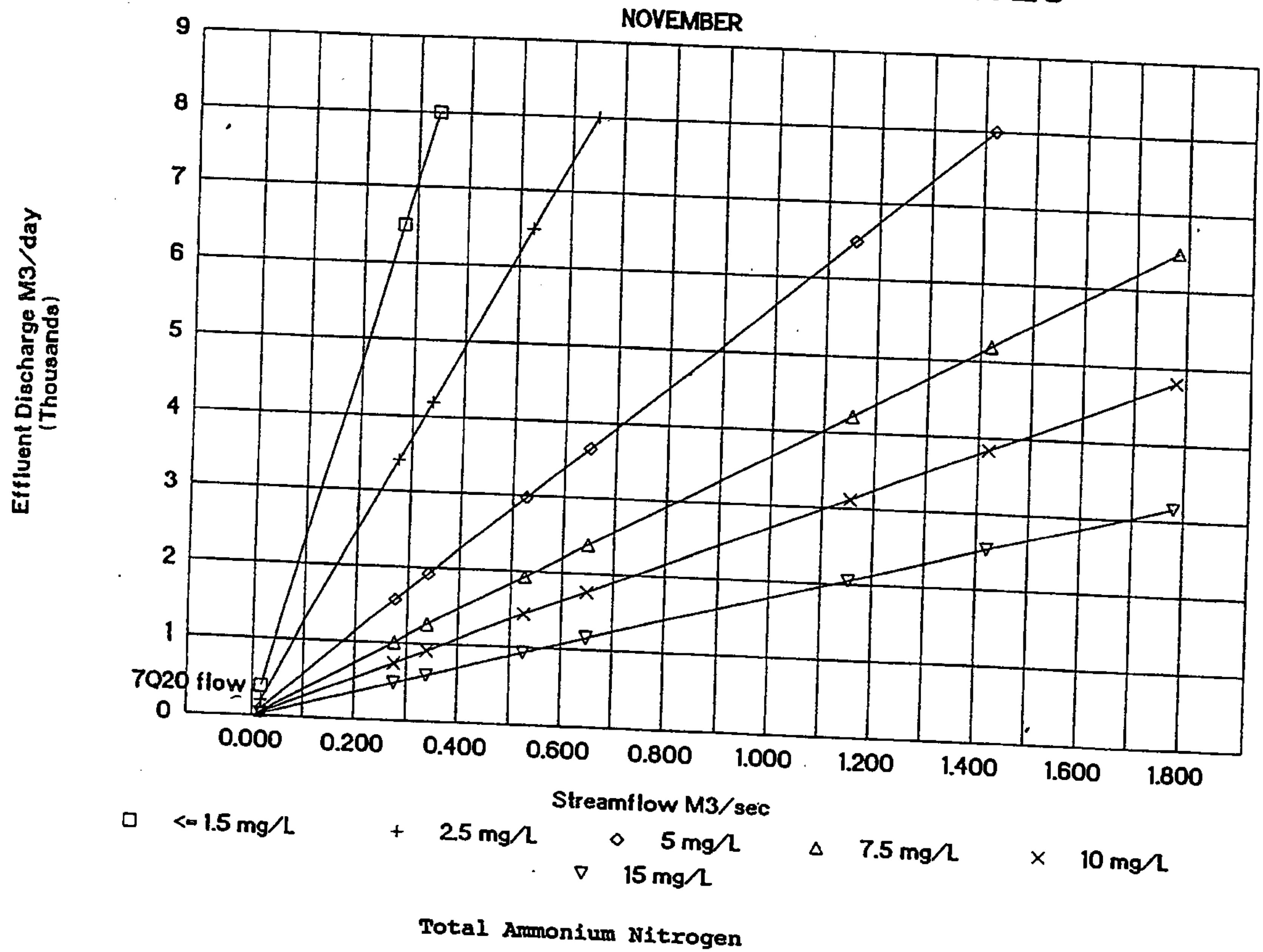


ARTHUR WPCP DISCHARGE CURVES

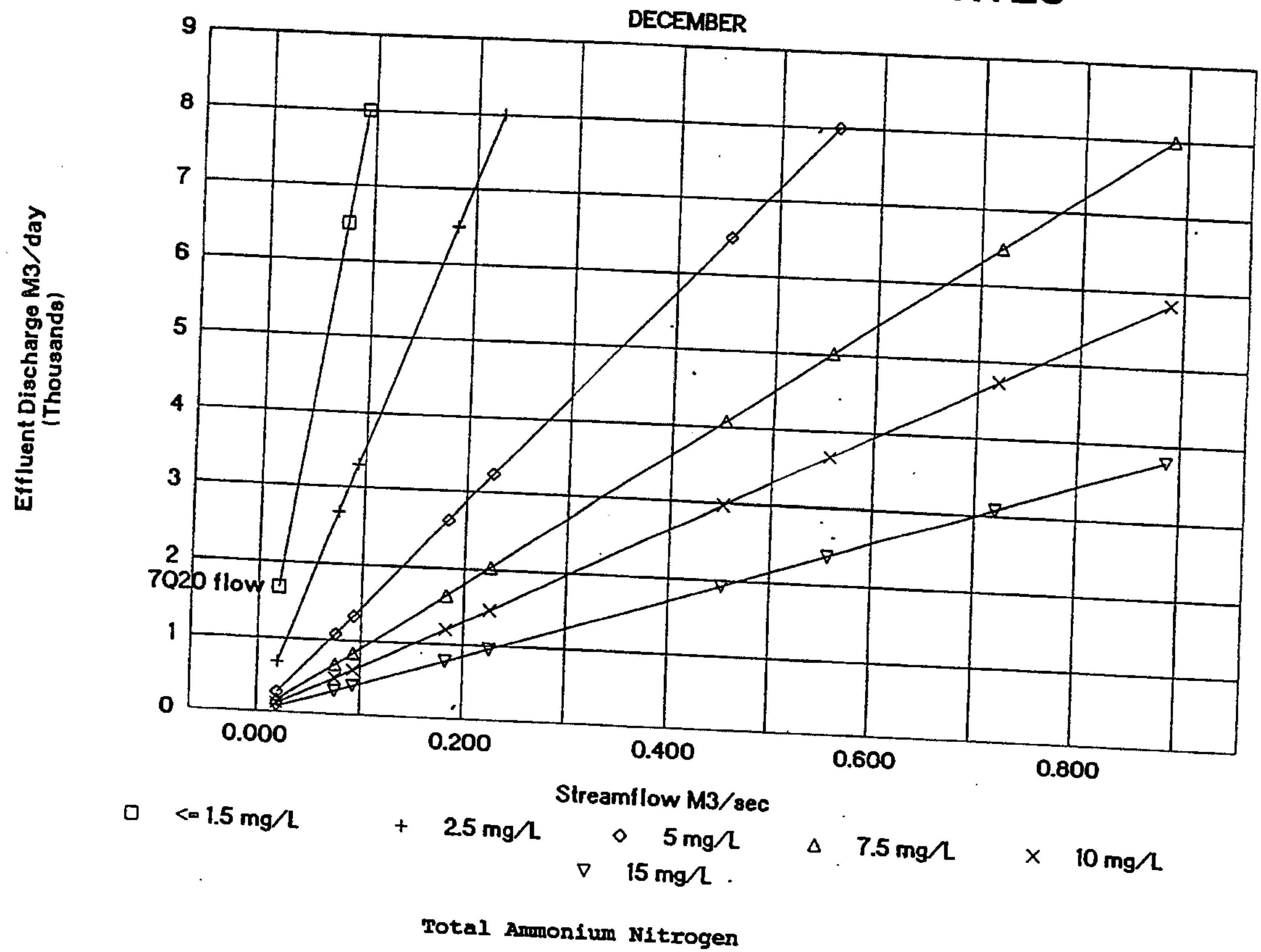


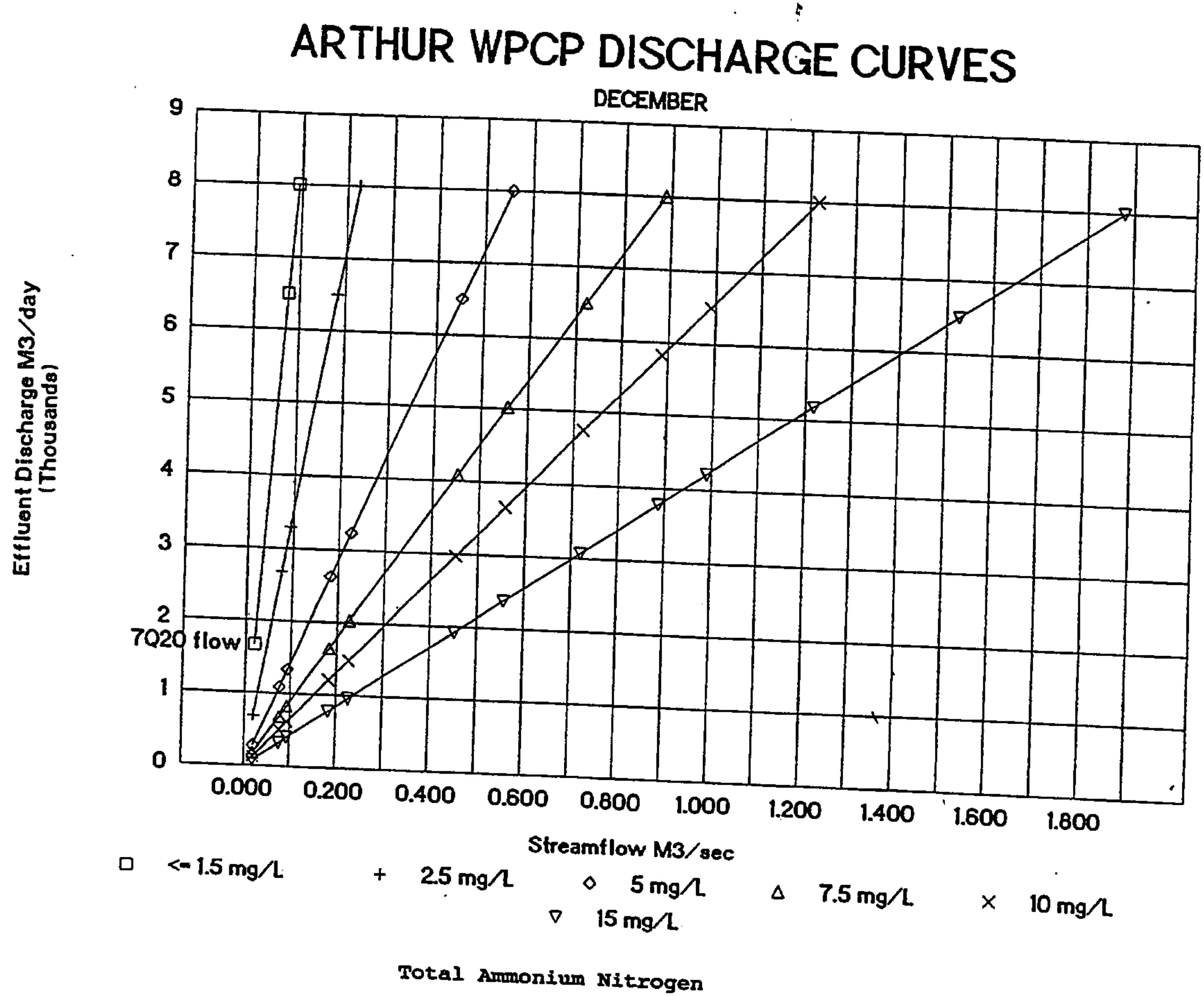

ARTHUR DISCHARGE CURVES
NOVEMBER
Effluent Discharge M3/day
(Thousands)
9
8
7
6
5
4
3
2
1
7Q20 flow
0
0.000
1.000
2.000
3.000
4.000
5.000
Streamflow M3/sec
<= 1.5 mg/L
+ 2.5 mg/L
◇ 5 mg/L
△ 7.5 mg/L
× 10 mg/L
▽ 15 mg/L
Total Ammonium Nitrogen

ARTHUR WPCP DISCHARGE CURVES



ARTHUR WPCP DISCHARGE CURVES





ARTHUR WPCP DISCHARGE CURVES
DECEMBER
Effluent Discharge M3/day
(Thousands)
9
8
7
6
5
4
3
2
7Q20 flow
1
0
0.000
0.200
0.400
0.600
0.800
1.000
1.200
1.400
1.600
1.800
Streamflow M3/sec
<= 1.5 mg/L
2.5 mg/L
5 mg/L
7.5 mg/L
10 mg/L
15 mg/L
Total Ammonium Nitrogen

APPENDIX B

PROJECTED FUTURE SERVICE POPULATION AND AVERAGE DAY WASTEWATER FLOWS

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.: 3-3167-01-01
January 20, 2016

TECHNICAL MEMORANDUM
PROPOSED DESIGN FLOWS
ARTHUR WWTP CLASS EA

Prepared for:

TOWNSHIP OF WELLINGTON NORTH
P.O. Box 125, 7490 Sideroad 7 W
Kenilworth, Ontario
N0G 3E0

Attention: Mr. Barry Trood

Prepared by:

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

TABLE OF CONTENTS

TABLE

FIGURE

1. INTRODUCTION

1.1 Background

The Arthur Wastewater Treatment Plant (WWTP) provides tertiary treatment for wastewater generated in the Village of Arthur. The plant is operated under Ministry of the Environment (MOE) Certificate of Approval (CofA) No. 3-1256-88-908 issued August 9, 1990. The Arthur WWTP has an average day CofA rated capacity of 1,465 m^3/d. During the period May 1 to September 15, flow from the secondary treatment system is pumped to holding ponds for storage. During the period September 16 to April 30, effluent from the plant can be discharged to the Conestogo River. During this discharge period, the holding pond contents are combined with the plant's secondary clarifier effluent, and this flow is then treated by the tertiary filter and UV disinfection system prior to discharge to the Conestogo River.

The Township of Wellington North (the Township) wishes to proceed to determine the most cost effective, environmentally sound and sustainable approach to upgrade the Arthur WWTP to provide servicing to a design year of 2031. To meet the servicing requirements of future growth in the service area, the Arthur WWTP may need to be expanded beyond its existing rated capacity. As such, this project is a Schedule C activity under the Municipal Class Environmental Assessment (Class EA) process. XCG Consultants Ltd. has been retained by the Township to undertake the Arthur WWTP Class EA.

This Technical Memorandum (TM) presents the future average day flow (ADF) projections to 2031, and the future servicing needs for the Arthur WWTP based on planning projections for growth within the servicing area.

1.2 Objective

The objective of this TM is to estimate the projected ADF from the Arthur WWTP service area to 2031.

2. EXISTING AND FUTURE SERVICING NEEDS

The future servicing needs for the Village of Arthur are based on the historic flows from the existing service area, plus the projected flows attributed to future residential and industrial/commercial/institutional (ICI) development.

2.1 Residential Population

2.1.1 Population Projections

Population projections for the Village were based on figures provided in the Wellington County Official Plan and information provided by the Wellington County Planning Department. The future residential serviced population was estimated based on the following information.

- The designation of the Village of Arthur as a serviced Village specifies that new development should be serviced by municipal water and wastewater under the Wellington County Official Plan. Therefore, it was assumed that all projected residential growth in the Village of Arthur would be serviced by the Arthur WWTP.
- Any existing residential population currently on private septic systems will remain as such.

The Wellington County Official Plan outlines total population and households for the Village of Arthur from 2011 to 2031, as provided in Table 2.1 and Figure 2.1. Staff from the Wellington County Planning Department confirmed that the information in Table 2.1 represents the most current forecast (Personal Communication, Mary McElroy, Policy Planner, County of Wellington, November 19, 2012).

Table 2.1 Population Projections for Village of Arthur

Community	Year					
	2006	2011	2016	2021	2026	2031
Total Population	2,430	2,540	2,690	2,830	3,070	3,310
Households	870	930	990	1,050	1,160	1,260

Source: Wellington County Official Plan. 1999. Revised to February 2011. Part 3. Wellington Growth Strategy, Table 2, P. 10.

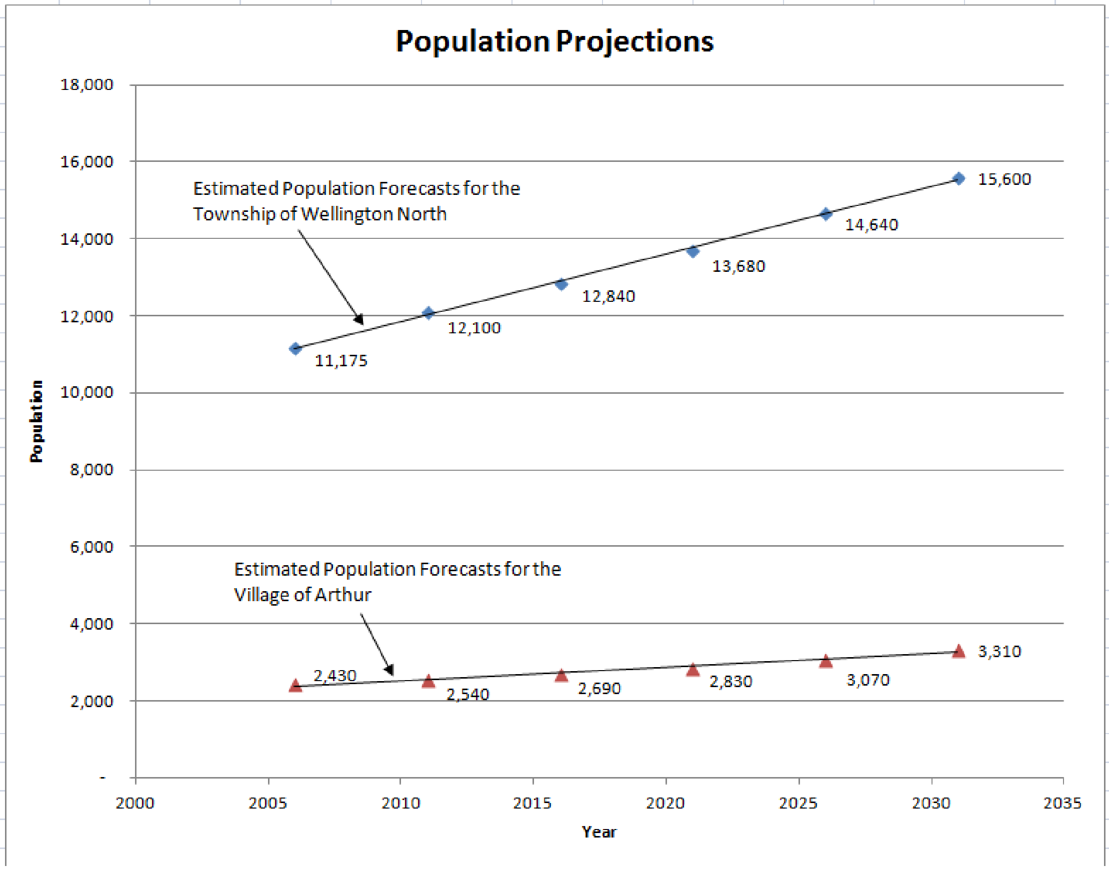


Figure 2.1 Population Projections for the Township of Wellington North and Village of Arthur

In addition to the population projections provided in Table 2.1, the projected residential flows outlined in Section 2.1.3 include 103 proposed lots for Phase 3 of the Eastridge Landing subdivision. In response to the Notice of Commencement (NoC) for this Class EA, the developers of the Eastridge Landing subdivision advised that they would be submitting a Draft Plan of Subdivision to the County of Wellington for the next phase of their development in Arthur in January 2013. Phase 3 of their development will consist of a mix of single detached homes, semis and townhouses. The developers anticipate that the proposed Draft Plan will be split into two phases with the first phase consisting of 47 lots. These Draft Plan lands are currently designated as Future Development.

County of Wellington Planning staff advised that there was no allowance for the proposed Phase 3 Eastridge Landing subdivision in the population projections provided in Table 2.1 since an Official Plan amendment would be required in order to re-designate the lands from Future Development to Residential, in keeping with Policy 8.10: Future Development of the Wellington County Official Plan (Personal Communication, Mary McElroy, Policy Planner, County of Wellington, January 8, 2013.)

While recognizing the policy position of the County, it was concluded that given the potential timing for the development of the Phase 3 Eastridge Landing subdivision, it would be prudent to include the proposed 103 lots for determining projected residential wastewater flows for this Class EA.

2.1.2 Current Serviced Population and Per Capita Flows

The historical serviced population for the Arthur WWTP was estimated to determine the existing per capita flows. The 2012 serviced population (2,596 people) was estimated based on the Township reported number of 941 residential wastewater service connections in Arthur, and a persons per unit (ppu) of 2.76 as established in the Class EA Master Plan Study For Water Supply and Sanitary Sewage System (Triton Engineering, 2012). Service populations for 2007 to 2010 were interpolated based on the 2006 and 2011 population projections from the County Official Plan.

Table 2.2 presents the estimated historical serviced populations to the Arthur WWTP. The table includes the ADF and estimated dry weather flow (DWF) to the plant, as well as the estimated per capita flows. A historical analysis of DWF was conducted to estimate the ADF associated with raw wastewater flow currently conveyed to the plant exclusive of extraneous flow (infiltration and inflow, I/I). The analysis of DWF was conducted based on flow data from 2007 to 2012 and meteorological data from Environment Canada. Days were considered dry when no precipitation occurred for that day and three days prior.

Table 2.2 Historical Serviced Population and Flows

Year	Arthur WWTP Service Population	ADF (m^3/d) (1)	Per Capita Flow (L/cap·d)	Estimated DWF (1,2) (m^3/d)	Estimated Per Capita DWF (L/cap·d)	Estimated Per Capita I/I (L/cap·d)
2007	2,452	986	402	656	268	135
2008	2,474	1,265	511	815	329	182
2009	2,496	1,094	438	1,043	418	20
2010	2,518	1,138	452	1,094	434	17
2011	2,540	1,231	485	837	330	155
2012	2,596	1,313	506	1,131	436	70
Average	**2,513**	**1,171**	**466**	**929**	**369**	**97**

Notes:
ADF - average day flow
DWF - dry weather flow
1. Current estimated residential flows based on the historic recorded average day flow (ADF) to the Arthur WWTP less the historic estimated average contribution (from July 2011 to June 2012) from Golden Valley Farms of 171 m^3/d.
2. Days were considered dry when no precipitation occurred for that day and three days prior.

Based on Table 2.2, the historic 6-year average per capita flow to the Arthur WWTP was 466 L/cap·d, inclusive of industrial/commercial/institutional (ICI) contributions, with the exception of contributions from Golden Valley Farms, and inflow/infiltration (I/I). Based on the DWF, the historic per capita (dry weather) flow, exclusive of I/I, was about 369 L/cap·d. This value is consistent with the typical range of per capita flows of 225 to 450 L/cap·d, exclusive of extraneous flows (MOE, 2008). The average per capita I/I flow was 97 L/cap·d, which is slightly higher than the MOE Design Guideline value of 90 L/cap·d (MOE, 1985).

2.1.3 Projected Residential Wastewater Flow

Projected residential wastewater flows for new growth were developed based on a design per capita dry weather flow of 370 L/cap·d and an average I/I allowance of 90 L/cap·d for new growth. This I/I allowance is marginally lower than historic values due to the assumption that new development should have less I/I contributions than historic I/I contributions from older infrastructure. This overall per capita flow of 460 L/cap·d should provide a conservative estimate of future residential flows, as historic per capita flow values included ICI contributions.

Future residential land use to 2031also includes the 103 proposed lots for Phase 3 of the Eastridge Landing subdivision, as detailed in Section 2.1.1. Based on a historic ppu of 2.76, the Eastridge development will approximately increase the population by an additional 284 people within the 2031 development period, and a flow of 131 m^3/d.

The projected 2031 population (see Table 2.1) of Arthur is 3,310 people. The total projected 2031 population, including Phase 3 of the Eastridge Landing subdivision, is 3,594 people. Based on current average day flows of 1,171 m^3/d (not including the Golden Valley contribution), and a per capita flow of 460 L/cap·d, the total projected residential wastewater flow to the Arthur WWTP in 2031 is 1,630 m^3/d.

2.2 Non-Residential Wastewater Flow Projections

The Arthur WWTP currently provides service to 106 ICI properties according to Township records. These 106 ICI properties are included in the historic 6-year average per capita flow to the Arthur WWTP, with the exception of contributions from Golden Valley Farms (see Section 2.2.1).

Future non-residential (commercial and industrial) land use to 2031 was based on planning information provided by the Wellington County Planning Department and the Class Environmental Assessment Master Plan Study for Water Supply and Sanitary Sewage System (Triton Engineering, 2012). The future non-residential land use to 2031 is summarized below:

- one vacant designated industrial parcel with a gross area of 77.6 acres and estimated 62.1 acres (25.1 hectares) of which are developable;

- one vacant designated Highway Commercial parcel with a gross area of 5.9 acres and an estimated developable area of 4.4 acres[1];
- one designated Highway Commercial parcel (i.e. the AVCOM Property) with an area of 4.4 acres[2]; and
- nine (9) equivalent residential units have been added to reflect the remaining unused portion of the Golden Valley Farms allocation.

Wellington County Planning and Development Department noted that the above lands do not include parcels which currently have buildings on them. It is not possible to estimate future expansions of existing businesses which may be on 'oversized' parcels.

ICI flow rates can vary widely depending on the function and activity on the lands. Typical unit flow rate allowances are shown below (Metcalf and Eddy, 2003):

- Commercial development: 7.5 to 14 m^3/ha·d;
- Light industrial development with little to no wet-process-type industries: 7.5 to 14 m^3/ha·d; and
- Medium industrial development: 14 to 28 m^3/ha·d.

A unit demand for the ICI contribution was assumed to be 14 m^3/ha·d. The ICI contribution incorporates both the Highway Commercial land (3.6 ha) and the Industrial land (25.1 ha). Based on the DWF analysis of the historic flows to the plant (see Table 2.2), the historical average day extraneous flow was approximately 21 percent of the ADF. As such, an average I/I allowance of 3 m^3/ha·d (21 percent of 14 m^3/ha·d) was applied.

Based on a total commercial and industrial land of 28.7 ha and a unit flow rate of 17 m^3/ha·d, additional ICI flows projected to 2031 are expected to be 488 m^3/d. This value is exclusive of contributions from the largest industrial contributor, Golden Valley Farms (see Section 2.2.1).

2.2.1 *Additional Industrial Contributions - Golden Valley Farms Inc.*

Golden Valley Farms (Golden Valley) is the single largest contributor of industrial flows to the Arthur WWTP. Historically, flows from Golden Valley have represented approximately 13 percent of the total hydraulic loading to the Arthur WWTP.

Historic water usage and wastewater volumes from Golden Valley are presented in Table 2.3.

---

[1] Both designated Highway Commercial properties are located at the intersection of County Road 109 and Highway 6.
[2] The AVCOM Property is a mixed commercial/retail development. The Township has indicated that a strip commercial plaza has been recently completed on this site. All of the units are not rented; however, a fast food restaurant and a car wash are now operating on-site (Personal Communication, Dale Small, Economic Manager, Township of Wellington North, November 27, 2012).

Table 2.3 Historic Industrial Wastewater and Water Use - Golden Valley

Parameter	July to December 2011	January to June 2012	Average (1)
Water Usage (m^3)	37,005	34,953	35,985
Water to Town (m^3)	32,009	30,059	31,039
Average Daily Water to Town (m^3/d)	175	166	171

Notes:
1. Weighted average based on 183 days from July to December 2011, and 181 days from January to June 2012.

The Golden Valley processing plant operates on one shift per day Monday through Friday, with only sanitation and cooking taking place in the evening. This consistent plant schedule provides a consistent flow of effluent to the Arthur WWTP.

Golden Valley is not currently using all of their wastewater allocation to the Arthur WWTP. As noted in the 2012 Reserve Capacity Calculations for the Arthur WWTP (Triton Engineering, 2012), an additional nine (9) equivalent residential units have been added to the 2031 development scenario to reflect the remaining unused portion of the Golden Valley allocation.

2.3 Overall Future Servicing Needs

Table 2.4 presents the future projected flows due to contributions from residential sources, commercial/industrial sources, and Golden Valley to 2031.

As can be seen in Table 2.4, the projected 2031 average wastewater flows exceed the existing Arthur WWTP ADF rated capacity of 1,465 m^3/d. As a result, additional wastewater servicing capacity must be provided to accommodate planned growth in the service area. Based on conservative estimates of the potential wastewater flow reductions that could be achieved by a combination of water conservation and I/I reduction, it is unlikely that these measures alone would eliminate the need to provide additional wastewater treatment capacity to service projected growth.

Based on the flow projections, a design ADF capacity of 2,300 m^3/d is proposed to provide servicing to the year 2031. If it is assumed that the flows will increase linearly over the planning period, then it is anticipated that the average day flows to the Arthur WWTP will exceed the existing C of A rated capacity of 1,465 m^3/d in about 2016. It should be noted that in a small community like Arthur, one major development can significantly increase the flows to the WWTP and affect the timeline for needed expansion.

Table 2.4 Arthur WWTP 2031 Flow Projections

Parameter	Value
Residential Flow Projections	
2012 Service Population	2,596
Historical ADF	1,171 m^3/d
Future Eastridge Contribution	103 lots
2031 Projected Service Population	3,310
2031 Service Population incl. Eastridge	3,310 + 284 = 3,594
Population Growth	998
Design Per Capita Flow	370 L/cap.d
Design Per Capita Average I/I	90 L/cap.d
2031 Residential Flow	1,630 m^3/d
ICI Flow Projections	
Industrial - Golden Valley Historic Flows	171 m^3/d
Industrial - Golden Valley Additional Growth	9 equivalent residential units
Industrial - Golden Valley Flows	9 units * 2.76 ppu * 460 L/cap.d = 11 m^3/d 171 m^3/d + 11 m^3/d = 182 m^3/d
Highway Commercial Land	3.6 ha
Industrial Land	25.1 ha
Unit Flow Rate	14 $m^3/ha·d$ (unit flow rate) 3 $m^3/ha·d$ (I/I allowance)
Commercial/Industrial Land Flows	28.7 ha * 17 $m^3/ha·d$ = 488 m^3/d
Total ICI Flow Projections	670 m^3/d
TOTAL 2031 FLOW PROJECTION	**2,300 m^3/d**

APPENDIX C
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.: 3-3167-01-01
June 6, 2013

TECHNICAL MEMORANDUM
SUMMARY OF EXISTING CONDITIONS
ARTHUR WWTP

Prepared for:

TOWNSHIP OF WELLINGTON NORTH
P.O. Box 125, 7490 Sideroad 7 W
Kenilworth, Ontario
N0G 3E0

Attention: Mr. Barry Trood
Water & Sewer Superintendant

Prepared by:

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

TABLE OF CONTENTS

TABLE

FIGURE

1. INTRODUCTION

The Arthur Wastewater Treatment Plant (WWTP) provides tertiary treatment for wastewater generated in the Village of Arthur. The plant is operated under Ministry of the Environment (MOE) Certificate of Approval (CofA) No. 3-1256-88-908 issued August 9, 1990. The Arthur WWTP has an average day CofA rated capacity of 1,465 m^3/d. During the period May 1 to September 15, flow from the secondary treatment system is pumped to holding ponds for storage. During the period September 16 to April 30, effluent from the plant can be discharged to the Conestogo River if flows in the river are adequate. During this discharge period, the holding pond contents are combined with the plant's secondary clarifier effluent, and this flow is then treated by the tertiary filter and UV disinfection system prior to discharge to the Conestogo River.

The Township of Wellington North (the Township) wishes to proceed to determine the most cost effective, environmentally sound and sustainable approach to upgrade the Arthur WWTP to provide servicing to a design year of 2031. To meet the servicing requirements of future growth in the service area, the Arthur WWTP may need to be expanded beyond its existing rated capacity. As such, this project is a Schedule C activity under the Municipal Class Environmental Assessment (Class EA) process. XCG Consultants Ltd. has been retained by the Township to undertake the Arthur WWTP Class EA.

1.1 Objectives

The overall objective of this investigation was to assess the current treatment capacity at the Arthur WWTP.

Specific objectives of this Technical Memorandum are:

- To review the historical operation and performance of the Arthur WWTP, and conduct a review of unit processes; and,
- To identify the unit processes that limit the plant's capacity or inhibit the performance of the plant.

1.2 Data Sources

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

- Certificate of Approval No. 3-1256-88-908 for the Arthur WWTP, Ministry of the Environment of Ontario, issued August 9, 1990.
- Arthur Wastewater Treatment Plant Capacity Determination Report, Hydromantis, Inc., July 2007.
- Annual Reports, Arthur WWTP 2007, 2008, 2009, 2010, and 2011.
- Arthur WWTP Plant Drawings, prepared by Triton Engineering Services Limited, dated July 1989.
- Plant performance data, 2007 - 2012.
- Site visit with the Arthur WWTP's Operating Staff on October 1st, 2012.

2. EXISTING WASTEWATER TREATMENT

The Arthur WWTP is an extended aeration (EA) plant, providing tertiary treatment for wastewater generated in the former Village of Arthur. The plant is operated under Ministry of the Environment (MOE) Certificate of Approval (CofA) No. 3-1256-88-908 issued August 9, 1990. The Arthur WWTP has an average day CofA rated capacity of 1,465 m^3/d.

Collection System

The Arthur WWTP collection system consists of a dedicated sanitary sewer collection network, and two sewage pumping stations (SPS). The sanitary sewer collection network includes approximately 19.1 km of sewer ranging in size from 150 mm to 450 mm, 4.4 km of 150 to 250 mm forcemain and approximately 1032 services. The collection system services the entire developed area of Arthur. The collection network is divided into three service areas including: the Wells Street SPS, the Preston Street Trunk Sewer, and the Frederick Street SPS.

The Wells Street SPS includes two fixed speed submersible sewage pumps, one duty and one standby, each rated at 16 L/s at 31 m TDH. The firm rated capacity of the Wells Street SPS is 16 L/s (1,382 m^3/d). The Wells Street SPS discharges though a 1 km length 150 mm diameter PVC/AC forcemain to a manhole at the intersection of Preston and Smith Streets and connects into the Preston Street Trunk Sewer. The Wells Street SPS receives primarily industrial flows from an industrial plant located in the west side of the village.

The Preston Street Trunk Sewer services Preston Street and the western portion of Domville Street, along with the Wells Street SPS discharge. The Preston Street Trunk Sewer conveys sewage by gravity directly into the Arthur WWTP.

The Frederick Street SPS includes two submersible sewage pumps with variable frequency drives, one duty and one standby, each rated at a maximum flow of 58.4 L/s at 14 m TDH. The firm rated capacity of the Frederick Street SPS is 58.4 L/s (5,046 m^3/d). The Frederick Street SPS pumps directly into the Arthur WWTP through a 750 m long, 250 mm diameter forcemain. The Frederick Street SPS receives the majority of the flows in the community, and services primarily commercial and residential properties. The Frederick Street SPS pumps directly into the Arthur WWTP via a 250 mm diameter forcemain.

Plant Description

The Arthur WWTP was commissioned in 1990. Raw wastewater enters the Arthur WWTP through the headworks consisting of two manually cleaned grit channels equipped with a proportional weir, a comminutor, and a manually raked screen connected in parallel to the comminutor.

Screened wastewater flows through a manually adjustable weir gate to a circular combined treatment unit (CTU), consisting of two outer aeration tanks and one inner circular clarifier. Flow is split evenly between the two cell annular ring type aeration tanks, each equipped with a coarse bubble air diffusion system consisting of approximately 84 coarse bubble air diffusers in each aeration cell. The two cell annular ring aeration tanks provide a total liquid volume of 1,073 m^3.

Alum is added to the mixed liquor immediately downstream of the aeration tanks and upstream of the secondary clarifier. Final clarification is provided by one 13.5 m diameter centre inlet clarifier as a part of the CTU. The secondary clarifier is equipped with a sludge collector mechanism and a scum skimming mechanism.

Settled sludge flows from the secondary clarifier to a 50 m^3 sludge hopper. Sludge is pumped from the sludge hopper via two variable speed submersible sludge pumps. One pump is dedicated to returning return activated sludge (RAS) to upstream of the aeration tanks and one pump is dedicated to pumping waste activated sludge (WAS) to the aerobic digester.

During periods where the Arthur WWTP cannot discharge due to low flows in the river (nominally from May 1 to September 15), secondary effluent is pumped to the holding ponds for storage. During the discharge period (September 16 to April 30), if there is adequate flow in the Conestogo River, the holding pond contents are combined with the plant's secondary clarifier effluent, filtered, and discharged.

There are three holding ponds located at the northeast side of the village, each with a capacity of 133,300 m^3, 87,200 m^3, and 122,500 m^3, for a total storage volume of 343,000 m^3. All flow being pumped to the holding ponds and returned to the plant is measured via an electromagnetic flow meter.

Tertiary filtration is provided by six continuous backwash, upflow, deep bed granular media (CUF) filter modules. The effluent filters have a total filtration area of 27.9 m^2. Filter reject water is returned to upstream of the aeration tanks. Tertiary effluent is disinfected by a ultraviolet (UV) disinfection system consisting of two banks of UV lamps in series. Each bank of UV lamps contains 8 modules with 4 lamps per module.

A composite auto-sampler is located between the two banks of UV lamps and takes final effluent samples to monitor effluent quality from the plant. Final effluent flow is measured by a Parshall flume then discharged through the outfall to the Conestogo River.

Sludge produced at the Arthur WWTP is treated in a two-stage aerobic digestion proceess. Air to the digesters is provided by coarse bubble diffusers and two blowers. Digested sludge is stored in four 150 m^3 sludge storage tanks prior to being hauled for land application.

Table 2.1 summarizes the unit process design for the Arthur WWTP. A process flow schematic of the Arthur WWTP is shown in Figure 2.1.

Table 2.1 Summary of Existing Process Design - Arthur WWTP

Unit Process	Design Parameters (1)
Grit Removal	
Type	Manually cleaned Grit Channels
Number	2
Dimensions	5.4 m x 0.75 m x 0.5 m SWD
Capacity	5,045 m^3/d
Comminution	
Capacity	5,045 m^3/d
Screening	
Type	Manually cleaned
Capacity	5,045 m^3/d
Aeration Tank	
Number	2 cell annular ring type aeration tank
Dimensions	27.95 m Equivalent Length x 4.65 m x 4.18 m SWD - Cell 1 27.26 m Equivalent Length x 4.65 m x 4.18 m SWD - Cell 2
Volume (each cell)	543 m^3 - Cell 1 530 m^3 - Cell 2
Volume (total)	1,073 m^3
Diffuser Type	Coarse Bubble
Blowers	
Number	2 (1 duty, 1 standby)
Capacity	486 L/s, each
RAS/WAS Pumps	
Number	2
Capacity	34 L/s, each
Storage Volume	50 m^3
Secondary Clarifier	
Type	Circular inlet clarifier
Number	1
Dimensions	13.5 m diameter x 3.8 m SWD
Surface Area	143 m^2
Chemical Pumps (Alum)	
Number	2 (1 duty, 1 standby)
Capacity	250 L/d, each
Chemical Storage Volume	23 m^3 storage tank & 450 L day tank
Tertiary Filtration	
Type	Continuous backwash, upflow, deep bed granular media (1 m depth)
Number of Modules	6
Total Filtration Area	27.9 m^3
Backwash pumps	2 wash water reject pumps (1 duty), each rated at 6.1 L/s at 3.5 m TDH
UV Disinfection	
No. of banks	2 banks in series
Modules Per bank	8
Lamps per module	4
Channel dimension	7.9 m long x 0.5 m wide x 0.9 m SWD
Capacity	6,500 m^3/d
Effluent Pumps to Holding Ponds	

Unit Process	Design Parameters (1)
Type Number Capacity	Horizontal split case 2 58.5 L/s @ 64 m TDH
Effluent Storage Facilities Type Number Total Volume	 Holding Ponds 3 340,000 m^3
Aerobic Digestion Primary Digester Dimensions Volume Secondary Digester Dimensions Volume	 9.4 m x 6.5 m x 5.0 m SWD 305.5 m^3 5.0 m x 6.5 m x 5.0 m SWD 162.5 m^3
Sludge Storage Number of Tanks Dimensions (each) Volume (each) Volume (total)	 4 6 m x 5 m x 5 m SWD 150 m^3 600 m^3
Sludge Transfer Pumps Type Number Capacity	 Horizontally mounted end suction 2 38 L/s @ 12 m TDH
Digester Supernatant Pumps Number Capacity	 2 7.5 L/s @ 6 m TDH
Secondary Digester Decant Pump Number Capacity	 1 6 L/s @ 4 m TDH
Sludge Blowers Number Capacity	 2 150 L/s, each

Note:
1. Based on the Certificate of Approval (C of A) No. 3-1256-88-908, issued August 9, 1990.

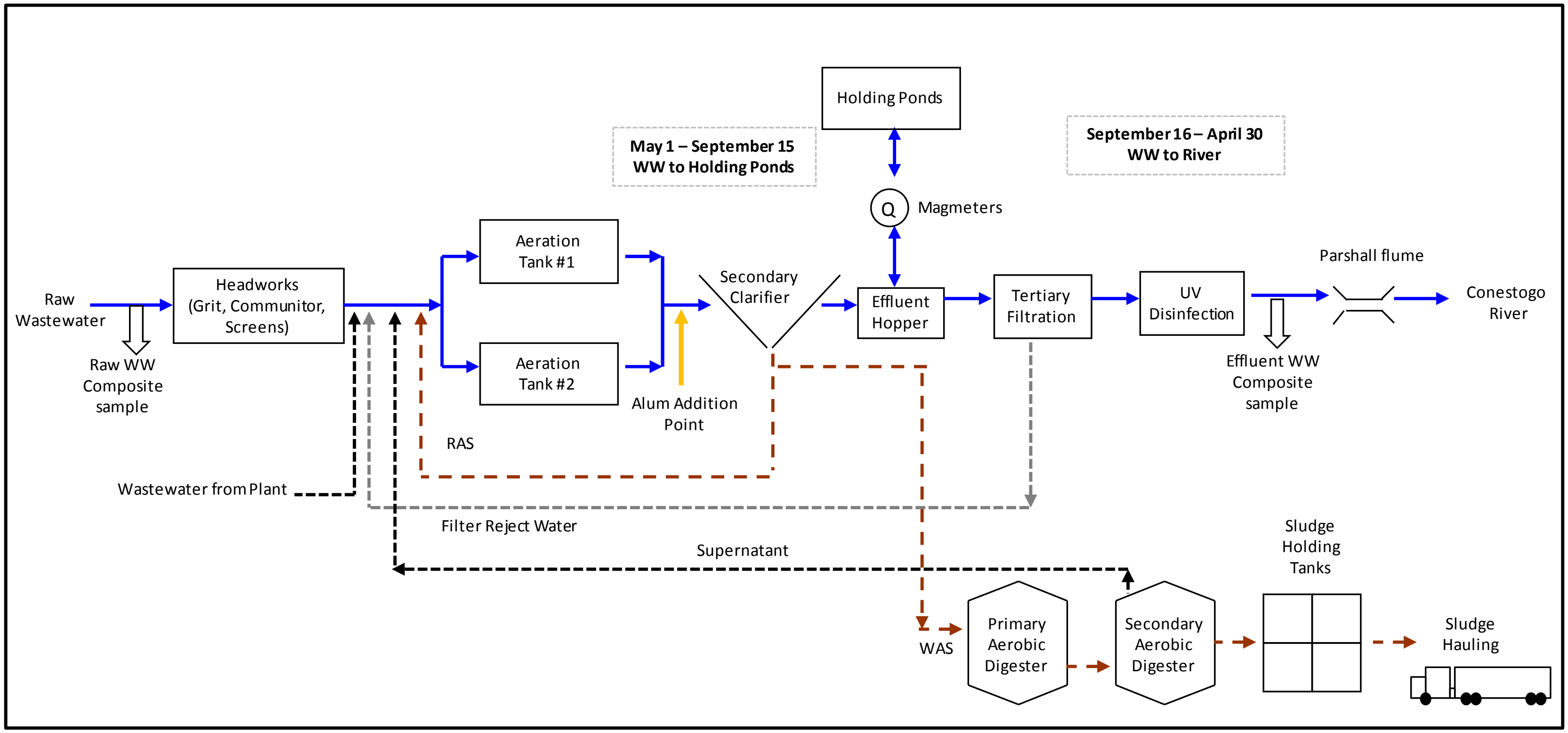


Figure 2.1 Process Flow Diagram of the Arthur WWTP

2.1 Treatment Requirements

The Arthur WWTP operates under CofA Number 3-1256-88-908 issued on August 9, 1990 and has a rated ADF capacity of 1,465 m^3/d.

The CofA specifies annual concentration limits for biological oxygen demand (BOD_5), Total Suspended Solids (TSS), Total Phosphorous (TP), total ammonia nitrogen (TAN), and *E. coli*. Monthly compliance limits are also included for BOD_5, TSS, TP, and TAN. The effluent non-compliance limit for *E. coli* is 200 organisms/100 mL (average geometric mean density).

Table 2.2 presents the CofA effluent limits for the Arthur WWTP. There are no effluent objectives in the CofA.

Table 2.2 CofA Non-Compliance Limits

Parameter	Average Annual Concentration (mg/L)	Average Monthly Concentration (mg/L)	Annual Average Loading[2] (kg/d)
BOD_5	10	15	14.65
TSS	10	15	14.65
TP	1	1	1.47
TAN	1.5	2.3	2.2
E. coli [1]	200 counts/100mL		

Notes:

Effluent from the plant may be discharged directly to the Conestogo River from September 16 to April 30, provided that there is adequate flow in the river.

1. Based on average geometric mean density.
2. Based on an average day flow of 1,465 m^3/d.

3. WASTEWATER FLOWS AND CHARACTERISTICS

3.1 Historical Flows

Wastewater is conveyed to the plant through the Wells Street SPS, the Preston Street Trunk Sewer, and the Frederick Street SPS. The Wells Street SPS pumps to a manhole at the intersection of Preston and Smith Streets and connects into the Preston Street Trunk Sewer. The Preston Street Trunk Sewer flows by gravity directly into the Arthur WWTP, and the Frederick Street SPS pumps directly into the Arthur WWTP.

Effluent flow is measured by a Parshall flume prior to discharge to the Conestogo River. Raw wastewater flow to the Arthur WWTP is not measured; raw wastewater flows are calculated as the difference between effluent flow and net flow to and from the holding ponds on a daily basis.

Table 3.1 summarizes the historical average day flow (ADF) and maximum day flow (MDF) for both the raw flow and the final effluent flow from the Arthur WWTP. The historic review period is from 2007 to 2012.

Table 3.1 Summary of Historical Flow (2007 – 2012)

Year	Estimated Raw Sewage Flow			Final Effluent/Discharge Flow		
	Average Day Flow (m^3/d)	Maximum Day Flow		Average Day Flow (m^3/d)	Maximum Day Flow	
		(m^3/d)	MDF Factor		(m^3/d)	MDF Factor
2007	1,157	5,559	4.8	1,213	7,431	6.1
2008	1,436	5,284	3.7	1,381	5,821	4.2
2009	1,265	5,875	4.6	1,632	5,925	3.6
2010	1,309	4,157	3.2	1,294	4,837	3.7
2011	1,402	5,035	3.6	1,458	5,667	3.9
2012	1,484	4,365	2.9	1,579	5,929	3.8
Overall	1,342	5,875	4.4	1,426	7,431	5.2
CofA Rated Capacity	1,465	6,500	-	-	-	-

The historic estimated raw sewage flow average ADF to the Arthur WWTP (2007 - 2012) was 1,342 m^3/d, which is equivalent to 92 percent of the plant's CofA rated ADF capacity. The highest flow year during this period occurred in 2012, when the plant was operating at 1,484 m^3/d, or approximately 101 percent of the CofA rated capacity. It should be noted that the Arthur WWTP reports raw sewage flow values to the MOE.

No peak hour flow data are available for the Arthur WWTP, as the raw sewage flow is not directly metered. According to Operations Staff, the plant experiences significant wet weather flow events. These wet weather flow events do not typically cause bypasses at the plant due to the capacity of the holding ponds, and the ability that the operators have to divert flow to the holding ponds after secondary treatment.

Figure 3.1 presents the monthly average day and maximum day raw wastewater flows from January 2007 to December 2012 plotted against the CofA rated ADF capacity of 1,465 m^3/d. The current CofA does not have a peak flow rated capacity.

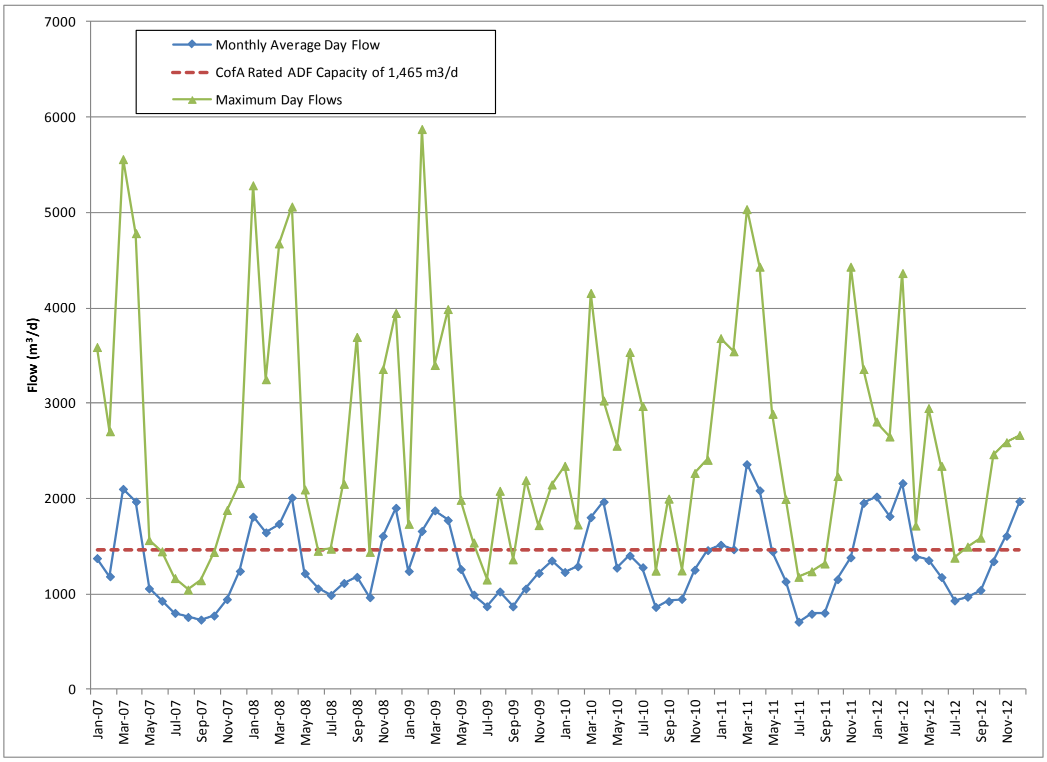


Figure 3.1 Historical Monthly Average Day Flows and Maximum Day Raw Wastewater Flows

Based on Figure 3.1, the historical monthly average day flows have occasionally exceeded the CofA rated ADF capacity; this has historically occurred during the months of January to May coinciding with rain and snow melt events.

Figure 3.2 presents the monthly maximum day final effluent wastewater flows from January 2007 to December 2012.

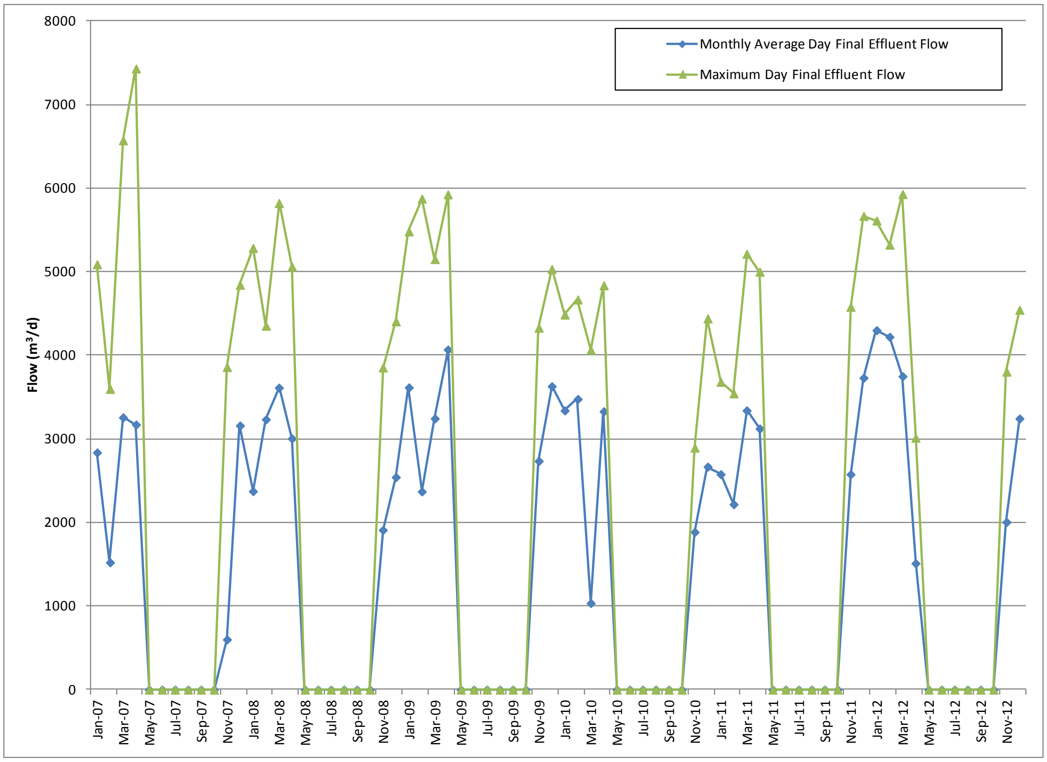


Figure 3.2 Historical Monthly Average Day and Maximum Day Final Effluent Flows

The seasonal discharge period for the Arthur WWTP is from September 16 to April 30. During this period, effluent from the Arthur WWTP can be discharged to the Conestogo River if river flows are adequate. Historically, the Arthur WWTP has not discharged until November due to insufficient flow in the river. The amount of flow that can be discharged is determined by the flow in the river as measured by a stream guage.

3.2 Raw Wastewater Quality

Influent wastewater samples are collected using a raw sewage automatic composite sampler located upstream of the grit channels, prior to preliminary treatment. Table 3.2 presents historical influent wastewater concentrations for 2007 to 2012.

Table 3.2 Historical Influent Wastewater Concentrations

Year	BOD_5 (mg/L)	TSS (mg/L)	TP (mg/L)	TKN (mg/L)
2007	148	184	4.67	34.5
2008	141	134	4.74	27.3
2009	134	141	4.54	35.3
2010	154	157	5.47	35.8
2011	172	118	4.67	31.3
2012	183	133	4.42	31.2
AVERAGE	**154**	**151**	**4.76**	**32.9**
Typical Raw Sewage Concentrations (1, 2)	*110 (low)* *190 (med)* *350 (high)*	*112 (low)* *200 (med)* *400 (high)*	*4 (low)* *7 (med)* *12 (high)*	*20 (low)* *40 (med)* *70 (high)*

Notes:
1. Metcalf and Eddy (2003). Wastewater Engineering: Treatment and Reuse, 4th Ed.
2. The “low”, “med”, and “high” refer to low, medium, and high strength wastewaters. Low strength wastewaters based on approximate flowrate of 750 L/capita/d, medium strength on 460 L/capita/d, and high strength on 240 L/capita/d.

Based on the historic averages, the wastewater can be characterised as low to medium strength with respect to BOD_5, TSS, TP, and TKN.

Table 3.3 presents historical influent wastewater loadings.

Table 3.3 Historical Influent Wastewater Loadings

Year	BOD_5 (kg/d)	TSS (kg/d)	TP (kg/d)	TKN (kg/d)
2007	169 (246)	208 (655)	5.57 (7.05)	40.6 (61.8)
2008	204 (431)	184 (419)	6.65 (10.2)	39.1 (67.8)
2009	169 (373)	173 (304)	5.69 (10.2)	44.8 (80.4)
2010	208 (529)	196 (338)	7.28 (14.5)	48.7 (72.4)
2011	222 (368)	160 (276)	6.2 (12.8)	43.2 (64.9)
2012	263 (402)	189 (332)	6.52 (15.6)	45.4 (79.5)
OVERALL	**206** **(529)**	**185** **(655)**	**6.32** **(15.6)**	**43.6** **(80.4)**
Overall Per Capita Loadings (1)	*82 $gBOD_5$/capita·d*	*74 gTSS/capita·d*	*2.5 gTP/capita·d*	*17.3 gTKN/capita·d*
Typical Per Capita Loadings	*75 $gBOD_5$/capita·d* (2)	*90 gTSS/capita·d* (2)	*3.3 gTP/capita·d* (3)	*13.3 gTKN/capita·d* (3)

Notes:

Values in parentheses represent maximum monthly loadings.

1. Based on the 2007 to 2012 average service population of 2,513 people.
2. MOE (2008)
3. Metcalf and Eddy, 2003

Based on the service population of 2,513, the per capita loadings were 82 g BOD_5/capita·d, 74 g TSS/capita·d, 17.3 g TKN/capita·d and 2.8 g TP/capita·d. The historic per capita loadings for TSS and TP are lower than the typical per capita loadings of 90 g/capita·d values for TSS (MOE, 2008) and 3.3 g/capita·d for TP (Metcalf & Eddy, 2003). The historic per capita loading for BOD_5 and TKN is slightly higher than the typical per capita loading of 75 g/capita·d for BOD_5 (MOE, 2008) and 13.3 g/capita·d for TKN (Metcalf & Eddy, 2003).

3.3 Historic Effluent Quality

Table 3.4 presents historic effluent concentrations for the Arthur WWTP.

Table 3.4 Historic Effluent Wastewater Concentrations (2007 – 2012)

Year	BOD_5 (1) (mg/L)	TSS (1) (mg/L)	TAN (1) (mg/L)	TP (1) (mg/L)	*E.coli* (2) (cts/100 mL)
2007	3.1 (3.8)	4.5 (6.3)	0.12 (0.18)	0.30 (0.42)	10 (24)
2008	2.4 (3.2)	2.9 (3.6)	0.24 (0.53)	0.33 (0.51)	10 (50)
2009	2.6 (3.0)	4.0 (7.3)	0.37 (1.1)	0.31 (0.43)	7 (20)
2010	2.6 (4.0)	4.2 (7.0)	0.16 (0.27)	0.33 (0.53)	4 (6)
2011	2.5 (4.2)	3.6 (6.4)	0.18 (0.25)	0.27 (0.45)	11 (61)
2012	2.1 (2.4)	2.4 (3.0)	0.13 (0.30)	0.18 (0.29)	10 (170)
OVERALL	**2.6 (4.2)**	**3.6 (7.3)**	**0.20 (1.1)**	**0.29 (0.53)**	9 **(170)**
Annual Average Compliance Limits	*10*	*10*	*1.5*	*1*	*200*
Monthly Average Compliance Limits	*15*	*15*	*2.3*	*1*	

Notes:
1. Based on annual average values during the discharge period (from September 16 to April 30). Values in parentheses represent maximum monthly average values during the discharge period.
2. Based on annual geometric mean density during the discharge period (from September 16 to April 30). Values in parentheses represent maximum monthly geometric mean density during the discharge period.

Over the review period (2007 – 2012), there were no non-compliance events for BOD_5, TSS, TAN, TP and *E. coli*.

Figure 3.3, Figure 3.4, Figure 3.5, and Figure 3.6 present the monthly average final effluent concentrations for BOD_5, TSS, TAN, and TP, respectively. The CofA monthly average and annual average effluent compliance limits are also shown for reference.

The Arthur WWTP has historically achieved full nitrification, even in the winter months. Although a maximum monthly average effluent TAN concentration of 1.1 mg/L was recorded in 2009, since 2010, the Arthur WWTP have been able to consistently provide a high level of nitrification with monthly average effluent TAN concentrations ranging from 0.10 mg/L to 0.30 mg/L.

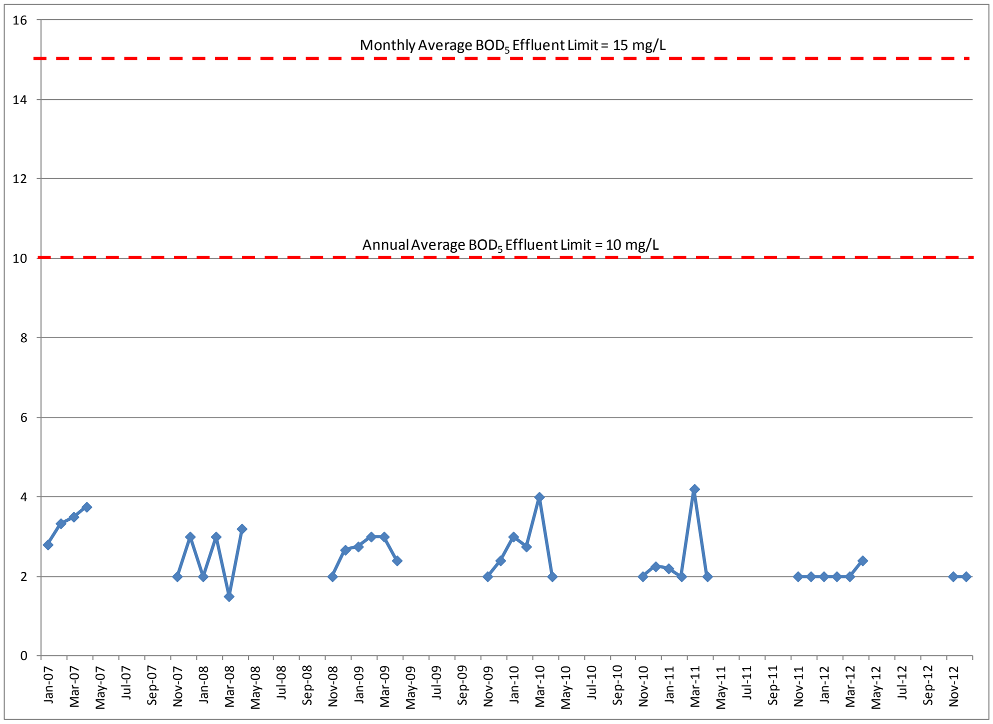


Figure 3.3 Monthly Average Effluent BOD_5 Concentrations

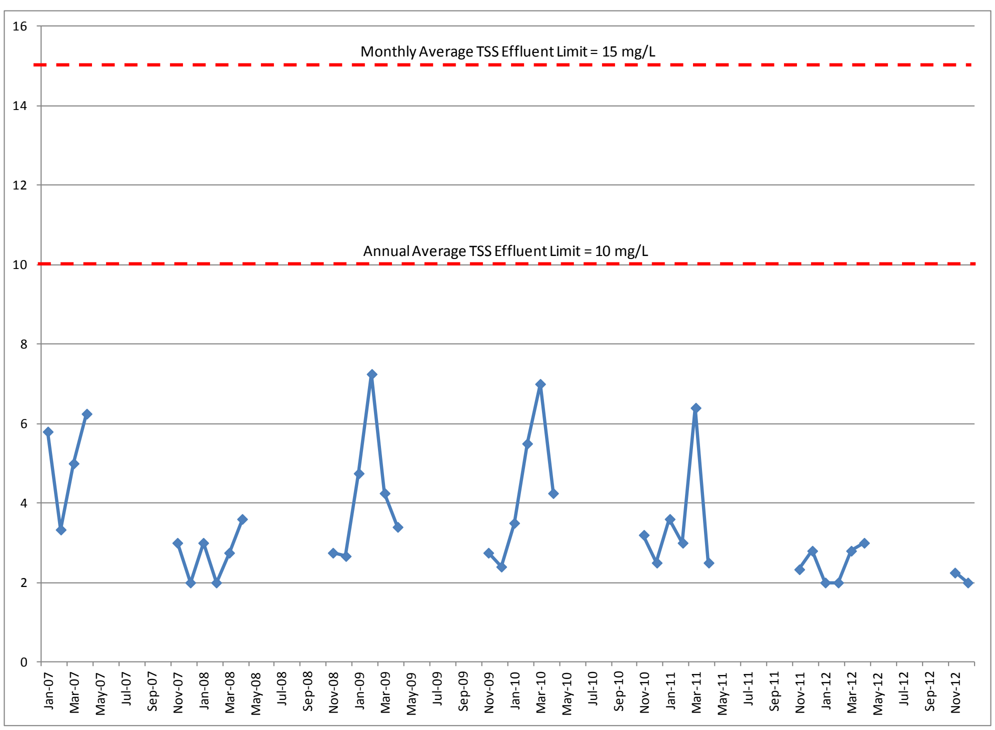


Figure 3.4 Monthly Average Effluent TSS Concentrations

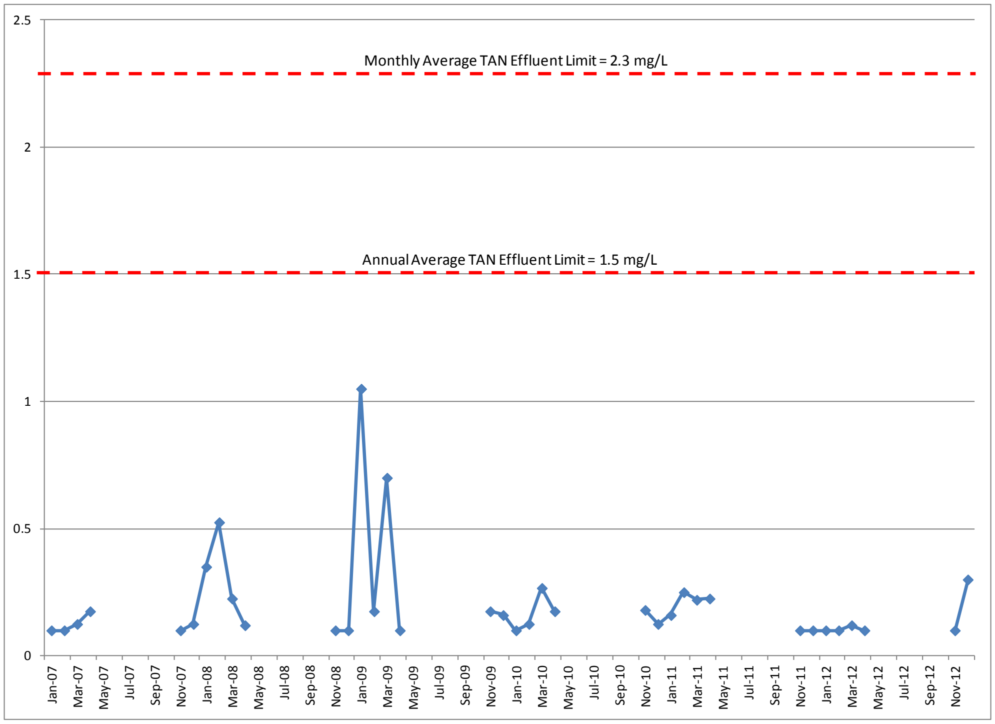


Figure 3.5 Monthly Average Effluent TAN Concentrations

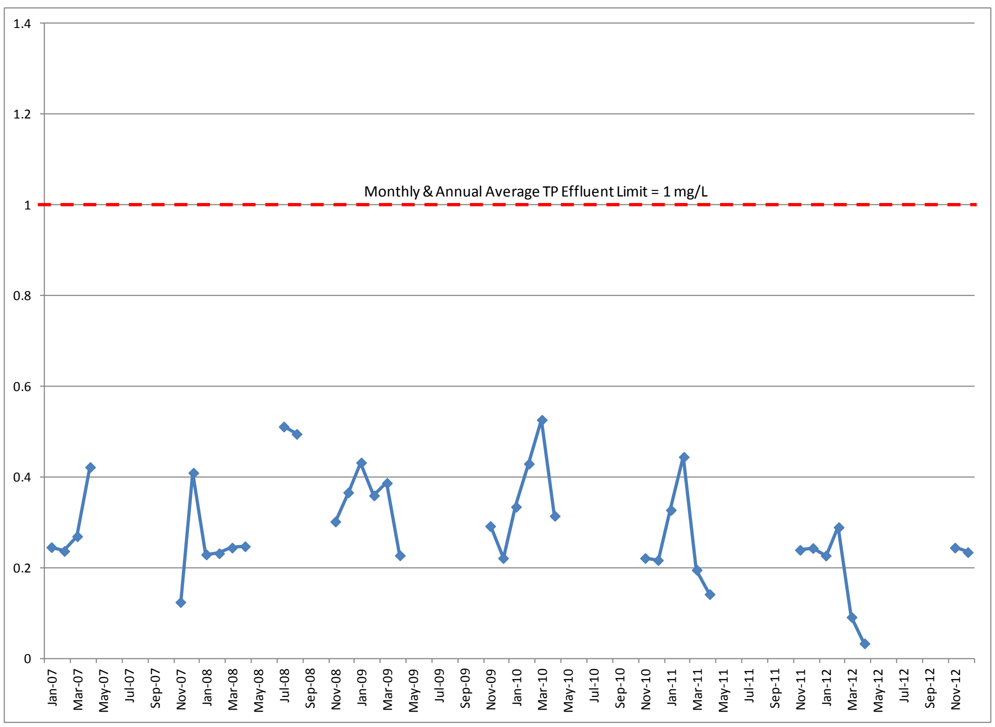


Figure 3.6 Monthly Average Effluent TP Concentrations

4. REVIEW OF PROCESS OPERATION AND HISTORICAL PERFORMANCE

A review of the current status of each treatment process at the Arthur WWTP was conducted to identify the unit process capacities based on MOE Guidelines and other design standards. The unit process review incorporated historic plant performance, available operational data and reports from Operations Staff from the period January 2007 to December 2012 to analyze the historic operating conditions of the major processes at the Arthur WWTP. A hydraulic analysis was not conducted to define maximum hydraulic capacity of channels or tanks.

Peak hourly flows to the plant are not available as raw wastewater flow is not measured. For the purposes of assessing the historic operating conditions of the unit processes, a PHF from the review period was estimated based on typical PHF factors caused by diurnal flow variations as suggested by WEF MOP No. 8. This methodology estimates the PHF as a function of the plant ADF. Utilizing the MDF rather than the ADF for this method should produce a reasonable estimate of the PHF experienced at the plant over the review period. For the purposes of this assessment, the historic PHF was estimated to be approximately 8,460 m^3/d based on a peaking factor of 1.44 (WEF, 2010). It is essential that peak wastewater flow into the Arthur WWTP are confirmed prior to the design of any upgrades or expansion.

4.1 Headworks

Raw sewage enters the Arthur WWTP from a 450 mm gravity sewer. Raw wastewater enters the headworks consisting of two manually cleaned grit channels, followed by a comminutor. A manually raked bar screen is also provided in parallel with the comminutor to allow bypassing of the comminutor.

4.1.1 Grit Channels

Grit removal is provided by two manually cleaned parallel grit channels (one duty and one standby), each measuring approximately 5.4 m long x 0.75 m wide x 0.5 m side wall depth (SWD) and equipped with a proportional weir to provide a control velocity of 0.3 m/s.

Based on the CofA, the peak flow capacity of the grit channels is 5,045 m^3/d.

Once the grit channels fill with grit, they are periodically manually cleaned by the operators. Only one channel will be cleaned at a time so that the other channel will allow continued operation.

The quantity of grit removed at the Arthur WWTP is not measured; therefore, the performance of the grit channels could not be assessed.

4.1.2 Comminution

Downstream of the grit channels, a comminutor provides grinding of large materials. Based on the CofA, the peak flow capacity of the comminutor is 5,045 m^3/d.

A manually raked bar screen is also provided in parallel with the comminutor to allow bypassing of the comminutor when flows exceed the capacity of the comminutor or during maintenance. Based on the CofA, the peak flow capacity of the manually raked bar screen is 5,045 m^3/d.

Operations Staff have not reported any problems with downstream equipment as a result of debris.

4.2 Secondary Treatment

4.2.1 Aeration Tanks

Secondary treatment is provided by a circular combined treatment unit consisting of two annular aeration tanks and an inside circular clarifier. Aeration Cell No. 1 has the dimensions of 27.95 m effective length x 4.65 m width x 4.18 m SWD while Aeration Cell No. 2 has the dimensions of 27.26 m effective length x 4.65 m width x 4.18 m SWD. The total liquid storage volume of both aeration tanks is 1,073 m^3.

Table 4.1 presents the historical operational data and a comparison to the typical operating values based on the MOE Design Guidelines.

Table 4.1 Bioreactors – Historic Operating Conditions

Parameter	Values	Typical Design Values
Bioreactor Volume (m^3)	1,073	n/a
Average Day Flow (m^3/d)	1,342	n/a
BOD_5 Load (kg/d)	206	n/a
MLSS (mg/L)	5,221	3,000 – 5,000 (1) 2,000 – 5,000 (2)
HRT (hrs)	19	> 15 (1) 20 - 30 (2)
OLR (kg $BOD_5/(m^3 \cdot d)$)	0.19	0.17 - 0.24 (1) 0.1 – 0.3 (2)
F/Mv (d^{-1})	0.06 (3)	0.05 – 0.15 (1) 0.04 – 0.10 (2)
Estimated SRT (days)	27 (3)	> 15 (1) 20 - 40 (2)

Notes:
1. Design Guidelines for Sewage Works, MOE, 2008.
2. Metcalf and Eddy (2003). Wastewater Engineering: Treatment and Reuse, 4th Ed.
3. Calculated based on a typical MLSS:MLVSS ratio of 0.6 g VSS/g TSS and typical Y_{obs} of 0.6 g VSS/g BOD_5.

Historically, operating staff has not monitored or recorded the mixed liquor volatile suspended solids (MLVSS) concentration, return activated sludge (RAS) / waste activated sludge (WAS) suspended solids concentration, RAS flow, or SVI.

Key findings of the bioreactor process review and summarized below:

- The bioreactors have historically operated within typical design guidelines values for an EA plant with respect to hydraulic retention time (HRT), organic loading rate (OLR), food to micro-organism (F/M_v) ratio, and solids retention time (SRT).
- The historic average MLSS concentration was 5,221 mg/L, above the typical range of 3,000 mg/L to 5,000 mg/L for an EA plant (MOE, 2008). Although the MLSS

concentrations were high, this has not negatively affected the final effluent TSS concentrations due to the tertiary filtration process downstream.

- Due to the high historical operating MLSS concentrations, the historic F/M_v ratio was 0.06 d^{-1}, this is at the low end of the MOE Design Guidelines range of typical values of 0.05 - 0.15 d^{-1}.
- The historic SRT was 27 days, significantly greater than the MOE Design Guidelines Recommended minimum SRT of 15 days but within the typical range of 20 to 40 days identified in literature (Metcalf & Eddy, 2003). At this SRT full or partial nitrification has been achieved even at low temperatures during the winter. Historically, the plant effluent has consistently been well below CofA effluent TAN concentration limit.

4.3 Final Clarifier

Final clarification is provided by one 13.5 m diameter centre inlet clarifier with a surface area of 143 m^2 and a 3.8 m SWD. The clarifier is equipped with a sludge collector mechanism and a scum skimming mechanism. RAS and WAS is pumped from a 50 m^3 sludge hopper that draws sludge from the center of the clarifier.

Table 4.2 presents the historic operating conditions for the secondary clarifiers.

Table 4.2 Secondary Clarifiers – Historic Operating Conditions

Parameter	Value	Typical Design Guideline Value
Clarifier Surface Area (m^2)	143	-
PHF (m^3/d)	8,460 (4)	-
MDF (m^3/d)	5,875	-
Peak Hourly SOR ($m^3/(m^2 \cdot d)$)	59	< 37 (1)
Maximum Day SLR ($kg/(m^2 \cdot d)$)	264 (3)	< 170 (1)
Peak Hourly Weir Loading Rate ($m^3/(m \cdot d)$)	199	< 250 (1) < 119 (2)

Notes:
1. Design Guidelines for Sewage Works, MOE, 2008. For an extended aeration process with coagulant addition to the mixed liquor for phosphorus removal.
2. Based on CofA, maximum weir loading rate is approximately 1.38 L/m-s (119 $m^3/(m \cdot d)$).
3. Calculated based on the historical MLSS concentration of 5,221 mg/L, a typical RAS flow of 100 percent of ADF, a typical filter reject flow of 10 percent of ADF for continuous upflow filters, and typical supernatant flow of 1 percent of ADF.
4. Estimated based on historic MDF and a typical PHF peaking factor of 1.44 (WEF, 2010).

Based on the results presented in Table 4.2, the secondary clarifiers have historically operated at peak hourly SOR and maximum day SLR values significantly higher than the MOE Design Guideline value of 37 $m^3/(m^2 \cdot d)$ and 170 $kg/(m^2 \cdot d)$ due to the historically high peaking factors and high operating MLSS concentrations.

Historic secondary effluent TSS concentrations were not available for review, therefore, the secondary clarifier performance at the historic operating SOR and SLR values could not be evaluated. Due to the downstream tertiary filters, the final effluent TSS concentrations have historically remained within the CofA compliance limits. Operating staff has not indicated that plugging or blinding of the filters due to high TSS loads has been an issue.

4.4 Oxygenation

Oxygenation for the aeration tanks is provided by a coarse bubble air diffusion system and two 45 kW (60 HP) blowers (one duty and one standby), each rated for 486 L/s at 45 kPa discharge pressure. Each aeration tank is equipped with approximately 84 coarse bubble air diffusers mounted on six separate headers.

According to the MOE Design Guidelines (MOE, 2008), the field oxygen transfer efficiency (FOTE) of coarse bubble diffusers is 4 to 6 percent (MOE, 2008). For the purposes of this report, a FOTE of 6 percent was assumed.

Table 4.3 presents the historic operating conditions of the oxygenation system at average and peak loadings.

Table 4.3 Oxygenation System – Historic Operating Conditions

Design Parameter	Value	
	Oxygen Demand	Air Requirement
Average Loading		
Process Requirement	510 kg O_2/d (1)	352 L/s (1)
Mixing Requirement	n/a	354 L/s (2)
Aeration Tank Air Requirement	354 m^3/h	
Maximum Month Loading		
Process Requirement	1,163 kg O_2/d (1)	803 L/s (1)
Mixing Requirement	n/a	354 L/s (2)
Aeration Tank Air Requirement	803 L/s	

Notes:
1. Based on an oxygen demand of 1.5 kg O_2/kg BOD_5 + 4.6 kg O_2/kg TKN (MOE, 2008).
2. Mixing requirements are based on 0.33 L/(m^3·s) for coarse bubble diffusers (MOE, 2008).

Based on the assumed FOTE of 6 percent, the aeration tank air requirement during average loadings is 354 L/s and during maximum month loading is 803 L/s. Although operating one of the two blowers during historical average loadings conditions would be sufficient, at historical maximum month loadings operating both blowers would be required to meet the aeration tank air requirements at the assumed FOTE of 6 percent.

Historic dissolved oxygen (DO) concentrations in the aeration tanks were not available for review; therefore, the historic performance of the aeration system could not be evaluated. However, the consistently low effluent TAN concentrations suggest that nitrification has not been limited by low DO concentrations in the bioreactors.

4.5 Return Sludge and Waste Sludge Pumping

Sludge withdrawn from the center of the final clarifier is collected in a sludge hopper with liquid volume of approximately 50 m^3. Sludge is pumped from the sludge hopper by two variable speed submersible sludge pumps, each rated at a maximum capacity of 2,938 m^3/d (34 L/s). One pump is dedicated to return sludge to the aeration cells and one pump is dedicated to pumping waste sludge to the digester.

Based on MOE Design Guidelines, a RAS pumping capacity of 50 to 200 percent of the ADF is recommended for EA plants. Historical RAS flows were not available for review.

Based on the capacity of the RAS pump, the pump is capable of providing up to 200 percent of the CofA rated ADF.

4.6 Phosphorus Removal

4.6.1 Chemical Addition

A coagulant feed system consisting of a 23 m^3 chemical storage tank, 450 L day tank, and two chemical metering pumps (one duty and one standby), each rated for 250 L/d, is available for to provide chemical phosphorus removal. The coagulant addition point is immediately upstream of the secondary clarifier. Provisions exist to dose alum upstream of the tertiary filters. The Arthur WWTP currently uses alum as the precipitant.

Historically, the alum dosages ranged from 36 mg/L to 244 mg/L, the average alum dosage was 89 mg/L. This value is slightly lower than the MOE Design Guidelines recommended dosage of 110 mg/L to 225 mg/L (MOE, 2008); however, the low effluent TP concentrations suggest that the lower alum dosage has not had a negative impact on plant performance.

4.6.2 Tertiary Filters

The Arthur WWTP is equipped with tertiary filtration, which consists of six continuous upflow deep bed filter modules. The CUF filters each have a total filtration surface area of 27.9 m^2. Based on the CofA, the filters have a maximum loading rate of 9.7 m/h (2.7 L/(m^2·s)) when treating a peak flow of 6,500 m^3/d.

Air is supplied to the CUF by two air compressors, each having a capacity of 38 L/s at 690 kPa pressure, and a 300 L air receiver tank.

Filter reject water is returned to upstream of the aeration tanks by a wash water reject pump, rated at 6.1 L/s against 3.5 m TDH. A shelf spare pump is also available as a standby unit.

Table 4.4 summarize the operating parameters of the filters at peak flows.

Table 4.4 Tertiary Filters – Historic Operating Conditions

Parameter	Value	Typical Design Guideline Value
Peak Final Effluent Flow (m^3/d)	7,431	-
Filtration Rate (L/(m^2·s))	3.1	< 3.3 (1) < 2.7 (2)

Notes:
1. Design Guidelines for Sewage Works, MOE, 2008. Design peak hour filtration rate for deep bed filter.
2. Based on the CofA.

Based on Table 4.4, the tertiary filter at the Arthur WWTP have historically operated above the maximum loading rate presented in the CofA but within the MOE Design Guidelines typical values for deep bed filters. Historically, the effluent TSS and TP values have consistently been well below the effluent compliance limit of 10 mg/L and 1 mg/L, respectively.

4.7 Disinfection

Disinfection of final effluent is provided by an UV irradiation system consisting of two banks of ultraviolet lamps in series, each bank containing 8 modules with 4 lamps per module, located in a channel with the dimensions of 7.9 m long x 0.5 m wide x 0.9 m deep. Liquid level in the UV channel is maintained at an average liquid depth of 250 mm -by an automatic level controller.

The UV system is designed to provide a dose of approximately 25.9 watts-sec/cm^2 at 65 percent transmission and a peak flow capacity of 6,500 m^3/d. Historically, final effluent flows have exceeded this value without negative impact on final effluent quality. Historically, the monthly geometric mean density effluent *E. coli* has been consistently maintained below the effluent compliance limit of 200 cts/100 mL.

4.8 Effluent Pumping and Storage

During seasons where the Arthur WWTP cannot discharge final effluent (May 1 to September 15) and if river flows are too low for effluent discharge, secondary effluent is pumped by two horizontal split case pumps, each rated for 58.5 L/s against 64 m TDH to three holding ponds with a total storage volume of 340,000 m^3.

Historically, the Arthur WWTP has not discharged until November due to insufficient flow in the river.

Table 4.5 summarizes the historic monthly average daily flows to the Arthur WWTP during the periods where discharge is not possible, the projected monthly flows when the plant reaches its CofA rated capacity of 1,465 m^3/d, and the required storage capacity at current and projected flows.

It should be noted that historically, the holding ponds have been also used during the discharge periods to attenuate peak flows.

Table 4.5 Historic Flows and Required Storage Volumes

Month	Historic Influent ADF (m^3/d)	Storage Requirement at Current Flows (m^3)	Projected ADF at CofA Rated Capacity (1) (m^3/d)	Projected Storage Requirement at CofA Rated Capacity (m^3)
May	1,270	39370	1386	42966
June	1,116	33480	1218	36540
July	931	28861	1016	31496
August	922	28582	1007	31217
September	926	27780	1011	30330
October	1,041	32271	1136	35216
Total Storage Volume Required	190,344 m^3		207,765 m^3	
Total Available Storage	340,000 m^3			

Notes:
1. Flows prorated based on the ratio of the CofA rated capacity of 1,465 m^3/d to the historic ADF of 1,342

Based on Table 4.5, there appears to be sufficient storage capacity in the holding ponds to accommodate storage during the no-discharge season beyond the CofA rated capacity. Operating staff has not reported that storage capacity in the holding ponds has been limited.

4.9 Sludge Digestion and Storage

A two-stage aerobic digestion process is used for treating the WAS from the Arthur WWTP. The first stage measures 9.4 m x 6.5 m x 5.0 m SWD, while the second stage measures 5.0 m x 6.5 m x 5.0 m SWD, for a volume of 305.5 m^3 for the first aerobic digestion stage, and a total aerobic digester volume of 468 m^3. Digested sludge is stored in four sludge storage tanks, each measuring approximately 6 m x 5 m x 5 m SWD, for a total storage volume of 600 m^3 (150 m^3 per tank).

Air is provided by coarse bubble diffuser systems installed in the digesters and storage tanks, and two blowers. There are approximately 48 diffusers in the primary digester tank, 24 diffusers in the secondary digester tank, and 36 diffusers in each of the sludge storage tanks. The two blowers are rated at 150 L/s against 45 kPa discharge pressure at standard conditions.

Mixing in the digesters and storage tanks is augmented by submersible mixers. Mixing in the primary digester is provided by two 1.1 kW submersible mixer and the secondary digester is provided by a single 1.1 kW submersible mixer. Mixing in the sludge storage tanks is provided by four 2.4 kW submersible mixers, one in each sludge storage tank.

Sludge pumping is provided by two end suction sludge transfer pumps, each rated at 38 L/s against 12 m TDH. A submersible pump rated at 6 L/s against 4 m TDH is provided for decant from the secondary digester. Digester supernatant pumping is provided by two pumps, each rated at 7.5 L/s against 6 m TDH. Supernatant is pumped upstream of the aeration tanks for treatment.

Volumes and quality of supernatant are not recorded at the plant; as such, the impact of the supernatant recycle stream on the liquid treatment process is difficult to assess, although no impact on effluent TAN is evident.

The design operating conditions for the aerobic digestion process and sludge storage, based on available data for 2007 to 2013, are summarized in Table 4.6.

Table 4.6 Historical Operation of Aerobic Digestion and Storage

Parameter	Historic Conditions	Typical Design Value
Primary Digester Volume (m^3)	305.5	n/a
Average WAS Flow (m^3/d)	60.4	n/a
Estimated VS Solids Loading (kg/d VSS)	124 (2)	n/a
Estimated VS Loading to Primary Digesters (g/m^3-d)	406	< 1,600 (1)
Estimated SRT (days) (3)	53	> 45 (1)
Average Annual Sludge Haulage (m^3/year) (4)	1,601	n/a

Notes:

n/a – not applicable

1. Design Guidelines for Sewage Works, MOE, (2008) for aerobic digestion.
2. Estimated based on the historic average BOD loading of 206 kg/d and a typical WAS yield (Y_{obs}) of 0.6 g VSS/g BOD_5.
3. Calculated based on a typical MLSS:MLVSS ratio of 0.6 g VSS/g TSS and typical Y_{obs} of 0.6 g VSS/g BOD_5. SRT includes aeration tanks, secondary clarifier, and both digester stages.
4. Based on historical sludge haulage data from 2007 to 2011.

Historical operational data on the WAS concentrations and volatile solids destruction in the digesters were not available for review. Therefore, the historic performance of the digesters was assessed based on a typical WAS yield (Y_{obs}) of 0.6 g VSS/g BOD_5.

Based on 4.6, the primary digesters have historically operated at an estimated VS loading of 406 g/m^3·d, this is within the MOE Design Guidelines maximum recommended VS loading of 1,600 g/m^3·d (MOE, 2008). This estimated historical SRT for the activated sludge process and both digester stages was 53 days. This is within the MOE Design Guidelines minimum recommended SRT of 45 days (MOE, 2008).

The 2007 to 2011 historical average annual sludge haulage rate was 1,601 m^3 sludge per year. This is equivalent to approximately 4.4 m^3 of digested sludge generated per day. Digested sludge is stored in four sludge storage tanks, with a total storage volume of 600 m^3, based on the historical digested sludge generation rate of 4.4 m^3/d, this is equivalent to 136 days of sludge storage volume.

5. SUMMARY AND RECOMMENDATIONS

Based on the available data and information provided, the following summarizes the key findings of this review of the current status of the Arthur WWTP.

- Over the seven-year review period from 2006 to 2010, the Arthur WWTP has operated at an ADF of 1,342 m^3/d, or 92 percent of the CofA rated capacity.
- Effluent quality from the Arthur WWTP consistently meets the CofA compliance criteria for BOD_5, TSS, TP, TAN, and *E. coli*.
- The bioreactors have historically operated within typical design guidelines values for an extended aeration (EA) plant with respect to HRT, OLR, F/M_v ratio, and SRT.
- The historic average MLSS concentration was 5,221 mg/L, above the typical range of 3,000 mg/L to 5,000 mg/L for an EA plant (MOE, 2008). Although the MLSS concentrations were high, this has not negatively affected the final effluent TSS concentrations due to the tertiary filtration process downstream.
- The high historic operating SRT 27 days, have resulted in full nitrification being achieved even at low temperatures during the winter.
- The final clarifiers have historically operated at peak hourly SOR and maximum day SLR values significantly higher than the MOE Design Guideline value of 37 $m^3/(m^2{\cdot}d)$ and 170 $kg/(m^2{\cdot}d)$ due to the historically high peaking factors and high operating MLSS concentrations.
- Although historic peak final effluent flows have exceeded the peak flow capacity of the UV system, the historic monthly geometric mean density effluent *E. coli* have been consistently maintained below the effluent compliance limit.
- The aerobic digesters have historically operated within the typical design guidelines values with respect to primary digester VS loading and SRT.
- Based on historical sludge haulage data, the existing digested sludge holding tanks provide approximately 136 days of sludge storage.

6. REFERENCES

MOE (2008). Design Guidelines for Sewage Works. 2008.

Metcalf & Eddy (2003). Wastewater Engineering: Treatment and Reuse. Fourth Edition, 2003.

WEF (2010). Design of Municipal Wastewater Treatment Plants: WEF Manual of Practice No. 8. Fifth Edition, 2010

APPENDIX D
DETERMINATION OF EFFLUENT REQUIREMENTS

XCG
Environmental Engineers & Scientists

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.: 3-3167-01-01
October 22, 2013

TECHNICAL MEMORANDUM
ASSIMILATIVE CAPACITY STUDY
ARTHUR WWTP CLASS EA

Prepared for:

THE TOWNSHIP OF WELLINGTON NORTH
7490 Sideroad 7 W, PO Box 125
Kenilworth, Ontario
M0G 2E0

Attention: Barry Trood
Water & Sewer Superintendant

Prepared by:

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

TABLE OF CONTENTS

TABLES

FIGURES

1. INTRODUCTION

The Arthur Wastewater Treatment Plant (WWTP) provides tertiary treatment for wastewater generated in the Village of Arthur. The plant is operated under Ministry of the Environment (MOE) Certificate of Approval (CofA) No. 3-1256-88-908 issued August 9, 1990. The Arthur WWTP has an average day CofA rated capacity of 1,465 m^3/d. During the period from May 1 to September 15, flow from the secondary treatment system is pumped to holding ponds for storage (approximately 340,000 m^3 of storage is available). During the period from September 16 to April 30, and provided that there is sufficient river flow in the Conestogo River, effluent from the plant can be discharged to the Conestogo River. During this discharge period, the holding pond contents are combined with the plant's secondary clarifier effluent, and this flow is then treated by the tertiary filters and UV disinfection system. Treated effluent is then conveyed through a 375 mm outfall pipe and discharges into the Conestogo River from the bank of the river.

The Township of Wellington North (the Township) is undertaking a Class Environmental Assessment (Class EA) to identify the preferred approach to treat future wastewater flows from the Village of Arthur that are estimated to increase during the planning period to an average day flow (ADF) of 2,300 m^3/d. As part of the Class EA, an Assimilative Capacity Study is being undertaken to determine the level of treatment that would be needed for an expanded Arthur WWTP to be protective of the receiving stream. This Technical Memorandum (TM) presents the findings of the assimilative capacity assessment and proposes effluent objectives and limits for an expanded Arthur WWTP.

1.1 Objectives

The objectives of this analysis are:

- To determine representative background water quality for the Conestogo River in the vicinity of the Arthur WWTP;
- To determine 7Q20 low flows in the Conestogo River upstream of the Arthur WWTP;
- To conduct an assimilative capacity assessment of the receiving waters; and
- To formulate reasonable recommendations for effluent limits and objectives for an expanded Arthur WWTP based on MOE Water Management: Policies, Guidelines, Provincial Water Quality Objectives (July 1994).

1.2 General Approach

In order to satisfy the objectives of the assimilative capacity assessment, the following approach for each of the necessary components was completed.

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[1]. The MOE states, "Normally the 75th percentile is used to determine background quality..."

[1] Ministry of Environment and Energy, Procedure 1-5: Deriving Receiving-Water Based, Point-Source Effluent Requirements for Ontario Waters, July 1994. (MOE Green Book)

2. Define Low Flows: Low-flow estimates are generated for each season using historical stream flow records. These estimates are critical for defining the amount of assimilative capacity available in the receiver.
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[2], MOE Blue Book[3] (MOE, 1994) and CEPA requirements[4].
4. Formulation of Recommended Effluent Limits: Based on the work completed in steps one through effluent limits for the Arthur WWTP can be generated.

1.3 Existing Effluent Limits

The Arthur WWTP operates under CofA No. 3-1256-88-908 which defines the effluent limits. The existing limits are shown in Table 1. The CofA does not define effluent objectives.

Table 1 Existing Effluent Limits for Arthur WWTP

Parameter	Average Annual Concentration (mg/L)	Average Monthly Concentrations (mg/L)	Average Loading (kg/d)
5 Day Biochemical Oxygen Demand (BOD_5)	10	15	14.65
Total Suspended Solids (TSS)	10	15	14.65
Total Phosphorus (TP)	1.0	1.0	1.47
Total Ammonium Nitrogen (TAN)	1.5	2.3	2.2
Fecal Coliforms	200 cfu/100 mL	-	-

[2] Ministry of Environment and Energy, Guideline F-5: Levels of Treatment for Municipal and Private Sewage Treatment Works Discharging to Surface Waters, April 1994.
[3] Ministry of Environment and Energy, Water Management: Policies, Guidelines, Provincial Water Quality Objectives, July 1994. (MOE Blue Book)
[4] Canadian Environmental Protection Act, 1999. http://laws.justice.gc.ca/en/c-15.31/

2. ANALYSIS OF BACKGROUND DATA

2.1 Applicable MOE Policies

Two specific water quality policies from the MOE Blue Book have been applied to each water quality parameter in assessing the receiving stream: MOE Policy 1 and MOE Policy 2. Both of these policies consider the surface water quality in comparison to the Provincial Water Quality Objectives (PWQO). For areas where water quality is better than the PWQO, Policy 1 applies. Policy 2 refers to areas where water quality does not meet the objectives. The policy statements from the MOE Blue Book are as follows:

MOE 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.

MOE Policy 2

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

2.2 Ambient Water Quality

Triton Engineering Services Limited conducts monthly water sampling at several locations in The Township of North Wellington. Collected samples are analyzed for numerous parameters including those of interest in assimilative capacity assessments (total phosphorus, ammonia, pH, temperature, BOD_5, dissolved oxygen, total suspended solids and *E.coli*). The data collected as part of this ongoing monitoring program was used to define ambient water quality upstream of the Arthur WWTP.

The closest upstream station to the Arthur WWTP is located on the Conestogo River at Highway 6 which is approximately 1.5 km upstream of the WWTP and has a period of record from 2007 to 2012. The location of the monitoring station relative to the Arthur WWTP outfall is shown in Figure 1.

Ambient water quality conditions were characterized on a seasonal basis as follows:

a. Winter: January–March
b. Spring: April–June
c. Summer: July–September
d. Fall: October–December

Figure 1 WWTP Outfall and Wellington Road 109 Sampling Location

2.2.1 Total Phosphorus

The MOE Provincial Water Quality Objectives (PWQO) state that the interim guideline for total phosphorus (TP) in rivers is 0.03 mg/L to prevent excessive plant growth in river and streams.

Seasonal statistics were calculated for each station and are shown in Table 2. A review of the statistics suggests that the Conestogo River upstream of the Arthur WWTP is MOE Policy 2 for TP year round.

Table 2 Total Phosphorus at Highway 6

Season	Mean Concentration (mg/L)	75th Percentile Concentration (mg/L)	Number of Observations
Winter (Jan - Mar)	0.036	0.049	26
Spring (Apr - Jun)	0.026	0.029	21
Summer (Jul - Sep)	0.058	0.043	17
Fall (Oct - Dec)	0.038	0.034	14
Annual	0.039	0.043	78

2.2.2 Un-ionized Ammonia

The MOE PWQO for un-ionized ammonia (UIA) is 0.02 mg/L (20 µg/L). The percentage of UIA in aqueous solution varies depending on the temperature and pH of the water. In order to determine the 75th percentile in stream UIA, it is necessary to calculate the 75th percentile of the calculated UIA based on synoptic measurements of pH, temperature, and ammonia. Calculated concentrations of UIA upstream of the Arthur WWTP are presented in Table 3. The table shows that for all seasons the receiver is Policy 1 with respect to UIA.

Table 3 Un-ionized Ammonia (UIA) at Highway 6

Season	Mean Concentration (mg/L)	75th Percentile Concentration (mg/L)	Number of Observations
Winter (Jan - Mar)	0.005	0.004	16
Spring (Apr - Jun)	0.005	0.006	19
Summer (Jul - Sep)	0.011	0.013	12
Fall (Oct - Dec)	0.003	0.003	9

For information purposes the 75th percentiles of ammonia, pH and temperature are shown in Tables 3, 4 and 5, respectively. With respect to pH, the 75th percentile values upstream of the Arthur WWTP exceed the PWQO upper limit of 8.5 in the winter and summer seasons. Accordingly, the receiver is Policy 2 for pH in the winter and summer seasons and Policy 1 in the remaining seasons.

Table 4 Total Ammonia at Highway 6

Season	Mean Concentration (mg/L)	75th Percentile Concentration (mg/L)	Number of Observations
Winter (Jan - Mar)	0.15	0.17	26
Spring (Apr - Jun)	0.10	0.11	21
Summer (Jul - Sep)	0.10	0.11	17
Fall (Oct - Dec)	0.08	0.09	14
Annual	0.08	0.11	78

Table 5 pH at Highway 6

Season	Mean (-)	75th Percentile (-)	Number of Observations
Winter (Jan - Mar)	8.36	8.53	20
Spring (Apr - Jun)	8.37	8.50	20
Summer (Jul - Sep)	8.35	8.60	13
Fall (Oct - Dec)	8.50	8.50	13
Annual	8.39	8.50	66

Table 6 Temperature at Highway 6

Month	Mean (ºC)	75th Percentile (ºC)	Number of Observations
January	0.0	0.0	9
February	-0.1	0.0	6
March	1.9	1.9	8
April	7.6	10.3	9
May	13.3	16.0	6
June	16.9	18.0	5
July	18.2	18.8	5
August	17.5	18.3	6
September	11.7	12.8	3
October	6.9	8.1	5
November	2.0	3.0	5
December	0.8	1.5	5

2.2.3 BOD_5 and Dissolved Oxygen

Many of the BOD_5 concentrations in the database were less than the minimum detection limit of 2 mg/L. For the purposes of this analysis these values were replaced with the minimum detection value of 2 mg/L; this will result in conservative estimates of the mean and 75^{th} percentile concentrations. Table 7 summarizes the BOD_5 concentrations. The calculated 75^{th} percentile concentrations of BOD_5 upstream of the Arthur WWTP suggest that there is assimilative capacity available for BOD_5.

Table 7 BOD_5 at Highway 6

Season	Mean Concentration (mg/L)	75th Percentile Concentration (mg/L)	Number of Observations
Winter (Jan - Mar)	2.2	2.0	26
Spring (Apr - Jun)	2.0	2.0	21
Summer (Jul - Sep)	2.1	2.0	17
Fall (Oct - Dec)	2.1	2.0	14
Annual	2.0	2.0	78

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

The DO concentrations reported in Table 8 show that the 25th percentile concentrations are less than the PWQO for July and August. Based on this the receiver upstream of the Arthur WWTP is Policy 2 from July to August and Policy 1 with respect to DO for the remaining months.

Table 8 Dissolved Oxygen at Highway 6

Month	Mean Concentration (mg/L)	25th Percentile Concentration (mg/L)	PWQO (1) (mg/L)	Number of Observations (mg/L)
January	11.2	11.7	7	9
February	11.8	10.5	7	6
March	10.9	10.7	7	8
April	9.9	9.1	5	9
May	7.6	6.7	5	6
June	5.1	5.0	5	5
July	3.8	2.8	5	5
August	3.5	2.3	5	6
September	6.8	6.4	5	3
October	8.9	9.4	6	5
November	10.1	9.4	7	5
December	12.9	12.2	7	5

Notes:
1. The PWQO values applied was based on the 75th percentile monthly temperatures shown in Table 6.

2.2.4 *Total Suspended Solids*

There is no PWQO for total suspended solids (TSS); however, in-stream concentrations less than 5 mg/L are generally considered good. TSS statistics are shown in Table 9. The seasonal values upstream of the Arthur WWTP are all above 5 mg/L.

Table 9 TSS at Highway 6

Season	Mean Concentration (mg/L)	75th Percentile Concentration (mg/L)	Number of Observations
Winter (Jan - Mar)	9.2	10.2	26
Spring (Apr - Jun)	7.0	8.8	21
Summer (Jul - Sep)	12.3	15.2	17
Fall (Oct - Dec)	11.9	10.2	14
Annual	9.7	10.8	78

2.2.5 E. Coli

The PWQO for *E. coli* is 100 cfu/100mL for recreational water use. Table 10 shows that the PWQO is exceeded in all seasons and on an annual basis upstream of the Arthur WWTP; therefore, the receiver is Policy 2 with respect to *E. coli.*

Table 10 E. coli at Highway 6

Season	Median Concentration (cfu/100mL)	75th Percentile Concentration (cfu/100mL)	Number of Observations
Winter (Jan - Mar)	121	288	26
Spring (Apr - Jun)	73	220	21
Summer (Jul - Sep)	310	690	17
Fall (Oct - Dec)	125	178	14
Annual	263	325	78

2.3 Stream flow

The drainage area to the Arthur WWTP is approximately 60 km^2. There is a stream flow gauge located just upstream of the Arthur WWTP discharge location. Instantaneous level measurements are made at the flow gauge and are converted to flow using a rating curve developed at the location by the MOE when the gauge was first instituted. In 2011, the Grand River Conservation Authority completed a draft memo "Flow Series - Conestogo River Arthur" that examined the flow data that had been collected at the location. It was found that there were some missing data and that flows less than 0.17 m^3/s or greater than 8.36 m^3/s did not correspond well with the flow duration curve of the downstream station (Conestogo River above Drayton). To address this problem, a modified Arthur WWTP stream flow series was developed to replace missing data, and to correct flows less than 0.17 m^3/s and flows greater than 8.36 m^3/s. This modified dataset is thought to be an improvement over the original dataset and, while there is still uncertainty associated with the dataset it provides the best available estimate for stream flow. The modified dataset covers the period from 1994 - 2012.

The monthly $7Q_{20}$ flow values were calculated using the method of Lowest Observed Drought for the Conestogo River at the Arthur WWTP. The resultant flows are presented in Table 11. A review of the flows suggests that discharging June through September is not advisable; however, discharging the entirety of May appears to be possible. Restricting discharge from June through September is critical based on the extreme low flows which would allow for almost no dilution of the treated wastewater effluent. In May, there is sufficient flow and assimilative capacity to allow for dilution.

Table 11 Monthly $7Q_{20}$ Flows in the Conestogo River at Arthur WWTP

Season	7Q20 Flow Conestogo River at Arthur WWTP (m^3/s)
January	0.054
February	0.039
March	0.063
April	0.087
May	0.053
June	0.005
July	0.005
August	0.006
September	0.005
October	0.022
November	0.076
December	0.060

3. ASSIMILATIVE CAPACITY ANALYSIS

3.1 Un-ionized Ammonia

With regards to un-ionized ammonia (UIA), the expanded plant must produce an effluent that is not acutely toxic. For the purposes of this analysis, a non-toxic UIA concentration of 0.2 mg/L was applied to develop compliance limits; a UIA concentration of 0.1 mg/L was used to develop the design objectives.

In the federal Wastewater Systems Effluent Regulations under the Fisheries Act, effluent toxicity limits are set to 1.25 mg/L UIA (at 15ºC). The assumption of UIA toxicity at 0.2 mg/L as discussed above is more stringent and thus the effluent limits discussed below are more conservative than required by the federal regulation and would comply with the new regulation.

Further, the effluent ammonia load must be sufficiently low to ensure that under fully mixed conditions in the receiver, the resultant UIA concentration does not exceed the PWQO and thereby result in Policy 2 conditions.

The percentage of UIA in aqueous solution varies depending on the temperature and pH of the water. To determine acceptable ammonia effluent limits, it is necessary to identify the 75th dissociation percentage that would be UIA based on synoptic measurements of pH and temperature (taken at the same time) in the effluent and in the receiver.

Table 12 shows the dissociation ratios, ammonia concentrations and resultant UIA concentrations. Under $7Q_{20}$ flow conditions with a TAN effluent concentration of 0.65 mg/L-N the effluent is non-toxic at the end of pipe and does not exceed the PWQO under fully mixed conditions.

Table 12 Ammonia Effluent Limit Determination

Season	Maximum Daily Discharge (1) (m^3/d)	Dissociation Ratio (2)		Ammonia (mg/L-N)		Un-ionized Ammonia (mg/L-NH_3)	
		Effluent	Fully Mixed	Effluent	Fully Mixed	Effluent	Fully Mixed
January	6,500 (3)	0.008	0.030	0.65	0.45	0.006	0.016
February	6,500	0.008	0.030	0.65	0.49	0.006	0.018
March	6,500 (3)	0.008	0.030	0.65	0.43	0.006	0.016
April	2,150	0.018	0.073	0.65	0.23	0.014	0.020
May	1,300	0.018	0.073	0.65	0.23	0.014	0.020
June	0	-	-	-	-	-	-
July	0	-	-	-	-	-	-
August	0	-	-	-	-	-	-
September	0	-	-	-	-	-	-
October	1,000	0.012	0.037	0.65	0.28	0.009	0.013
November	3,550	0.012	0.037	0.65	0.29	0.009	0.013
December	2,800	0.012	0.037	0.65	0.29	0.009	0.013

Notes:
1. Maximum daily discharge was calculated based on an ammonia mass balance between effluent and monthly 7Q20 flows to ensure that effluent discharges did not result in Policy 2 status under fully mixed conditions.
2. Dissociation ratios were calculated on a seasonal basis due to the small monthly sample sizes
3. Effluent outflow constrained by outlet works.

The existing plant discharges based on a series of curves that have been developed for each month. These curves identify the allowable effluent discharge based on the effluent TAN concentration and the streamflow. Similar curves have been developed for the proposed WWTP expansion. The curves identify the effluent discharge based on streamflow and effluent TAN concentration; the provided curves ensure that the end of pipe UIA concentration is less than 0.2 mg/L and the fully mixed concentration does not exceed the PWQO of 0.02 mg/L UIA. The curves are shown in Figure 2 through Figure 9. The use of the curves requires that reasonable estimates of streamflow can be made. To that end, it is necessary to ensure that a reasonable rating curve exists for the streamflow gauging station. Given that the stream bed in the vicinity of the gauge does change, it is recommended that the rating curve be periodically updated.

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 (TAN) concentrations for the Arthur WWTP will meet CEPA requirements.

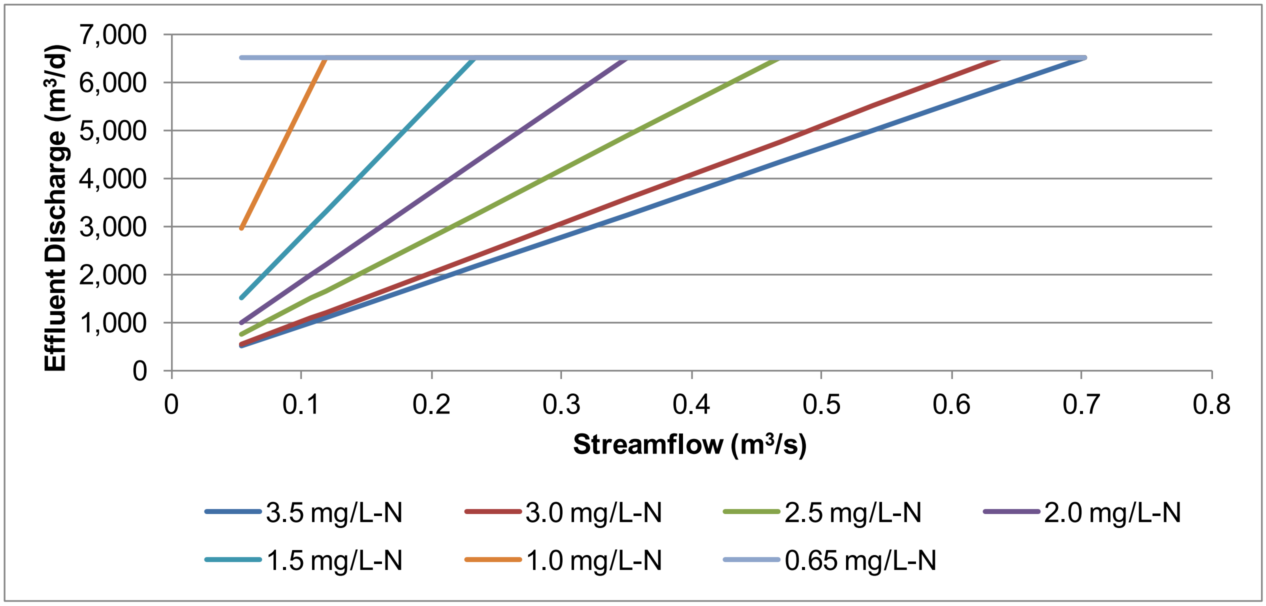


Figure 2 January Arthur WWTP Discharge Curve

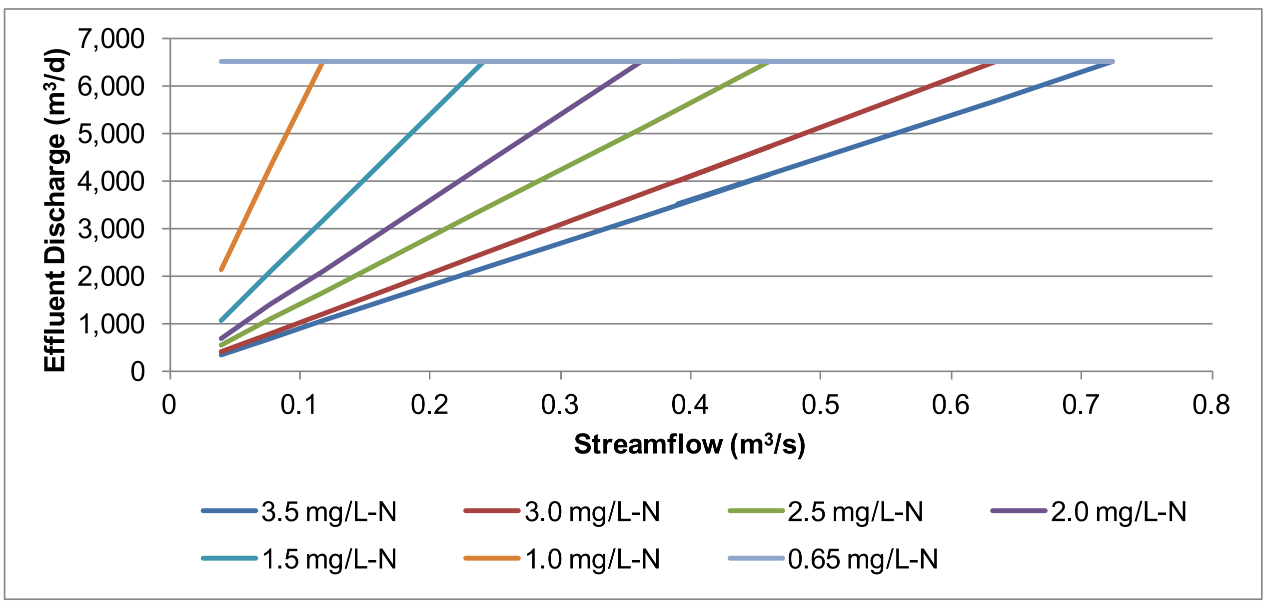


Figure 3 February Arthur WWTP Discharge Curve

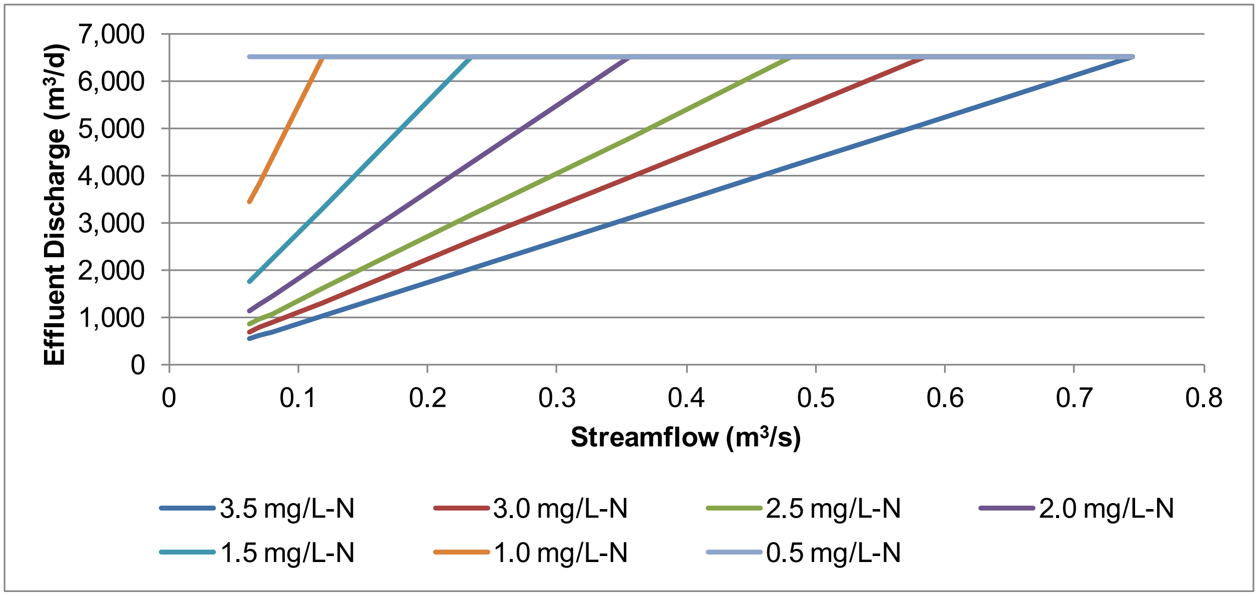


Figure 4 March Arthur WWTP Discharge Curve

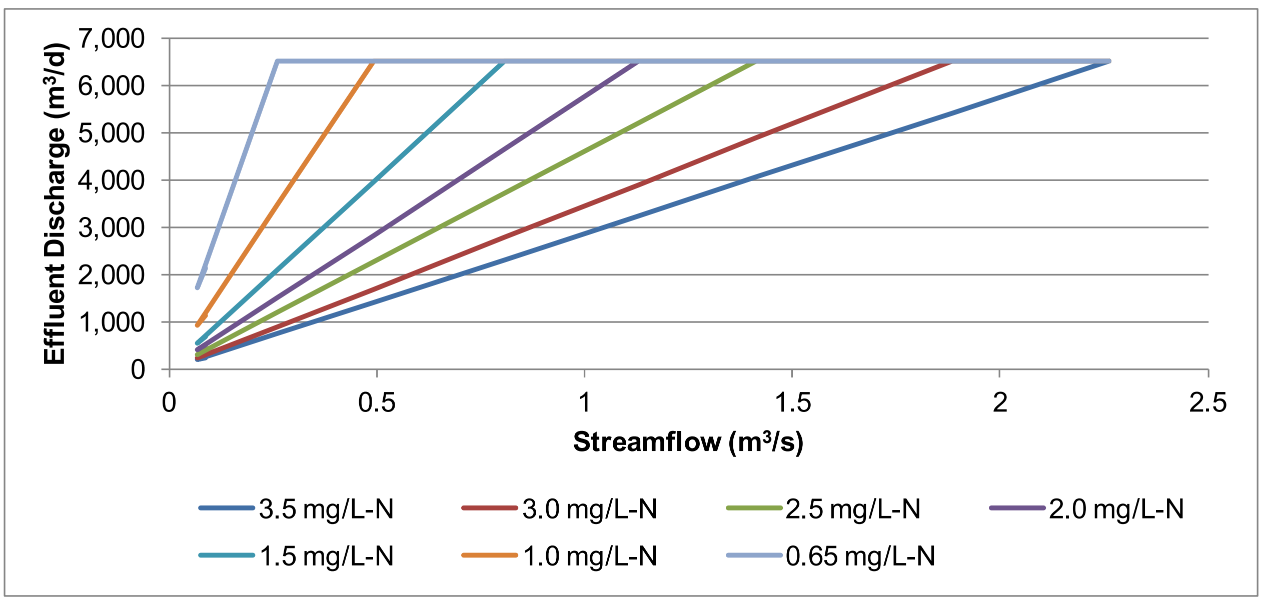


Figure 5 April Arthur WWTP Discharge Curve

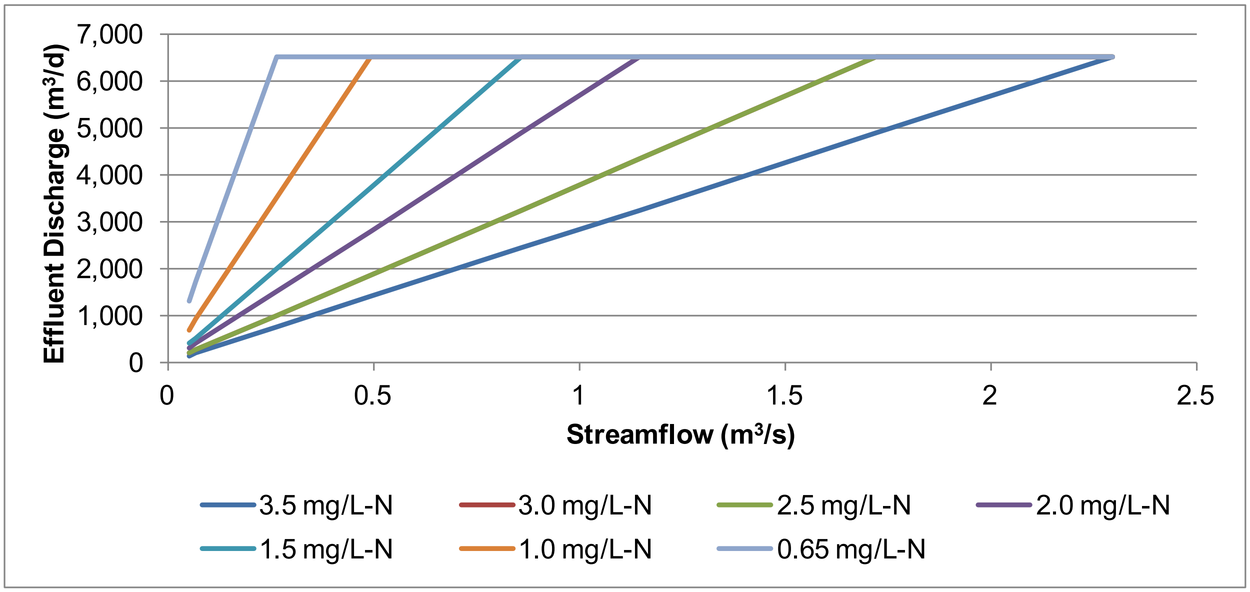


Figure 6 May Arthur WWTP Discharge Curve

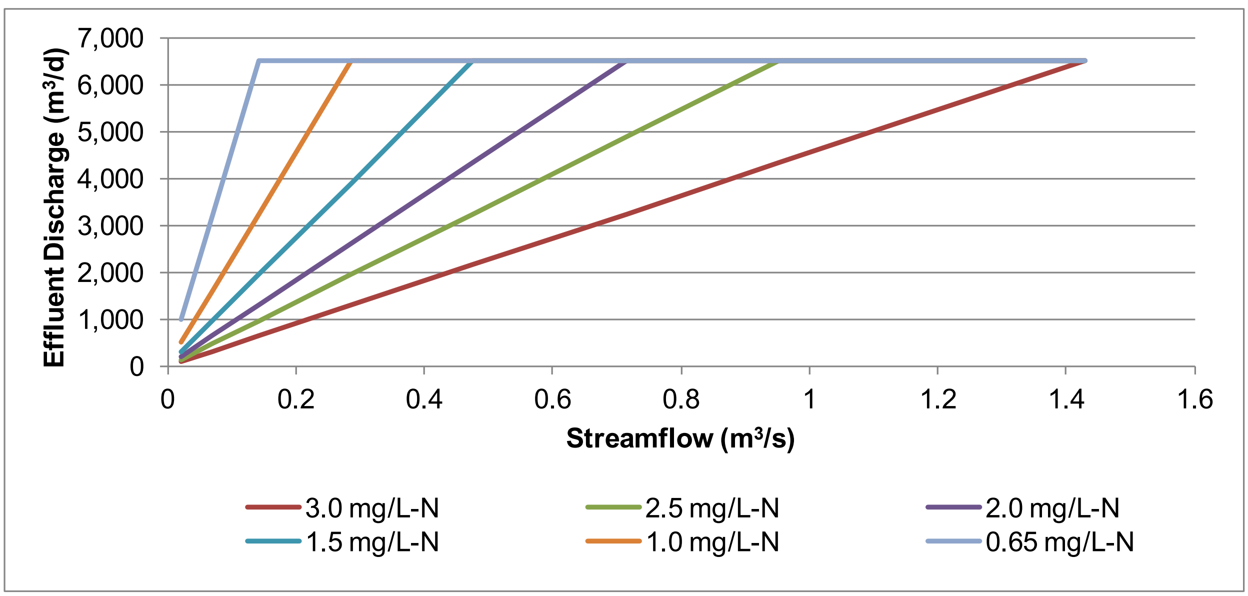


Figure 7 October Arthur WWTP Discharge Curve

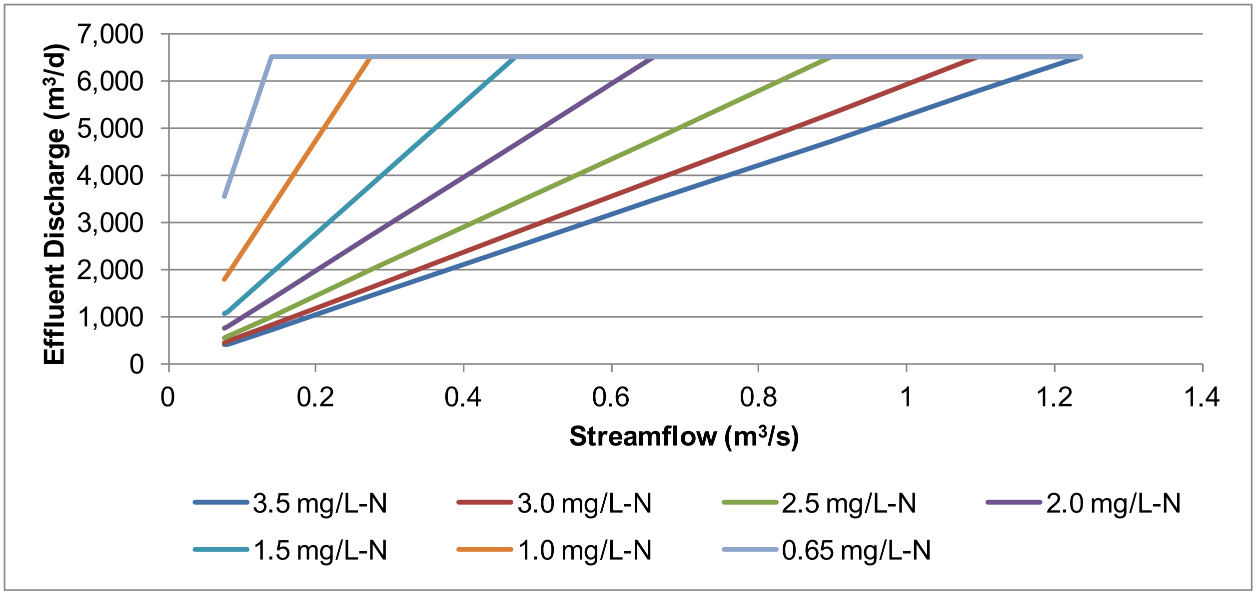


Figure 8 November Arthur WWTP Discharge Curve

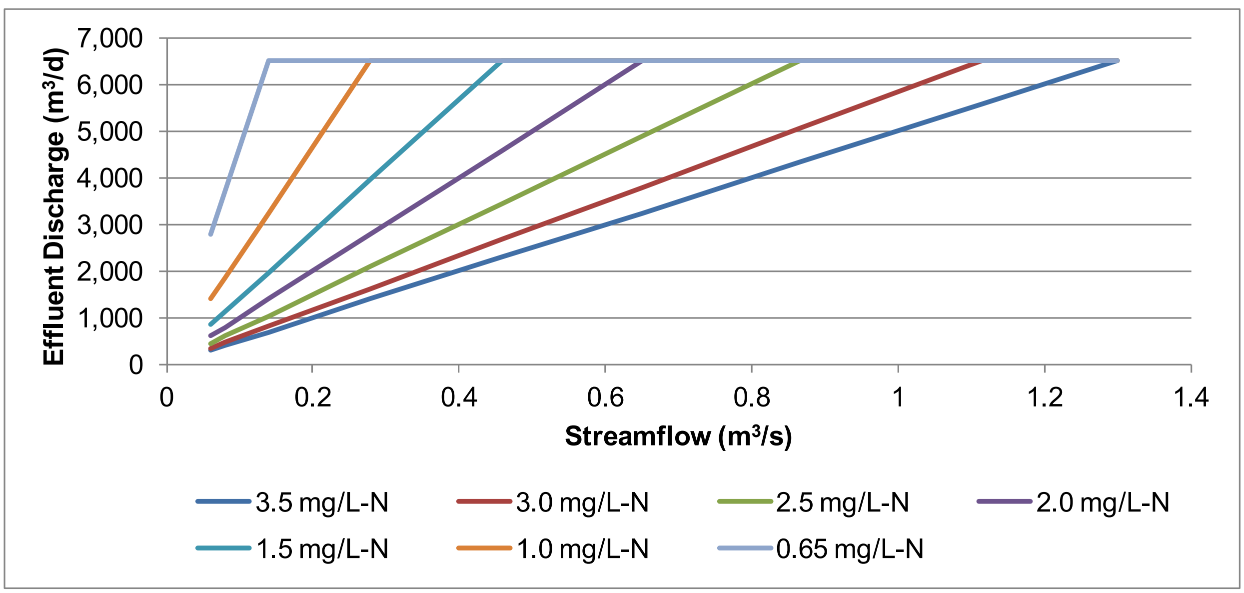


Figure 9 December Arthur WWTP Discharge Curve

3.2 Total Phosphorus

The receiver is MOE Policy 2 status and the existing compliance loading must not be exceeded. The permitted average daily load based on the CofA is 1.47 kg/d. The proposed TP limit for an expanded Arthur WWTP is 0.3 mg/L which results in an average daily load of 0.69 kg/d. This is a significant reduction relative to the currently permitted effluent TP loading. A design objective of 0.2 mg/L TP is proposed.

3.3 BOD_5 and Dissolved Oxygen

A review of the ambient conditions for ambient BOD_5 and DO suggests that there is adequate assimilative capacity available for BOD_5 from October through May. Based on this information, it is proposed to set the effluent $cBOD_5$ compliance limit to 10 mg/L with a design objective of 5 mg/L.

3.4 Total Suspended Solids

There are high ambient TSS concentrations in the Conestogo River. Effluent discharges should try and minimize increases in TSS concentrations in the receiver. It is proposed that the effluent TSS compliance limit be 10 mg/L and the design objective be 5 mg/L.

3.5 E. Coli

Given that the receiver is Policy 2 with respect to *E. coli,* a compliance level of 100 CFU / 100 mL is proposed (annual geometric mean).

3.6 Storage Requirements

During June through September, there will be no discharge from the plant to the Conestogo River. Further, not all months can discharge an effluent flow rate greater than or equal to the ADF of 2,300 m^3/d (see Table 12). Thus, effluent storage is required.

Based on the maximum effluent discharge flow rates (determined based on monthly 7Q20 flows) shown in Table 12, the required storage is estimated at 357,000 m^3 based on the flow scenario shown in Figure 10 at the proposed future design flow of 2,300 m^3/d and based on the conservative assumption of 7Q20 monthly flows (higher streamflows would allow for higher effluent discharge rates and less storage). The existing facility has storage of about 340,000 m^3 in the current holding ponds. Therefore, options to provide additional storage for the expanded Arthur WWTP will need to be considered to accommodate the proposed discharge flow limits.

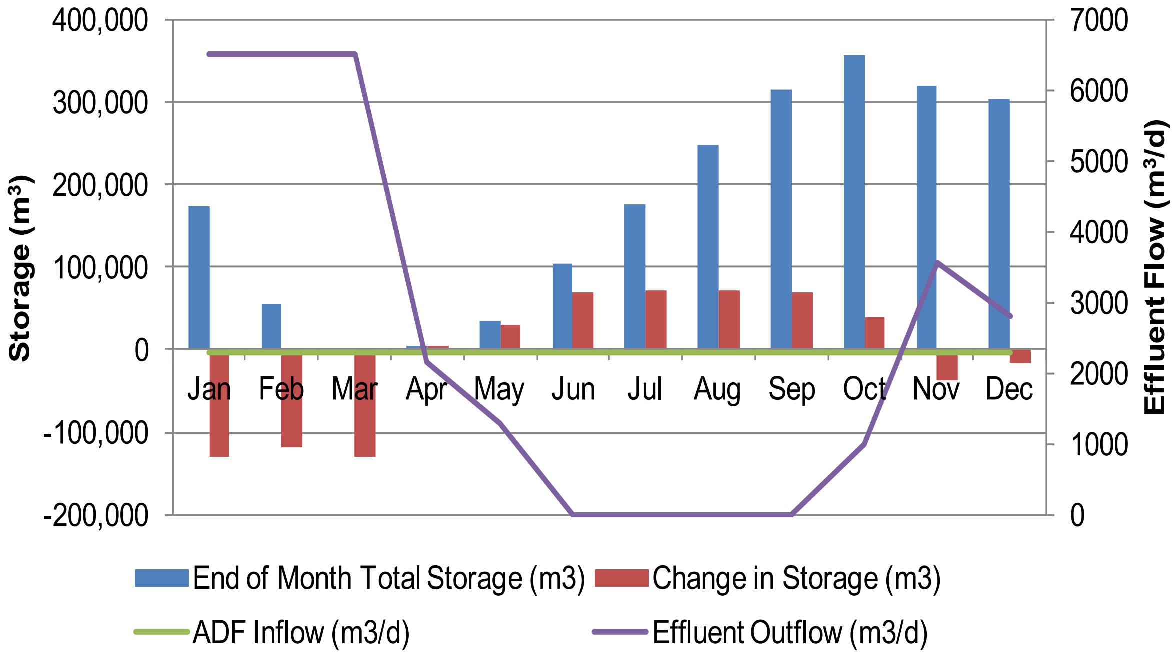


Figure 10 Effluent Flow and Storage Requirements under 7Q$_{20}$ Conditions

4. SUMMARY AND RECOMMENDATIONS

4.1 Summary of Findings

Key findings of this assimilative capacity assessment analysis for the Arthur WWTP expansion are as follows:

- Based on available water quality data upstream of the Arthur WWTP outfall, the Conestogo River is MOE Policy 1 for UIA, pH (during spring and fall) and dissolved oxygen (concentrations of DO fall below the PWQO for July and August and are Policy 2 during these months). The receiver is Policy 2 upstream of the Arthur WWTP with respect to total phosphorus, pH (during winter and summer) and *E. coli*. Concentrations of TSS are high in the receiver upstream of the Arthur WWTP.
- Low flow analysis was completed on the GRCA generated record for the streamflow gauge located immediately upstream of the WWTP. The low flow analysis suggests that a suitable discharge period is from October through May.
- The proposed TP limit is 0.3 mg/L which results in an average load of 0.69 kg/d which is a substantial reduction in comparison to the current approved loading of 1.47 kg/d.
- The UIA concentration at the end of pipe must be non-toxic and the resulting fully mixed concentrations cannot exceed the PWQO. Ammonia concentrations that can satisfy these criteria at a given streamflow for a defined effluent flow rate have been developed for each month.
- There is a need to maintain and update the rating curve used for streamflow estimates at the plant.
- The expanded plant would require approximately 360,000 m^3 of storage to hold flows for months where no discharge or limited discharge is allowed. Options to provide additional storage for the expanded Arthur WWTP will need to be considered.

4.2 Recommended Effluent Limits and Effluent Objectives

Table 13 shows the recommended Arthur WWTP compliance limits and effluent objectives.

Table 13 Recommended Design Objectives and Compliance Limits

Effluent Parameter	Design Objectives	Compliance Limits
$cBOD_5$ (mg/L)	5	10
Total Suspended Solids (mg/L)	5	10
Total Phosphorus (mg/L)	0.2	0.3
Un-ionized Ammonia (mg/L)	0.1	0.2
E. coli (CFU/100 mL)	-	100

XCG
Environmental Engineers & Scientists

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:	January 6, 2014	**XCG File No.: 3-3167-01-01**
To:	Barbara Slattery & Sarah Day (Ministry of the Environment)	
cc:	Barry Trood & Deb Zehr (Township of Wellington North) and Stephen Nutt (XCG Consultants Ltd.)	
From:	Colin Clarke (XCG Consultants Ltd.)	
Re:	Arthur WWTP - Assimilative Capacity Study	

1. INTRODUCTION

In an e-mail dated December 4, 2013, Ms. Barbara Slattery of the Ministry of the Environment (MOE) provided MOE comments regarding the Arthur Wastewater Treatment Plant (WWTP) Assimilative Capacity Study (XCG Consultants Ltd., October 2013). The e-mail provided comments and recommendations related to the Assimilative Capacity Study and the effluent limits proposed for the expanded Arthur WWTP. The comments covered two broad categories 1) Reporting and Documentation; and 2) Surface Water Impacts.

This memorandum repeats MOE's original comment (shown in italics), and provides XCG's response to the comment. Note that data tables and appendices contained in the MOE email are not repeated herein.

2. REPORTING AND DOCUMENTATION

1. *As previously noted, no indication has been provided to show that the Grand (sic) Valley flows were included in this assessment of the new average daily flow (ADF) of 2300 m^3d-1. Adjustments may need to be made to the assimilative capacity study (ACS) and specific calculations (e.g. loadings) depending on the clarification provided.*

   Future flow increases requested by Golden Valley Farms have been included in the proposed ADF. No increase in the proposed future capacity will be required to accommodate Golden Valley Farms.

3. SURFACE WATER IMPACTS

1. *The proposed maximum total daily effluent flow (i.e. flow from the WWTP plus flow from the storage lagoons) to the Conestogo River for the months of April (2150 m^3d-1), May (1300 m^3d-1), October (1000 m^3d-1), November (3550 m^3d-1) and December (2800 m^3d-1) appear to be acceptable. Additional information is to be provided to the MOE for our review before acceptance of the January,*

February and March maximum total effluent flow of 6500 m^3d-1 for each month can be made. We will request that a condition be included in the future Environmental Compliance Approval (ECA) identifying the maximum total effluent flow rates to the receiver.

To address this concern, XCG Consultants Ltd. (XCG) has completed additional mixing zone modelling. The mixing zone modelling is provided in Attachment A to this memo.

2. *The proposed effluent objectives (5 mg/L, 5 mg/L and N/A) and limits (10 mg/L, 1 mg/L and 100 CFU/100 mL) for $cBOD_5$, total suspended solids (TSS) and E. coli, respectively, appear to be acceptable. The total phosphorus (TP) objective (0.2 mg/L) also appears to be acceptable. It should be noted that these limits, along with TP and total ammonia nitrogen (TAN), will be monthly average limits to reflect existing wastewater treatment plant requirements and not annual average limits as set out in the old Certificate of Approval (C of A). In the case of E. coli the limit will be a monthly geometric mean. This will be clearly reflected in the new ECA.*

   Notes will be added to the proposed effluent limits table in the ACS to identify the averaging period for each parameter.

3. *The TAN limit of 0.65 mg/L is acceptable based on the mixing zone modeling that was completed. However, after reviewing the information in the ACS for total ammonia, discharge curves based on TAN concentration will be used to determine the discharge quality and quantity. As a result, it is possible that TAN concentrations will be greater than 0.65 mg/L (e.g. February discharge curve with a streamflow of 0.3 m^3s-1 and an effluent discharge of 3000 m3d-1 could have a TAN of 3.5 mg/L) and would technically not meet the TAN limit of 0.65 mg/L. Therefore, it is suggested that the monthly TAN limit be based on the maximum TAN identified in the curves provided in Figures 2 to 9 and any adjustments required based on comments #6 and #8 below.*

   See responses to 6 and 8 below.

4. *An objective for TAN needs to be proposed and provided to the MOE for review and approval.*

   The proposed design objective for TAN is 0.5 mg/L-N.

5. *Dissociation ratios were used to calculate total ammonia end of pipe toxicity and unionized ammonia at the end of the mixing zone. The use of the dissociation ratios are not ideal or necessarily adequate for the following reasons:*
   a. *The dissociation ratio data were lumped together for the effluent and the ambient data were lumped into quarters rather than calculated monthly;*
   b. *The direct calculation of unionized ammonia using appropriate field pH and temperature data is preferred over a dissociation ratio;*
   c. *The effluent dissociation ratio was based on the 75th percentile rather than the worst case scenario of 95th percentile or maximum concentration;*

d. *The MOE uses a total ammonia end of pipe toxicity of 0.1 mg/L rather than 0.2 mg/L to assess acute toxicity impacts;*

e. *The effluent dissociation ratio was generated using PWQMN field pH and temperature data but did not include field pH and temperature data from the actual wastewater characterization dataset; and*

f. *The ambient dissociation ratio was generated using PWQMN field pH and temperature data but did not include field pH and temperature data that was collected in the receiver by Triton from 2007 to 2011.*

To clarify, the Triton data was incorporated for both pH and temperature. There were no PWQMN stations in the area.

6. *Recalculation of the total ammonia end of pipe toxicity was completed using monthly 95th percentile pH and temperature for the effluent generated from the "Wastewater Characterization" and "Ambient and Effluent Data" spreadsheets that were provided by XCG to Lindsey Burzese on June 10, 2013. These data are limited for May and October as there is only one data point for these months. The results are provided in the table below and the raw effluent pH and temperature data are provided in Appendix A.*

   Table and Appendix A excluded.

   Based on the results, the effluent has the potential to be acutely toxic in March and November at an effluent TAN greater than 2.8 and 0.4 mg/L, respectively.

   Because of the limited monthly data for May and October, additional calculations were completed for these months using pH and temperature data from April/June and September/November to give an idea of the potential range of effluent TAN for those months (see table below). The maximum TAN in the effluent to be non-acutely toxic could potentially range from 4.8 to 15.1 in May and from 0.4 to 128.1 in October.

   Table excluded.

   A potential October and November TAN limit of 0.4 mg/L will likely be unachievable and provide limited flexibility for the WWTP. The low TAN for November (and the October range) appears to be driven by the high pH in effluent for that month which was a result of a couple of elevated pH concentrations in the effluent. If the effluent pH is maintained at a value no higher than 8, TAN would not be acutely lethal at the end of pipe at a TAN of 3.5 mg/L (see table below) for all months including November and would also address the lower TAN for acute lethality originally calculated for March. However, the October effluent TAN has the potential to be acutely lethal at a concentration greater than 2.8 mg/L.

   Therefore, it is recommended that the TAN limit for January, February, March, April, May, November and December be set to 3.5 mg/L while the October TAN limit be set to 2.8 mg/L. This recommendation is only valid provided that the ECA identifies an upper pH limit of 8.

XCG has recalculated effluent un-ionized ammonia based on additional effluent temperature data and an effluent pH limit of 8 (see Table 1). To ensure a pH limit of 8, effluent pH adjustment will be required. Preliminary discussion with MOE identified that pH adjustment would be acceptable.

Table 1 Calculation of Effluent Un-ionized Ammonia

Month	Effluent Temperature (°C)[a]	Effluent pH	pka	f	Un-ionized Ammonia (mg/L)	TAN in Effluent (mg/L)
January	10.1	8	9.73	0.018	0.099	5.5
February	8.5	8	9.78	0.016	0.099	6.2
March	11.9	8	9.67	0.021	0.099	4.7
April	11.9	8	9.67	0.021	0.099	4.7
May	14.5	8	9.58	0.026	0.099	3.8
October	18.4	8	9.45	0.034	0.099	2.9
November	13.4	8	9.62	0.023	0.099	4.3
December	9.3	8	9.75	0.017	0.100	5.9

Notes:
a - 95th percentile temperature

The updated calculations are similar to those presented by the MOE. The results support the recommendation by the MOE that the TAN limit for January to May and November to December be set to 3.5 mg/L-N and that the limit for February be set to 2.8 mg/L-N. It should be noted that the TAN effluent limit applies for a pH upper compliance limit of 8.

7. *The standard pH limit of 6 to 9 will not be appropriate for this facility as a pH of 9 will result in an acutely toxic TAN at the end of pipe for all discharge months. The maximum pH limit should be set to 8 to ensure that TAN end of pipe acute toxicity does not occur. If the proponent feels a pH limit of 8 is too constrictive then they should provide an alternate TAN and pH limit that will ensure acutely toxic TAN does not occur at the end of pipe.*

   The proposed pH limit is 6 - 8. The upper limit will be maintained by pH adjustment of the effluent.

8. *Recalculation of the unionized ammonia concentration at the end of the mixing zone was completed using quarterly 75th percentile pH and temperature for the receiver generated from the "Ambient and Effluent Data" spreadsheets that were provided by XCG to Lindsey Burzese on June 10, 2013. Ideally monthly pH and temperature data for the receiver should have been used however there was an insufficient dataset for this to be completed. In addition, June data was not included in the second quarter (April, May and June) calculation as it was not considered appropriate. The results are provided in the table below and the receiver pH and temperature data are provided in Appendix A.*

Table and Appendix A excluded.

Based on the results, the unionized ammonia at the end of the mixing zone for an effluent TAN ranging from 0.65 to 3.5 mg/L should be less than the provincial water quality objective (PWQO). However, it needs to be noted that there is limited data for the receiver and the pH and temperature data should be based on monthly information not quarterly. It is recommended that any Triton field data collected from 2007 to 2011 be included in the receiver dataset and monthly statistics generated, if possible.

The dataset provided to the MOE contains the Triton data. XCG has completed a monthly analysis of fully mixed unionized ammonia (see Table 2) using the same approach applied by the MOE for the seasonal analysis. The resultant unionized ammonia concentrations are similar to those presented by the MOE. Fully mixed concentrations are less than the PWQO of 0.02 mg/L for un-ionized ammonia.

Table 2 Calculation of Fully Mixed Un-ionized ammonia

Month	75th Percentile Ambient Temperature (°C)[a]	75th Percentile Ambient pH	pka	f	Un-ionized Ammonia (mg/L)	Fully Mixed TAN (mg/L)
January	0.0	8.58	10.08	0.031	0.014	0.45
February	0.0	8.35	10.08	0.018	0.009	0.49
March	1.9	8.53	10.01	0.032	0.014	0.43
April	10.3	8.60	9.72	0.071	0.016	0.23
May	16.0	8.48	9.53	0.082	0.019	0.23
October	8.1	8.50	9.8	0.048	0.013	0.28
November	3.0	8.50	9.98	0.032	0.009	0.29
December	1.5	8.80	10.03	0.056	0.016	0.29

9. *The proposed discharge curves for TAN are not ideal and the MOE would like to move away from their use such that exact numbers can be calculated and recorded by the operators, rather than estimations from a figure, and made available for review by Environmental Officers. In order to maintain flexibility for the Arthur WWTP it is recommended that a table be included in the new ECA that identifies the flow ratios that can be used to discharge effluent at a range of effluent TAN concentrations and that this table replace the figures proposed in Section 3.1 of the ACS. A possible example is provided below. Dilution values or flow ratios were taken from the "Ambient and Effluent Data" spreadsheet provided by XCG to Lindsey Burzese on June 10, 2013.*

A table as opposed to curves will be easier to apply and is acceptable to the Township of Wellington North. XCG has developed updated ratios based on the monthly analysis completed above (see Table 3).

Table 3 Streamflow: Effluent Ratio for various TAN Limits

Month	TAN Concentration (mg/L)					
	<= 0.65	>0.65 to 1	>1 to 1.5	>1.5 to 2	>2 to 2.8	>2.8 - 3.5
January	0.7	1.9	3.7	5.5	8.5	11.0
February	0.5	1.6	3.2	4.6	7.1	9.4
March	0.8	2.2	4.2	6.0	9.1	11.8
April	3.5	6.3	10.7	15.0	21.5	27.3
May	3.5	6.5	10.2	15.3	21.8	26.2
October	1.9	3.8	6.3	9.1	13.6	N/A
November	1.8	3.5	6.0	8.8	12.5	16.4
December	1.9	3.5	6.1	8.6	12.6	16.0

Notes:
N/A – not available as recommended TAN limit for October is 2.8 mg/L

10. *The calculations to determine the streamflow based on the stage-discharge curve, and the effluent flow rate based on TAN concentrations/flow ratios need to be clearly set out in the operations manual and easy for the operators to understand, follow and record the resulting information. A condition should also be included in the new ECA that requires that this information (i.e. stage, calculated streamflow, TAN, calculated effluent flow) be recorded in a log by the operator on a daily basis. The proponent should provide a recommendation on how the daily TAN will be determined.*

    Recommendations for a log and measurements of TAN will be included in the ESR.

11. *The consultant indicated that a reasonable rating curve will be required for the discharge curves and that the curves will need to be updated to reflect changes in bed morphology. A condition should be included in the ECA requiring the development of the stage-discharge curve, annual updating of the curve and a backup plan in place should updating of the curves not be completed.*

    The requirement of a stage-discharge curve will be discussed in the ESR.

12. *The old C of A has annual loading limits for cBOD5, TSS, TP and TAN however no loading limits were proposed for the new ECA. This needs to be completed however there are several issues specific to this that will need to be addressed and are as follows:*

    a. *The old C of A loadings are annual average limits and the new ECA will require monthly average loading limits;*

    b. *Monthly average loading limits are generally determined using the monthly average concentration and the ADF however this is specific to WWTPs that discharge year round. In the case of Arthur where discharge only occurs during a specific window (~243 days from October 1 to May 31) a new method* *to determine the monthly loading limit will be required, particularly as the old method will result in non-compliance issues;*

c. *Use of the ADF to determine the loading limit may not be appropriate as it does not reflect the total effluent flow to the Conestogo River. Consideration should be given to using the proposed maximum total daily effluent flow in place of the ADF or an average total daily effluent flow, if it can be satisfactorily calculated;*

d. *The new monthly loading limits may result in values that are higher than the existing C of A loading limits for some months but lower for others. In order to substantiate that there will be an overall reduction in loadings, the total loading for the discharge window for the existing C of A (227 days from September 16 to April 30), for the new ECA (243 days from October 1 to May 31) and actual loadings for the existing discharge window for the last 2 years should be compared; and*

e. *It is also recommended that a seasonal (i.e. Oct 1 to May 31) loading limit be included such that the monthly limits provide flexibility but the seasonal limit ensures an overall reduction in loadings, in particular for TP, from the previous C of A.*

Response to a., b. c. and e.:

Proposed maximum loading limits have been calculated as the maximum effluent flow multiplied by the proposed compliance limit (see Table 4).

Table 4 Maximum Loading Limits

Discharge Period	ADF (m^3/d)	TSS & BOD_5 (mg/L)	TSS & BOD_5 (kg/d)	TP (mg/L)	TP (kg/d)	TAN (mg/L)	TAN (kg/d)
January	6500	10	65	0.3	1.95	3.5	22.8
February	6500	10	65	0.3	1.95	3.5	22.8
March	6500	10	65	0.3	1.95	3.5	22.8
April	2150	10	22	0.3	0.65	3.5	7.5
May	1300	10	13	0.3	0.39	3.5	4.6
October	1000	10	10	0.3	0.30	2.8	2.8
November	3550	10	36	0.3	1.07	3.5	12.4
December	2800	10	28	0.3	0.84	3.5	9.8
Seasonal (October 1 - May 31)	3455	10	35	0.3	1.04*	3.5	12.1

Note:
* equates to 0.69 kg/d on an annual basis at an ADF of 2300 m^3/d.

Response to d.:

A comparison table for TP showing existing limits proposed limits and historical values are shown in Table 5.

Table 5 Comparison of TP Loads

Month	Existing*	Proposed	2007	2008	2009	2010	2011	2012
January	2.36	1.95	0.70	0.55	1.56	1.12	0.85	0.98
February	2.36	1.95	0.36	0.75	0.85	1.50	0.99	1.22
March	2.36	1.95	0.88	0.89	1.26	0.55	0.65	0.34
April	2.36	0.65	1.34	0.75	0.93	1.05	0.45	0.05
May	0	0.39	0	0	0	0	0	0
September	2.36	0	0	0	0	0	0	0
October	2.36	0.30	0	0	0	0	0	0
November	2.36	1.07	0.08	0.58	0.80	0.42	0.62	0.49
December	2.36	0.84	1.30	0.93	0.81	0.58	0.91	0.76

Notes:
* Annual average spread evenly across months.

The Table shows that there is a decrease in TP loads in all months, from the existing CofA to the proposed limits, with the exception of May. Actual values from 2007 - 2012 show a wide variability in TP loads; in part due to effluent concentrations as well as effluent flows which are not as regulated under the current CofA.

13. *The sampling program for the effluent and receiver were not provided in the ACS. The proponent should submit the proposed surface water and effluent sampling program for review and acceptance by the Ministry and for inclusion in the new ECA. The sampling program should include but not be limited to: parameters to be sampled, locations to be sampled and frequency of sampling. In addition to this, a contingency plan should be provided, and included as a condition in the new ECA, on the steps that will be taken should effluent limits be exceeded.*

    This information will be provided in the ESR.

ATTACHMENT A

XCG Environmental Engineers & Scientists

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: January 6, 2014 **XCG File No.: 3-3167-01-01**

To: Sarah Day (Ministry of the Environment)

cc: Barry Trood, Deb Zehr (Township of Wellington North), Stephen Nutt (XCG Consultants Ltd.), Barbara Slattery (Ministry of the Environment)

From: Colin Clarke (XCG Consultants Ltd.)

Re: Arthur WTTP Mixing Zone Analysis - TAN and TP

---

1. INTRODUCTION

In a letter dated October 23, 2013, Ms. Sarah Day of the Ministry of the Environment (MOE) provided comments regarding the Arthur Wastewater Treatment Plant (WWTP) mixing zone analysis for total ammonia nitrogen (TAN) and total phosphorus (TP).

The letter outlined general background information and provided seven comments. In general, comments 1 - 4 identified that the proposed effluent limits and mixing zones were acceptable for the four scenarios presented (i.e. 7Q20 April, 7Q20 October, 2 x 7Q20 April and 2 x 7Q20 October. These comments require no response from XCG Consultants Ltd. (XCG). The remaining three comments require additional work. Each comment is listed below followed by the response.

2. COMMENTS

Comment #5:

As the TP concentrations at the end of the mixing zone aren't ideal, the MOE is requesting that far field modeling be completed to determine the distance downstream where TP concentrations return close to background concentrations. This may require the use of decay kinetics and/or uptake parameters in the modeling.

For clarification purposes Colin Clarke of XCG contacted Ms. Sarah Day in order to clarify MOE requirements. Through discussion it was determined that it would be suitable to estimate TP attenuation using a simple linear decay model and that the points of interest were approximately 2.8 km downstream (near the All Treat discharge) and 3.7 km downstream (approximately 1 km downstream of Wellington Road 109).

To determine a reasonable range of decay coefficients, XCG reviewed the following report by Reiser, R.G., 2004, "Evaluation of stream flow, water quality, and permitted and nonpermitted loads and yields in the Raritan River Basin, New Jersey, Water Years 1991-98": U.S. Geological Survey Water-Resources Investigations Report 03-4207, 210 p. The paper looked at four different rivers in the Raritan River Basin including the South Branch Raritan River, North Branch Raritan River, Millstone River and Lamington River and developed TP decay coefficients on a reach by reach basis. The decay coefficients ranged from 0.05 - 0.77 1/day during the non-growing season which is when the bulk of the discharge would be occurring from the Arthur WWTP. While these numbers were measured in New Jersey, they show that in general decay is expected to be small during the non-growing season and they should be transferable to this study. As such the above range in decay coefficients was used to estimate downstream concentrations of total phosphorus.

TP concentrations from the plant (including decay) were estimated at the downstream location using the following equation.

$$TP_x = TP_{wwtp}e^{-kt}$$

Where:

TP_x = effluent effective concentration at location x metres downstream (mg/L)

TP_{wwtp} = effluent TP concentration from the WWTP (mg/L)

k = decay coefficient

t = time in days. Estimated from the CORMIX velocity and the total distance travelled.

With this concentration, a simple mass balance was completed. The estimated concentrations at the aforementioned locations are summarized in Table 1 and Table 2 for decay rates of 0.05 1/day and 0.77 1/day respectively.

Table 1 CORMIX Predicted Mixing Zone Lengths for TP Decay 0.05 1/d

Scenario	Stream Velocity (m/s)	Concentration at All Treat (mg/L)	Concentration 1 km past Wellington Road 109 (mg/L)
October 7Q20	0.115	0.132	0.128
February 7Q20	0.127	0.212	0.206
April 7Q20	0.232	0.100	0.100
October 2 x 7Q20	0.142	0.132	0.132
February 2 x 7Q20	0.208	0.169	0.169
April 2 x 7Q20	0.311	0.100	0.100

Table 2 CORMIX Predicted Mixing Zone Lengths for TP Decay 0.77 1/d

Scenario	Stream Velocity (m/s)	Concentration at All Treat (mg/L)	Concentration 1 km past Wellington Road 109 (mg/L)
October 7Q20	0.115	0.111	0.107
February 7Q20	0.127	0.179	0.166
April 7Q20	0.232	0.093	0.091
October 2 x 7Q20	0.142	0.114	0.111
February 2 x 7Q20	0.208	0.154	0.150
April 2 x 7Q20	0.311	0.096	0.093

Table 3 shows the downstream concentrations with no decay.

Table 3 Mass Balance for Fully Mixed TP Concentrations

Scenario	Streamflow (m^3/s)	Stream TP Concentration (mg/L)[1]	Proposed Effluent Flow (m^3/d)	Proposed TP Compliance Limit (mg/L)	Fully Mixed Concentration (mg/L)
October 7Q20	0.022	0.043	1,000	0.3	0.132
February 7Q20	0.039	0.043	6,500	0.3	0.212
April 7Q20	0.087	0.043	2,150	0.3	0.010
October 2x7Q20	0.044	0.043	2,000	0.3	0.132
February 2 x 7Q20	0.078	0.043	6,500	0.3	0.169
April 2x7Q20	0.174	0.043	4,300	0.3	0.010

Notes:
1. Annual 75th percentile TP concentration

Concentrations resulting from decay are quite variable dependant on the decay coefficient applied and the total travel time. Longer travel times would result in lower concentrations. Background conditions are not likely to be reached prior to reaching the All Treat discharge location.

Comment #6:

The maximum effluent flow permitted to be discharged in January to March is 6500 m^3d-1 (lagoon effluent plus treatment system effluent) and is approximately 6.5 times greater than the maximum flow rate in October however the 7Q20 flows in February (month with the lowest 7Q20 during that period) are only 1.4 times greater than in October. As the increase in effluent discharge far exceeds the increase in 7Q20 flow, there is the potential for more impact to be noted during this period than in

October or April. Therefore, it is requested that a mixing zone analysis be completed for the maximum effluent flow of 6500 m3d-1 in February (lowest 7Q20 when maximum flow would be allowed).

The CORMIX modelling was updated to include two additional scenarios: February 7Q20 and February 2 x7 Q20 (double the 7Q20 flow) for TP and TAN. The parameters used in the TP model are summarized in Table 4; the parameters for the TAN model are summarized in Table 5.

Given that the effluent flow rate is greater than the February 7Q20 it was not possible to model the mixing zone. However, all other scenarios show complete mixing occurs in less than 150 m. With regard to TP, the intent is to ensure that loads do not increase; therefore, the modelling of this mixing zone is not as much of concern. For TAN, the effluent ammonia concentration is low enough that it is protective of the environment. The effluent is not acutely toxic at the end-of-pipe and under fully mixed conditions the un-ionized ammonia concentration is 0.019 mg/L. Further, given the ratio of wastewater to streamflow it is likely that the dissociation ratio will be less due to the lower pH of the effluent.

Mixing zone lengths for all scenarios are shown in Table 6 and Table 7 for TP and TAN respectively. As mentioned above total mixing occurs in less than 150 m for all scenarios; in some cases mixing zones for TAN to reach the PWQO for un-ionized ammonia are less than the total mixing length. Small differences in total mixing zone lengths between TP and TAN are a result of rounding for various concentrations.

Comment #7:

It is not clear if the flow values used in the mixing zone analyses include the Grand Valley (sic) discharge to the WWTP? If not, then modeling scenarios should be redone to account for the flow from this wastewater source.

Additional flow from the Golden Valley Farms (180 m^3/d) would be accommodated within the proposed future ADF capacity.

Table 4 CORMIX3 Parameters - TP model

Model Input	Oct. 7Q20	Feb. 7Q20	Apr. 7Q20	Oct. 2 x 7Q20	Feb. 2 x 7Q20	Apr. 2 x 7Q20
Ambient Parameters						
7Q20 Flow (m^3/s)	0.022	0.039	0.087	0.044	0.078	0.174
Average depth at discharge (m)	0.1	0.14	0.15	0.14	0.15	0.2
Depth at discharge (m)	0.1	0.14	0.15	0.14	0.15	0.2
Ambient 75th percentile temperature (ºC)	8.1	0.0	10.3	8.1	0.0	10.3
Wind speed (m/s)	2.0					
Manning's n	0.055 (calibrated value from GRCA HEC-RAS model)					
Ambient annual 75th percentile TP (mg/L)	0.043					
Outfall Parameters						
Discharge located on bank	left					
Discharge configuration	flush					
Outfall Angle relative to flow (degrees)	90					
Channel side slope (degrees)	10					
Local depth at discharge (m)	0.1	0.14	0.15	0.14	0.15	0.2
Discharge width (m)	0.375					
Estimated discharge depth (m)	0.05	0.075	0.1	0.1	0.15*	0.2
Discharge Parameters and PWQO						
Proposed ADF (m^3/d)	1,000	6,500	2,150	2,000	6,500	4,300
Proposed TP compliance limits (mg/L) [1]	0.3					
Effluent Temperature (ºC)	18.4	8.5	11.9	18.4	8.5	11.9
Fully mixed TP (mg/L) [1]	0.132	0.212	0.10	0.132	0.169	0.10

Notes:

1. Concentrations in table are actual values; to convert to excess concentrations for use in CORMIX subtract the ambient value from the proposed TP limit and calculated PWQO.

*The higher velocity for the February flow required that the channel width be increased to 0.4 m because the discharge channel depth cannot exceed the receiver depth.

Table 5 CORMIX3 Parameters - TAN model

Model Input	Oct. 7Q20	Feb. 7Q20	Apr. 7Q20	Oct. 2 x 7Q20	Feb. 2 x 7Q20	Apr. 2 x 7Q20
Ambient Parameters						
7Q20 Flow (m^3/s)	0.022	0.039	0.087	0.044	0.078	0.174
Average depth at discharge (m)	0.1	0.14	0.15	0.14	0.15	0.2
Depth at discharge (m)	0.1	0.14	0.15	0.14	0.15	0.2
Ambient 75th percentile temperature (ºC)	8.1	0.0	10.3	8.1	0.0	10.3
Wind speed (m/s)	2.0					
Manning's n	0.055 (calibrated value from GRCA HEC-RAS model)					
Ambient 75th percentile NH_3 (mg/L-N)	0.09	0.17	0.11	0.09	0.17	0.11
Outfall Parameters						
Discharge located on bank	left					
Discharge configuration	flush					
Outfall Angle relative to flow (degrees)	90					
Channel side slope (degrees)	10					
Local depth at discharge (m)	0.1	0.14	0.15	0.14	0.15	0.2
Discharge width (m)	0.375					
Estimated discharge depth (m)	0.05	0.1	0.1	0.1	0.15*	0.2
Discharge Parameters and PWQO						
Proposed ADF (m^3/d)	1,000	6,500	2,150	2,000	6,500	4,300
Proposed $NH_{3\text{-}N}$ compliance limits (mg/L-N) [1]	0.65					
Effluent Temperature (ºC)	18.4	8.5	11.9	18.4	8.5	11.9
NH_3[1] for compliance(mg/L-N)	0.33	0.96	0.17	0.33	0.96	0.17

Notes:

1. 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.
2. NH_3-N concentration for compliance was solved by iterating ammonia concentrations with the 75th percentile dissociation ratio to calculate an un-ionized ammonia concentration of 0.02 mg/L.

* The higher velocity for the February flow required that the channel width be increased to 0.4 m because the discharge channel depth cannot exceed the receiver depth.

Table 6 CORMIX Predicted Mixing Zone Lengths - TAN No Decay

Scenario	Plume Length to Reach PWQO (m)	Plume Length to Reach Fully Mixed Conditions (m)
October 7Q20	<10	104
February 7Q20	CORMIX will not run this scenario as the effluent flow is greater than the ambient flow.	
April 7Q20	51	108
October 2 x 7Q20	<10	104
February 2 x 7Q20	< 10	105
April 2 x 7Q20	57	110

Table 7 CORMIX Predicted Mixing Zone Lengths - TP No Decay

Scenario	Plume Length (m)
October 7Q20	101
February 7Q20	CORMIX will not run this scenario as the effluent flow is greater than the ambient flow.
April 7Q20	119
October 2 x 7Q20	99
February 2 x 7Q20	103
April 2 x 7Q20	129

From: Colin Clarke
Sent: January-13-14 8:37 AM
To: Day, Sarah (ENE)
Subject: Arthur Effluent Limits
Attachments: Final Effluent Limits.xlsx

Good morning Sarah,

I hope you had a good weekend. I have attached a spreadsheet that includes updated calculations for effluent volumes, TAN discharges and a flow pacing strategy.

The new volumes attempt to optimize a number of components. 1) non-acutely toxic effluent ammonia; 2) fully mixed ammonia less than the PWOQ; and 3) trying to minimize increases in concentration of TP in the receiver.

Tables 1 – 6 focus on TAN for effluent toxicity and the PWQO for unionized ammonia. You'll notice in these tables different monthly volumes than previously.
Table 7 Shows the Streamflow:Effluent Flow Ratios for various TAN limits. These numbers look different than previously. You will also notice that some months have the same ratio for multiple concentrations; this is because all concentrations below the highest value do not exceed the PWQO in the stream under fully mixed conditions.

Table 8 was used to assist in assessing the monthly volumes by trying to minimize the increase in TP. Monthly flows have been reallocated.

Table 9 was used to determine a threshold streamflow above which effluent flows can increase at a constant ratio. You'll notice that increased effluent flows occur around 2x7Q20 flows; this was done in order to reduce instream TP concentrations.

Table 10 is a proposed table for the ECA that identifies the maximum allowable effluent flow.

Table 11 shows the proposed seasonal compliance limits.

Implementation wise it would work something like this.

- Gather data regarding current effluent TAN concentration and current streamflow;
- Using Table 7 and the effluent TAN concentration, determine the streamflow:discharge ratio, then use the current streamflow to determine the allowable effluent discharge rate based on ammonia;
- Using Table 10 and the current streamflow, determine the maximum discharge flowrate possible based on flow constraints (i.e. TP);
- Select the allowable discharge flow rate, which is the lower of the values determined from Tables 7 and 10.

If TP is consistently above the design objective of 0.2 mg/L we could include a condition that the Township will need to provide a plan on how effluent TP will be brought to below 0.2 mg/L.

I have not updated the mixing zone analysis at this point but based on the previous modeling it is expected to be small. I would update this in the final ACS.

Please have a look and let me know what you think.

Thank you,

Colin Clarke, M.Sc., P.Eng.
Project Engineer

XCG Consultants Ltd. Environmental Engineers & Scientists
6 Cataraqui Street, Kingston, Ontario, Canada K7K 1Z7
www.xcg.com | T 613 542 5888 x214 | F 613 542 0844 | C 613 532 4938

From: Colin Clarke
Sent: January-20-14 10:25 AM
To: Day, Sarah (ENE)
Cc: Barry Trood; barbara.slattery@ontario.ca; dzehr@wellington-north.com
Subject: Arthur Proposed Effluent Limits and Objectives - Updated

Sarah,

To address the MOE concern of increased TP concentrations in the Conestogo River, XCG proposes to redistribute the effluent flows and reduce the TP effluent compliance limit and design objective. The proposed maximum monthly effluent discharges are shown in Table 1. The proposed effluent compliance limit for TP is 0.25 mg/L and the proposed design objective for TP is 0.17 mg/L.

Table 1 Proposed Maximum Monthly Effluent Flows

Month	Outflow at 7Q20
	(m^3/d)
January	5000
February	5000
March	5500
April	3200
May	1300
October	1400
November	4600
December	3800

The existing lagoons have a maximum storage capacity of about 340,000 m^3. Required storage for the increased effluent flow was evaluated in two different ways; 1) a constant inflow of 2,300 m^3/d into the system; and 2) a variable monthly inflow based on historical observations. The required storage ranged from 250,000 m^3 – 320,000 m^3. These preliminary estimates suggest sufficient storage capacity is available; however, options to provide additional storage for the expanded WWTP will be considered as part of Phase 3 of the Class EA, if necessary.

Due to the changes in allocation of monthly effluent flow it was necessary to recalculate the requirements for effluent ammonia discharge. The new flow ratios based on effluent ammonia are shown in Table 2.

Table 2 Streamflow : Effluent Flow Ratios for Specified Effluent TAN Concentrations

Month	Effluent TAN Concentration (mg/L)					
	<=0.65	>0.65 to 1	>1 to 1.5	>1.5 to 2.0	>2.0 to 2.8	>2.8 to 3.5
January	0.9	0.9	1.7	2.7	4.7	5.8
February	0.7	0.7	0.7	0.9	1.8	2.6
March	1.0	1.0	1.8	2.9	4.9	6.0
April	2.3	4.2	7.5	10.7	15	18.8
May	3.5	5.7	11.4	15.3	22.9	45.8
October	1.4	1.7	3.8	4.8	9.5	N/A
November	1.4	1.4	1.6	2.5	4.1	5.5

December	1.4	2.4	4.3	6.5	10.4	13
Notes: These ratios ensure that under fully mixed conditions that the PWQO is not exceeded and that effluent ammonia concentrations are not acutely toxic.						

There are no H_2S data for the lagoons. The lagoons are used to store treated (secondary) effluent that has low concentrations of BOD and TSS. As raw sewage is not introduced to the lagoons, H_2S production would not be expected. In addition, the lagoon contents are blended with plant secondary effluent and treated through the effluent filters prior to discharge.

If you need anything further please do not hesitate to contact me at your convenience.

Colin Clarke, M.Sc., P.Eng.
Project Engineer

XCG Consultants Ltd. Environmental Engineers & Scientists
6 Cataraqui Street, Kingston, Ontario, Canada K7K 1Z7
www.xcg.com | T 613 542 5888 x214 | F 613 542 0844 | C 613 532 4938

From: Colin Clarke
Sent: January-27-14 9:06 AM
To: Stephen Nutt
Subject: FW: Arthur WWTP

Colin Clarke, M.Sc., P.Eng.
Project Engineer

XCG Consultants Ltd. Environmental Engineers & Scientists
6 Cataraqui Street, Kingston, Ontario, Canada K7K 1Z7
www.xcg.com | T 613 542 5888 x214 | F 613 542 0844 | C 613 532 4938

From: Slattery, Barbara (ENE) [mailto:barbara.slattery@ontario.ca]
Sent: Friday, January 24, 2014 9:04 AM
To: Colin Clarke; btrood@wellington-north.com
Cc: Serwotka, Carola (ENE); Day, Sarah (ENE)
Subject: Arthur WWTP

Good morning,

This is to advise that the following documents have now been reviewed by Sarah Day, Surface Water Specialist:

- Memorandum to Barbara Slattery and Sarah Day (MOE) titled "Arthur WWTP – Assimilative Capacity Study" from Colin Clarke (XCG) dated January 6, 2014
- Email to Sarah Day (MOE) titled "Arthur Effluent Limits" from Colin Clarke (XCG) dated January 13, 2014 at 8:37am
- Email to Sarah Day (MOE) titled "Arthur Proposed Effluent Limits and Objectives - Updated" from Colin Clarke (XCG) dated January 20, 2014 at 10:25am

As part of the Class Environmental Assessment to permit the re-rating of the Arthur WWTP to an ADF of 2,300 $m^3d^{-1,}$ an assimilative capacity assessment (ACS) is being undertaken to determine the effluent limit requirements for the expanded discharge. The purpose of this review was to provide final recommendations on the proposed flows and effluent limits to enable the EA to move forward and to be included in the conditions of an updated ECA for the facility.

Comments and Recommendations

1. Based on the responses provided in the above noted memorandum, the following items have been agreed upon between the MOE TSS and the proponent and the recommendations for inclusion in the updated ECA are as follows:

A. The maximum total daily effluent flow to the receiver shall be

Month	Maximum total daily flow (m^3/d)
January	5000
February	5000
March	5500
April	3200
May	1300
October	1400
November	4600
December	3800

B. The effluent objectives and limits for the following parameters shall be

Parameter	Objective	Limit
$cBOD_5$	5 mg/L	10 mg/L
TSS	5 mg/L	10 mg/L
TP	0.17 mg/L	0.25 mg/L
E. coli	N/A	100 CFU/100 mL

C. The effluent objectives and limits for TAN shall be

Month	Objective (mg/L as N)	Limit (mg/L as N)
January	0.5	3.5
February	0.5	3.5
March	0.5	3.5
April	0.5	3.5
May	0.5	3.5
October	0.5	2.8
November	0.5	3.5
December	0.5	3.5

D. The objectives and limits for $cBOD_5$, TSS, TAN and TP shall be based on a monthly average while E. coli shall be based on a monthly geometric mean.

E. The effluent limit for pH shall be 6 to 8.

F. The effluent flow rate shall be calculated using the total ammonia nitrogen (TAN) concentration and following flow ratio table

	TAN (mg/L)					
Month	<=0.65	>0.65 to 1	>1 to 1.5	>1.5 to 2	>2 to 2.8	>2.8 to 3.5
January	0.9	0.9	1.7	2.7	4.7	5.8
February	0.7	0.7	0.7	0.9	1.8	2.6
March	1.0	1.0	1.8	2.9	4.9	6.0
April	2.3	4.2	7.5	10.7	15	18.8
May	3.5	5.7	11.4	15.3	22.9	45.8
October	1.4	1.7	3.8	4.8	9.5	N/A

November	1.4	1.4	1.6	2.5	4.1	5.5
December	1.4	2.4	4.3	6.5	10.4	13

G. The loading limits for the following parameters shall be

Month	**TSS (kg/d)**	**BOD_5 (kg/d)**	**TAN (kg/d)**	**TP (kg/d)**
January	50	50	17.5	1.25
February	50	50	17.5	1.25
March	55	55	19.3	1.38
April	32	32	11.2	0.80
May	13	13	4.6	0.32
October	14	14	3.9	0.35
November	46	46	16.1	1.15
December	38	38	14.4	0.95
Seasonal* (Oct 1 to May 31)	34.6	34.6	12.1	0.86

*based on ADF 2300 m^3/d convert from 365 to 243 days

2. The following condition should be included in the new ECA “Upon an exceedance of the TP effluent objective, the Owner shall take action to reduce TP concentrations to below the objective.”

3. Detail regarding the protocol for the logbook, daily TAN measurements, development and maintenance of the stage-discharge curve, and the sampling program will be provided in the Environmental Studies Report (ESR). The MOE reserves final comment of these items upon submission of the ESR to the ministry.

Should you have any questions or comments or require additional information, please feel free to contact Sarah either at (905) 521-7304 or Sarah.Day@ontario.ca

From: Colin Clarke
Sent: January-27-14 7:55 AM
To: Stephen Nutt; Melody Johnson
Subject: FW: Arthur Effluent Limits

Colin Clarke, M.Sc., P.Eng.
Project Engineer

XCG Consultants Ltd. Environmental Engineers & Scientists
6 Cataraqui Street, Kingston, Ontario, Canada K7K 1Z7
www.xcg.com | T 613 542 5888 x214 | F 613 542 0844 | C 613 532 4938

From: Day, Sarah (ENE) [mailto:Sarah.Day@ontario.ca]
Sent: Friday, January 24, 2014 9:26 AM
To: Colin Clarke
Cc: Day, Sarah (ENE); Slattery, Barbara (ENE); Burzese, Lindsey (ENE)
Subject: RE: Arthur Effluent Limits

Hi Colin,

I have been thinking about this request and have finally come to a decision after discussion with other MOE staff. The maximum total daily effluent volumes are not "standard" in the sense that they reflect an ADF of a WWTP but reflect the ADF plus whatever Arthur can pump out from the storage lagoons. As a result of this, the peaking factor for this is likely much higher than a standard WWTP and could potentially occur for a longer more consistent period of time which wouldn't happen in a regular WWTP (e.g. maximum total daily effluent flow of 6500 m3/d for two weeks straight then a reduction to low output to meet an average of 5000 m3/d for Jan). We have already established that 6500 m3/d at a TP of 0.3 mg/L or even 0.25 mg/L is not acceptable based on impact to the receiver. Furthermore, the TP limit of 0.25 mg/L is still not ideal but was agreed to as long as other conditions were included in the ECA to minimize TP impacts. Finally, this is a Policy 2 system that has limited capacity for TP assimilation. With the compromises that have already been agreed to and the increases in TP concentrations that are calculated based on flows of 6500 m3/d, I do not support the request that the maximum total daily effluent flows be based on a monthly average at this point in time. However, should the Town install additional TP treatment to further reduce their TP limit then this request may be revisited.
Cheers,

Sarah

From: Colin Clarke [mailto:colin.clarke@xcg.com]
Sent: January 20, 2014 11:54 AM
To: Day, Sarah (ENE)
Subject: Arthur Effluent Limits

Sarah,

I have been asked if the MOE would consider the following.

For the monthly maximum effluent volumes proposed. Could the volumes be calculated based on a monthly average. This would give the plant the ability to discharge up to a maximum daily volume of 6,500 m^3/d. This would provide a little more flexibility for the plant for day to day discharge.

Have a good day,

Colin Clarke, M.Sc., P.Eng.
Project Engineer

XCG Consultants Ltd. Environmental Engineers & Scientists
6 Cataraqui Street, Kingston, Ontario, Canada K7K 1Z7
www.xcg.com | T 613 542 5888 x214 | F 613 542 0844 | C 613 532 4938

Date: December 10, 2015 **XCG File No.: 03-3167-01-01**

To: Barbara Slattery, Ministry of the Environment and Climate Change

Cc: Matt Aston & Barry Trood, Township of Wellington North

From: Graham Seggewiss and Melody Johnson, XCG Consultants Ltd.

Re: Proposed Effluent Quality Requirements at an Interim Capacity for the Arthur WWTP

1. INTRODUCTION

The Township of Wellington North (Township) is currently undertaking a Schedule C Class Environmental Assessment (EA) to determine the most cost effective, environmentally sound, and sustainable approach to upgrade the Arthur Wastewater Treatment Plant (WWTP) to provide servicing to a design year of 2031. XCG Consultants Ltd. (XCG) has been retained by the Township to undertake the Arthur WWTP Class EA. A preferred design concept has been selected as part of Phase 3 of the Class EA process. The preferred concept is to twin the existing extended aeration package plant to provide treatment up to 2,300 m^3/d.

Since completion of Phase 3 of the Class EA process, the Township has investigated the feasibility of phasing in the plant capacity expansion to address recent increases in flow experienced at the WWTP. Based on a review of the existing liquid treatment train, it was determined that phasing-in construction is a feasible option. The proposed construction phasing would result in an interim (Phase 1) capacity of 1,860 m^3/d and an ultimate (Phase 2) capacity of 2,300 m^3/d.

As part of the Class EA process, an Assimilative Capacity Study (ACS) was completed to define effluent requirements for the Phase 2 capacity of 2,300 m^3/d. The Ministry of the Environment and Climate Change (MOECC) provided written approval of the effluent objectives, limits and discharge regime associated with this capacity (see Attachment 1). The purpose of this memorandum is to define proposed effluent objectives, limits, and discharge regime associated with the proposed interim Phase 1 capacity of 1,860 m^3/d.

2. PROPOSED EFFLUENT CRITERIA FOR PHASE 1 CAPACITY

2.1 Effluent Concentration and Loading Objectives and Limits

The future design effluent objectives and limits for the Arthur WWTP Phase 2 capacity (average day flow (ADF) of 2,300 m^3/d) were previously developed in consultation with the MOECC as part of the Class EA process. The effluent loadings (as calculated by the concentration limit times the ADF capacity) for BOD_5, TSS, and TP that were approved for the Phase 2 capacity of 2,300 m^3/d were used to develop the proposed effluent concentration limits for the Phase 1 capacity of 1,860 m^3/d. This approach was also used to develop proposed effluent objectives for these parameters. Effluent *E. coli* and pH requirements previously approved for Phase 2 have been carried forward for the proposed Phase 1 effluent requirements.

Due to the limitations on effluent discharge from the facility based on effluent total ammonia nitrogen (TAN) concentrations (see Section 2.2), no changes to effluent TAN concentration limits are proposed for Phase 1. In this way, no modifications will be required to the effluent discharge:receiver flow ratios that had previously been developed (see Table 2.2). The proposed effluent TAN objective for Phase 1 was prorated based on the ratio of the design Phase 2 to Phase 1 flows.

The established effluent objectives and limits for the Phase 2 flow of 2,300 m^3/d, and the proposed effluent objectives and limits for the Phase 1 flow of 1,860 m^3/d, are summarized in Table 2.1. Details regarding the development of effluent quality criteria can be found in the ACS completed for the Arthur WWTP (XCG, 2013), and subsequent communication with the MOECC.

Table 2.1 Future Design Effluent Objectives and Compliance Limits for Phases 1 and 2

Parameter	Phase 1 Capacity (1,860 m^3/d) Proposed Values		Phase 2 Capacity (2,300 m^3/d) Approved Values	
	Objective Concentration	Compliance Limit	Objective Concentration	Compliance Limit
BOD_5 (mg/L)	6 mg/L	12 mg/L	5 mg/L	10 mg/L
TSS	6 mg/L	12 mg/L	5 mg/L	10 mg/L
TP	0.21 mg/L	0.30 mg/L	0.17 mg/L	0.25 mg/L
TAN	0.6 mg/L	3.5 mg/L (1) 2.8 mg/L (2)	0.5 mg/L	3.5 mg/L (1) 2.8 mg/L (2)
E. coli (3)	-	100 cfus/100 mL	-	100 cfus/100mL
pH	-	6 - 8	-	6 - 8

Notes:
1. For discharge during January, February, March, April, May, November, and December.
2. For discharge during October.
3. Based on a monthly geometric mean.

2.2 *Seasonal Effluent Discharge Restrictions*

Based on the results of the ACS, the Arthur WWTP will only be permitted to discharge to the Conestogo River during the months of October through May. The allowable effluent flow rate will be dependent on the effluent TAN concentration and the flow rate in the Conestogo River. As noted in Section 2.1, it is proposed that the effluent TAN concentration limits previously developed for Phase 2 be used for the Phase 1 interim capacity. It is, therefore, also proposed that the allowable discharge at the Phase 1 interim capacity remain the same as the discharge schedule previously approved for the Phase 2 capacity of 2,300 m^3/d.

Table 2.2 presents the ratio of river flow to allowable plant effluent flow as a function of effluent TAN for each month from October through May. Table 2.3 presents the maximum allowable daily effluent flow from the Arthur WWTP.

Table 2.2 Allowable River Flow to Effluent Flow Ratio Table for Phases 1 and 2

Month	TAN (mg/L)					
	≤0.65	>0.65 - 1.0	>1.0 - 1.5	>1.5 - 2.0	>2.0 - 2.8	>2.8 - 3.5
January	0.9	0.9	1.7	2.7	4.7	5.8
February	0.7	0.7	0.7	0.9	1.8	2.6
March	1.0	1.0	1.8	2.9	4.9	6.0
April	2.3	4.2	7.5	10.7	15	18.8
May	3.5	5.7	11.4	15.3	22.9	45.8
October	1.4	1.7	3.8	4.8	9.5	- (1)
November	1.4	1.4	1.6	2.5	4.1	5.5
December	1.4	2.4	4.3	6.5	10.4	13

Notes:
1. Proposed CofA TAN effluent limit for October is 2.8 mg/L.

Table 2.3 Maximum Daily Effluent Flow from the Arthur WWTP for Phases 1 and 2

Month	Allowable Max Daily Flow (m^3/d)
January	5,000
February	5,000
March	5,500
April	3,200
May	1,300
October	1,400
November	4,600
December	3,800

ATTACHMENT 1
EFFLUENT REQUIREMENTS OF THE ARTHUR WWTP AT THE PHASE 2 CAPACITY

From:	Colin Clarke
To:	Stephen Nutt
Subject:	FW: Arthur WWTP
Date:	January-27-14 9:06:20 AM

Colin Clarke, M.Sc., P.Eng.
Project Engineer

XCG Consultants Ltd. Environmental Engineers & Scientists
6 Cataraqui Street, Kingston, Ontario, Canada K7K 1Z7
www.xcg.com | T 613 542 5888 x214 | F 613 542 0844 | C 613 532 4938

From: Slattery, Barbara (ENE) [mailto:barbara.slattery@ontario.ca]
Sent: Friday, January 24, 2014 9:04 AM
To: Colin Clarke; btrood@wellington-north.com
Cc: Serwotka, Carola (ENE); Day, Sarah (ENE)
Subject: Arthur WWTP

Good morning,

This is to advise that the following documents have now been reviewed by Sarah Day, Surface Water Specialist:

- Memorandum to Barbara Slattery and Sarah Day (MOE) titled "Arthur WWTP – Assimilative Capacity Study" from Colin Clarke (XCG) dated January 6, 2014
- Email to Sarah Day (MOE) titled "Arthur Effluent Limits" from Colin Clarke (XCG) dated January 13, 2014 at 8:37am
- Email to Sarah Day (MOE) titled "Arthur Proposed Effluent Limits and Objectives - Updated" from Colin Clarke (XCG) dated January 20, 2014 at 10:25am

As part of the Class Environmental Assessment to permit the re-rating of the Arthur WWTP to an ADF of 2,300 m^3d^{-1}, an assimilative capacity assessment (ACS) is being undertaken to determine the effluent limit requirements for the expanded discharge. The purpose of this review was to provide final recommendations on the proposed flows and effluent limits to enable the EA to move forward and to be included in the conditions of an updated ECA for the facility.

-

<u>Comments and Recommendations</u>

1. Based on the responses provided in the above noted memorandum, the following items have been agreed upon between the MOE TSS and the proponent and the recommendations for inclusion in the updated ECA are as follows:

A. The maximum total daily effluent flow to the receiver shall be

Month	**Maximum total daily flow (m^3/d)**
January	5000
February	5000
March	5500
April	3200
May	1300
October	1400
November	4600
December	3800

B. The effluent objectives and limits for the following parameters shall be

Parameter	**Objective**	**Limit**
$cBOD_5$	5 mg/L	10 mg/L
TSS	5 mg/L	10 mg/L
TP	0.17 mg/L	0.25 mg/L
E. coli	N/A	100 CFU/100 mL

C. The effluent objectives and limits for TAN shall be

Month	**Objective (mg/L as N)**	**Limit (mg/L as N)**
January	0.5	3.5
February	0.5	3.5
March	0.5	3.5
April	0.5	3.5
May	0.5	3.5
October	0.5	2.8
November	0.5	3.5
December	0.5	3.5

D. The objectives and limits for $cBOD_5$, TSS, TAN and TP shall be based on a monthly average while E. coli shall be based on a monthly geometric mean.

E. The effluent limit for pH shall be 6 to 8.

F. The effluent flow rate shall be calculated using the total ammonia nitrogen (TAN) concentration and following flow ratio table

Month	TAN (mg/L)					
	<=0.65	>0.65 to 1	>1 to 1.5	>1.5 to 2	>2 to 2.8	>2.8 to 3.5
January	0.9	0.9	1.7	2.7	4.7	5.8
February	0.7	0.7	0.7	0.9	1.8	2.6
March	1.0	1.0	1.8	2.9	4.9	6.0
April	2.3	4.2	7.5	10.7	15	18.8
May	3.5	5.7	11.4	15.3	22.9	45.8
October	1.4	1.7	3.8	4.8	9.5	N/A
November	1.4	1.4	1.6	2.5	4.1	5.5
December	1.4	2.4	4.3	6.5	10.4	13

G. The loading limits for the following parameters shall be

Month	TSS (kg/d)	BOD_5 (kg/d)	TAN (kg/d)	TP (kg/d)
January	50	50	17.5	1.25
February	50	50	17.5	1.25
March	55	55	19.3	1.38
April	32	32	11.2	0.80
May	13	13	4.6	0.32
October	14	14	3.9	0.35
November	46	46	16.1	1.15
December	38	38	14.4	0.95
Seasonal* (Oct 1 to May 31)	34.6	34.6	12.1	0.86

*based on ADF 2300 m^3/d convert from 365 to 243 days

2. The following condition should be included in the new ECA "Upon an exceedance of the TP effluent objective, the Owner shall take action to reduce TP concentrations to below the objective."

3. Detail regarding the protocol for the logbook, daily TAN measurements, development and maintenance of the stage-discharge curve, and the sampling program will be provided in the Environmental Studies Report (ESR). The MOE reserves final comment of these items upon submission of the ESR to the ministry.

Should you have any questions or comments or require additional information, please feel free to contact Sarah either at (905) 521-7304 or Sarah.Day@ontario.ca

Ministry of the Environment and Climate Change
West Central Region

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

Ministère de l'Environnement et de l'Action en matière de changement climatique
Direction régionale du Centre-Ouest

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

January 8, 2016

Mr. Graham Seggewiss
XCG Consulting Limited
2620 Bristol Circle, Suite 300
Oakville, ON L6H 6Z7

Dear Mr. Seggewiss:

RE: Arthur WWTP Proposed Effluent Criteria for a Phased-In Construction

We have reviewed the memorandum titled *"Proposed Effluent Quality Requirements at an Interim Capacity for the Arthur WWTP"* dated December 10, 2015 and offer these comments in order to assist you moving forward with this project.

Background

The Arthur WWTP provides tertiary treatment for wastewater generated in the Village of Arthur and is currently rated for an average daily flow (ADF) of 1,465 m^3d^{-1}. From May 1 to September 15 treated wastewater is stored in holding ponds with a storage volume of 340,000 m^3. From September 16 to April 30 effluent (holding pond water plus secondary clarified water is combined then treated by tertiary filters and UV disinfection) is discharged to the Conestogo River.

In 2014, a Class Environmental Assessment to re-rate the Arthur WWTP to an ADF of 2,300 m^3d^{-1} that was based on an assimilative capacity assessment (ACS) to determine the effluent limit requirements for the expanded discharge was completed. The purpose of these comment is to express our thoughts on the proposal to phase in the capacity increase first to 1,860 m^3d^{-1} to deal with recent increases in flow experienced by the WWTP, and then ultimately to the previously assessed 2,300 m^3d^{-1} effluent discharge, and whether a phased-in approach would allow for different effluent limit requirements for the interim stage.

Comments and Recommendations

1. There was no indication provided on how long Phase 1 will be in effect.

2. The proposal to maintain the same pH and E. coli effluent limits (6 to 8 and 100 CFU/100 mL, respectively) for Phase 1 and 2 would be acceptable.

3. Interim objectives and limits for BOD_5, TSS and TP for the proposed Phase 1 calculations were completed by using the previously agree-upon loading limits for Phase 2 and back-calculating the concentration using the interim ADF of 1,860 m^3d^{-1}.

   This is not acceptable as the monthly Phase 2 effluent loadings to the receiver were calculated using the MDEF to the receiver and not the ADF (Note: only the seasonal effluent loading was calculated using the ADF which was adjusted based on the number of days in the season vs. annually). If the MDEF from Phase 2 is to be used for Phase 1, the effluent limits will have to remain the same as the proposed increased effluent limits for Phase 1 will not be acceptable as it will result in unacceptable concentrations in the receiver.

   It is recommended that the consultant go back to the original mass balance work completed for Phase 2 and rerun the numbers with the proposed increased effluent limits for Phase 1 and an adjusted MDEF and provide those results for review of the potential impact to the receiver.

4. The proponent is proposing to maintain the same TAN limits for Phase 1 and 2 but increase the TAN objective from 0.5 mg/L to 0.6 mg/L. This is acceptable however should the MDEF values change for Phase 1, then the flow ratio table used to determine the effluent flow rate will need to be adjusted as it was generated using the Phase 2 MDEF.

5. Should the MDEF for Phase 1 be adjusted from that proposed for Phase 2 in order to have higher effluent limits for Phase 1, then the monthly effluent loadings and the seasonal effluent loading for Phase 1 will need to be recalculated and provided.

It is recommended that you consult with Colin Clarke as he completed the original assessment for the 2014 EA. Should you have any questions or comments or require additional information it is recommended that you contact Sarah Day directly at either (905) 521-7304 or Sarah.Day@ontario.ca.

Regards,

Barbara Slattery

EA/Planning Coordinator

cc. Martha Weber, GDO

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

Date:	January 15, 2016	**XCG File No.: 3-3167-01-01**
To:	Barbara Slattery, Ministry of the Environment and Climate Change	
cc:	Matt Aston & Barry Trood, Township of Wellington North	
From:	Graham Seggewiss and Melody Johnson, XCG Consultants Ltd.	
Re:	Proposed Effluent Quality Requirements at an Interim Capacity for the Arthur WWTP - Response to MOECC Letter	

1. INTRODUCTION

In a letter dated January 8, 2016, Ms. Barbara Slattery of the Ministry of the Environment and Climate Change (MOECC) provided comments regarding the Arthur Wastewater Treatment Plant (WWTP) proposed effluent criteria for a phased-in construction. (XCG Consulting Ltd., December 2015).

This memorandum repeats the MOECC's original comments from the letter (shown in italics), and provides XCG's response to each.

2. COMMENTS AND RECOMMENDATIONS

1. *There was no indication provided on how long Phase 1 will be in effect.*

   Phase 1 is expected to last approximately 5 to 10 years.

2. *The proposal to maintain the same pH and E.coli effluent limits (6 to 8 and 100 CFU/100 mL, respectively) for Phase 1 and 2 would be acceptable.*

   Acknowledged.

3. *Interim objectives and limits for BOD_5, TSS, and TP for the proposed Phase 1 calculations were completed by using the previously agree-upon loading limits for Phase 2 and back-calculating the concentration using the interim ADF of 1,860 m^3/d.*

   This is not acceptable as the monthly Phase 2 effluent loadings to the receiver were calculated using the MDEF (Maximum Daily Effluent Flow) *to the receiver and not the ADF (Note: only the seasonal effluent loading was calculated using the ADF which was adjusted based on the receiver.*

It is recommended that the consultant do back to the original mass balance work completed for Phase 2 and rerun the numbers with the proposed increased effluent limits for Phase 1 and adjusted MDEF and provide those results for review of the potential impact to the receiver.

Please see answer to Question No. 5 below.

4. *The proponent is proposing to maintain the same TAN limits for Phase 1 and 2, but increase the TAN objective from 0.5 mg/L to 0.6 mg/L. This is acceptable however should the MDEF values change for Phase 1, then the flow ratio table used to determine the effluent flow rate will need to be adjusted as it was generated using the Phase 2 MDEF.*

   Please see answer to Question No. 5 below.

5. *Should the MDEF for Phase 1 be adjusted from that proposed for Phase 2 in order to have higher effluent limits for Phase 1, then the monthly effluent loadings and the seasonal effluent loading for Phase 1 will need to be recalculated and provided.*

   The proposed effluent compliance limits for Phase 1 have been revised to be equal to the agreed upon limits for Phase 2. As such, there are no projected changes to the MDEF schedule as this was previously agreed to for the Phase 2 capacity. Table 2.1 from the memorandum issued December 10, 2015 has been reproduced below. Changes to the proposed effluent Phase 1 limits are highlighted in the table.

Table 2.1 Future Design Effluent Objectives and Compliance Limits for Phases 1 and 2

Parameter	Phase 1 Capacity (1,860 m^3/d) Proposed Values		Phase 2 Capacity (2,300 m^3/d) Approved Values	
	Objective Concentration	Compliance Limit	Objective Concentration	Compliance Limit
BOD_5	6 mg/L	~~12 mg/L~~ 10 mg/L	5 mg/L	10 mg/L
TSS	6 mg/L	~~12 mg/L~~ 10 mg/L	5 mg/L	10 mg/L
TP	0.21 mg/L	~~0.30 mg/L~~ 0.25 mg/L	0.17 mg/L	0.25 mg/L
TAN	0.6 mg/L	3.5 mg/L (1) 2.8 mg/L (2)	0.5 mg/L	3.5 mg/L (1) 2.8 mg/L (2)
E. coli (3)	-	100 cfus/100 mL	-	100 cfus/100mL
pH	-	6 - 8	-	6 - 8

Notes:
1. For discharge during January, February, March, April, May, November, and December.
2. For discharge during October.
3. Based on a monthly geometric mean.

From: Slattery, Barbara (MOECC) <barbara.slattery@ontario.ca>
Sent: January-28-16 12:24 PM
To: Graham Seggewiss
Cc: Melody Johnson; Matt Aston; Barry Trood; Weber, Martha (MOECC)
Subject: RE: Arthur WWTP Proposed Interim Effluent Quality Requirements

Thank you Graham, we have reviewed your memo and based on our understanding that you are retracting the proposed effluent limits for Phase 1 and are now proposing to meet the original agreed to effluent limits for what is now Phase 2 with slightly increased effluent objectives, we do not have any issue with this approach. Please let me know if I can be of any further assistance.

Barb Slattery, EA/Planning Coordinator
Ministry of the Environment and Climate Change
West Central Region
(905) 521-7864

From: Graham Seggewiss [mailto:graham.seggewiss@xcg.com]
Sent: January 15, 2016 4:23 PM
To: Slattery, Barbara (MOECC)
Cc: Melody Johnson; Matt Aston; Barry Trood; Weber, Martha (MOECC)
Subject: RE: Arthur WWTP Proposed Interim Effluent Quality Requirements

Good afternoon, Barb

Thank you for the letter regarding the proposed interim effluent characteristics at the Arthur WWTP. Attached to this email for your review is a memorandum which addresses all of the comments which were received, and updates the proposed effluent quality limits at the interim plant capacity.

Please do not hesitate to contact me with any questions or additional comments. Thanks, and have a good weekend!

Graham Seggewiss, M.A.Sc., E.I.T
Process Specialist
XCG Consulting Limited

From: Slattery, Barbara (MOECC) [mailto:barbara.slattery@ontario.ca]
Sent: January-11-16 11:31 AM
To: Graham Seggewiss <graham.seggewiss@xcg.com>
Cc: Melody Johnson <melody.johnson@xcg.com>; Matt Aston <maston@wellington-north.com>; Barry Trood

<btrood@wellington-north.com>; Weber, Martha (MOECC) <Martha.Weber@ontario.ca>
Subject: RE: Arthur WWTP Proposed Interim Effluent Quality Requirements

Good Morning, attached please find our comments on the December 10th memo.

Best Regards,

Barb Slattery, EA/Planning Coordinator
Ministry of the Environment and Climate Change
West Central Region
(905) 521-7864

From: Graham Seggewiss [mailto:graham.seggewiss@xcg.com]
Sent: December 10, 2015 4:04 PM
To: Slattery, Barbara (MOECC)
Cc: Melody Johnson; Matt Aston; Barry Trood
Subject: Arthur WWTP Proposed Interim Effluent Quality Requirements

Good afternoon, Barbara

For your review, please see a memo detailing the proposed interim Arthur WWTP effluent quality requirements attached to this email.
Please do not hesitate to contact us with any questions or comments.

Thanks,

Graham Seggewiss, M.A.Sc., E.I.T.
Process Specialist

XCG Consulting Limited Environmental Engineers & Scientists
2620 Bristol Circle, Suite 300, Oakville, Ontario, Canada L6H 6Z7
www.xcg.com | T 905 829 8880 x4224 | F 905 829 8890

APPENDIX E
ALTERNATIVE DESIGN CONCEPTS

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.: 3-3167-01-01
April 29, 2014

TECHNICAL MEMORANDUM
EVALUATION OF ALTERNATIVE TREATMENT DESIGN CONCEPTS
ARTHUR WWTP CLASS EA

Prepared for:

TOWNSHIP OF WELLINGTON NORTH
P.O. Box 125, 7490 Sideroad 7 W
Kenilworth, Ontario
N0G 3E0

Attention: Deb Zehr,
Director of Public Works

Prepared by:

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

TABLE OF CONTENTS

TABLE

FIGURE

APPENDICES

1. INTRODUCTION

1.1 Background

The Arthur Wastewater Treatment Plant (WWTP) provides tertiary treatment for wastewater generated in the Village of Arthur. The plant is operated under Ministry of the Environment (MOE) Certificate of Approval (CofA) No. 3-1256-88-908 issued August 9, 1990. The plant is owned by the Township of Wellington North and operated by the Ontario Clean Water Agency (OCWA).

The Arthur WWTP has an average day CofA rated capacity of 1,465 m^3/d. During the period of May 1 to September 15, effluent flow from the secondary treatment system is pumped to holding ponds for storage. During the period September 16 to April 30, effluent from the plant can be discharged to the Conestogo River if river flows are adequate. During this discharge period, the holding pond contents are combined with the plant's secondary clarifier effluent, and this flow is then treated by the tertiary filters and UV disinfection system prior to discharge to the Conestogo River. Plant discharge rates are controlled by effluent concentrations of phosphorus and ammonium and the flow rate of the Conestogo River.

The Township of Wellington North (the Township) wishes to proceed to determine the most cost effective, environmentally sound and sustainable approach to upgrade the Arthur WWTP to provide servicing to a design year of 2031. To meet the servicing requirements of future growth in the service area, the Arthur WWTP may need to be expanded beyond its existing rated capacity. As such, this project is a Schedule C activity under the Municipal Class Environmental Assessment (Class EA) process. XCG Consultants Ltd. (XCG) has been retained by the Township to undertake the Arthur WWTP Class EA.

During Phase 1 and 2 of the Class EA process, flows to the Arthur WWTP from the predicted 2031 service area were estimated and the assimilative capacity of the Conestogo River was evaluated to determine the discharge capacity and treatment requirement. In order to accommodate growth within the servicing area, the preferred solution was determined to be expansion of the Arthur WWTP to an average day flow of 2,300 m^3/d. This Technical Memorandum (TM) reviews potential alternative design concepts that could meet the future servicing requirements and provides a preliminary evaluation of the alternatives as required to fulfill Phase 3 of the Class EA process.

1.2 Objective

The objectives of this TM are to:

1. Determine the conceptual level design basis for the expanded Arthur WWTP in terms of raw wastewater flows and characteristics;
2. Identify design alternatives to accommodate future flows to the Arthur WWTP that will meet design effluent criteria; and
3. Complete a preliminary evaluation of the design alternatives and identify a recommended preferred design alternative for expansion of the Arthur WWTP.

2. CONCEPTUAL LEVEL DESIGN BASIS

2.1 Design Flows

2.1.1 Average Daily Flow

The design average daily flow (ADF) was developed in the Proposed Design Flows Technical Memorandum (XCG, 2013).

Table 2.1 presents a summary of the design ADF for the Arthur WWTP.

Table 2.1 Arthur WWTP 2031 Flow Projections

Parameter	Value
Residential Flow Projections	
2012 Service Population	2,596
Historical ADF	1,171 m^3/d
Future Eastridge Contribution	103 lots
2031 Projected Service Population	3,310
2031 Service Population incl. Eastridge	3,310 + 284 = 3,594
Population Growth	998
Design Per Capita Flow	370 L/cap.d
Design Per Capita Average I/I	90 L/cap.d
2031 Residential Flow	1,630 m^3/d
ICI Flow Projections	
Industrial - Golden Valley Allocation	181 m^3/d
Highway Commercial Land	3.6 ha
Industrial Land	25.1 ha
Unit Flow Rate	14 $m^3/ha \cdot d$ (unit flow rate) 3 $m^3/ha \cdot d$ (I/I allowance)
Commercial/Industrial Land Flows	28.7 ha * 17 $m^3/ha \cdot d$ = 488 m^3/d
Total ICI Flow Projections	669 m^3/d
TOTAL 2031 FLOW PROJECTION	**2,300 m^3/d**

The design ADF of 2,300 m^3/d is based on population projections from the Wellington County Official Plan and potential growth in the proposed Eastridge Landing subdivision, design per capita flows of 370 L/cap·d and an allowance of 90 L/cap·d for inflow/infiltration (I/I). Future flows from industrial / commercial / institutional (ICI) contributors were estimated based on existing allocations, plus potential future flows from developable ICI lands, a design flow rate of 14 m^3/ha·d and an allowance of 3 m^3/ha·d for I/I. The design ADF will accommodate a proposed flow allocation increase to Golden Valley Farms (GVF) of 179 m^3/d within the proposed ICI allocation.

2.1.2 Maximum Daily Flow

Maximum day flow (MDF) values were calculated based on the historic MDF, plus a MDF allowance for new growth. Table 2.2 shows historical (2007 - 2012) ADF and MDF records from the Arthur WWTP.

Table 2.2 Historic Recorded Maximum Day Flows

Parameter	Year						
	2007	2008	2009	2010	2011	2012	OVERALL
ADF (m^3/d)	1,157	1,436	1,265	1,309	1,402	1,484	1,342
MDF (m^3/d)	5,559	5,284	5,875	4,157	5,035	4,365	5,875

A dry weather flow analysis was completed to determine the historic dry weather flow (DWF) factor. The analysis of DWF was conducted based on flow data from 2010 to 2013 and meteorological data from Environment Canada. Days were considered to be "dry" when no precipitation occurred for that day and three days prior between the months of May and September, inclusive. Based on the flow analysis, the historic DWF factor for the existing service area was 2.1.

By applying the historic DWF factor of 2.1 to the dry weather flow portion of the per capita flow (370 L/cap/d), and a peak extraneous flow allowance of 227 L/cap/d (MOE, 1985), the overall MDF factor for new growth was determined to be 2.7.

To determine the conceptual level design MDF, the new growth MDF factor was applied to the increase in average day design flow and was added to the existing MDF. For the purposes of this conceptual level design basis, the MDF factor for new growth was applied to both residential and ICI growth flows. The conceptual level design MDF values are presented in Table 2.3.

Table 2.3 Projected Maximum Day Flow

Parameter	Projected ADF	MDF Factor	Projected MDF
Existing Service Area	1,342 m^3/d (1)	-	5,875 m^3/d
Growth	957 m^3/d	2.2	2,062 m^3/d
Overall Projected MDF	2,300 m^3/d (2)	3.5	7,937 m^3/d
Design MDF	-	-	8,000 m^3/d

Notes:
1. Based on existing residential flow of 1,171 m^3/d and existing flow of 171 m^3/d from Golden Valley Farms Inc.
2. Design ADF is based on 2036 estimated flow projection of 2,299 m^3/d, and rounded up to 2,300 m^3/d for the purposes of the Class EA.

2.1.3 Peak Instantaneous Flow

Raw wastewater entering the Arthur WWTP is delivered by the Wells St. Sewage Pumping Station (SPS), the Frederick St. SPS, and the Preston St. gravity sewer. The Frederick Street SPS pumps directly to the Arthur WWTP, while the Wells St. SPS discharges to the Preston St. sewer near the Smith St. and Preston St. intersection. There is no raw wastewater flow monitoring capability at the Arthur WWTP; therefore, for the purposes of this Class EA and the evaluation of alternate design concepts, the peak instantaneous flow was estimated from literature values and typical design principles. These estimates are intended only to allow the comparison of the alternate designs. It is essential that accurate raw sewage flow data are collected at the Arthur WWTP prior to the preliminary design of the plant expansion so that more accurate estimates of future flows can be developed.

As historic peak instantaneous flow (PIF) data were not available for the Arthur WWTP, the PIF factor for the current WWTP service area was estimated based on typical peak hourly flow (PHF) factors caused by diurnal flow variations as suggested by WEF MOP No. 8 (1999). This methodology estimates the PHF as a function of the plant ADF. Utilizing the MDF for this estimation should produce a reasonable projection of the PIF experienced at the plant from the existing service area assuming that the PIF would be similar in magnitude to the PHF during MDF conditions.

By applying a Harmon peaking factor of 3.2, based on the overall equivalent design population of 5,055, to the dry weather flow portion of the per capita flow (370 L/cap/d), and a peak extraneous flow allowance of 227 L/cap/d (MOE, 1985), the overall PIF factor for new growth was determined to be 3.1.

To determine the conceptual level design PIF for the expanded WWTP, the new growth PIF factors were applied to the increase in average day design flows, and these growth PIF values were added to the existing base peak flow. For the purposes of this conceptual level design basis, the PIF factor for new growth was applied to both residential and ICI growth flows. The conceptual level design PIF values are presented in Table 2.4.

Table 2.4 Projected Peak Instantaneous Flow

Parameter	Projected ADF	MDF Factor	Projected PIF
Existing Service Area	1,342 m^3/d (1)	6.3	8,460 m^3/d
Growth	957 m^3/d	3.1	2,967 m^3/d
Overall Projected PIF	2,300 m^3/d (2)	5.0	11,427 m^3/d
Design PIF	-	-	11,500 m^3/d

Notes:
1. Based on existing residential flow of 1,171 m^3/d and existing flow of 171 m^3/d from Golden Valley Farms Inc.
2. Design ADF is based on 2036 estimated flow projection of 2,299 m^3/d, and rounded up to 2,300 m^3/d for the purposes of the Class EA.

2.2 Design Loadings

2.2.1 Historic Plant Loadings

Historic (2007 - 2012) raw wastewater characteristics are shown in Table 2.5. The average and maximum concentrations for biochemical oxygen demand (BOD_5), total suspended solids (TSS), total Kjeldahl nitrogen (TKN), and total phosphorus (TP) are presented. Generally, raw wastewater at the Arthur WWTP is low to medium strength.

Table 2.5 Arthur WWTP Historic Raw Wastewater Quality

Parameter	Historic Average Concentration (mg/L)	Typical Domestic Raw Wastewater Concentrations (mg/L)	
		MOE, 2008	Metcalf and Eddy, 2003
BOD_5	154 (362)	150-200 mg/L	110 mg/L (low) 190 mg/L (med) 350 mg/L (high)
TSS	151 (409)	150-200 mg/L	120 mg/L (low) 210 mg/L (med) 400 mg/L (high)
TKN	32.9 (105)	30-40 mg/L	20 mg/L (low) 40 mg/L (med) 70 mg/L (high)
TP	4.76 (11.3)	6-8 mg/L	4 mg/L (low) 7 mg/L (med) 12 mg/L (high)

Notes:
Values in parentheses represent maximum concentrations.

Table 2.6 shows the average and maximum historic loading rates to the Arthur WWTP. Historic per capita loading rates are calculated based on the 2012 equivalent population of 2,975. Historic per capita loading rates were less than typical design values for all parameters, with the exception of TKN.

Table 2.6 Arthur WWTP Historic Raw Wastewater Loadings

Parameter	Historic Average Load (kg/d)	Historic Equivalent Average Per Capita Loading (g/cap·d) (1)	Typical Per Capita Loading (g/cap·d)
BOD_5	206 (529)	69.2	75 (2)
TSS	185 (655)	62.2	90 (2)
TKN	43.6 (80.4)	14.6	13.3 (3)
TP	6.32 (15.6)	2.12	3.3 (3)

Notes:
Values in parentheses represent maximum concentrations.
1. Based on an equivalent population of 2,975.
2. MOE Design Guidelines, 2008.
3. Metcalf and Eddy, 2003.

2.2.2 *Projected Future Loadings*

Projected raw wastewater characteristics were based on historic loadings plus projected loadings from future growth. Loadings from future growth were estimated based on equivalent service population growth and a combination of historical and typical design per capita loadings. Typical per capita loadings were used for estimating BOD_5, TSS and TP loadings. As seen in Table 2.6, the historic TKN per capita loading was higher than the typical value of 13.3 g/cap·d, and was used to provide a conservative estimate of TKN loading. Table 2.7 presents the design raw wastewater loadings and concentrations. For the purposes of conceptual design and evaluation of alternate design concepts, it has been assumed that the characteristics of the additional flow allocated to GVF will be of similar quality to that currently discharged by GVF to the plant. This should be confirmed during the preliminary design of the preferred alternative.

Table 2.7 Design Raw Wastewater Loadings and Concentrations

Parameter	Current Raw Wastewater Loading (kg/d)	Loading due to Growth (1) (kg/d)	Total Design Loading (kg/d)	Average Design Concentration (2) (mg/L)
BOD_5	207	156	363	158
TSS	190	187	377	164
TKN	43.5	30.8	73.9	32.2
TP	6.4	6.9	13.4	5.8

Notes:
1. Based on an equivalent service population increase of 998 persons for residential and 1,082 for ICI (based on 498 m^3/d in ICI growth, and an equivalent per capita flow of 460 L/cap/d), and design per capita loadings of 75 g/cap/d, 90 g/cap/d, 14.8 g/cap/d, and 2.1 g/cap/d for TP (MOE, 2008; Metcalf & Eddy, 2013).
2. Based on the design ADF of 2,300 m^3/d.

2.3 Summary of Design Basis

Table 2.8 presents the overall raw wastewater design basis for the Arthur WWTP at the 2031 design flow of 2,300 m^3/d. Design flows and loadings are also presented.

Table 2.8 Arthur WWTP Design Basis

Parameter	Design Value
ADF	2,300 m^3/d
MDF	8,000 m^3/d
PIF	11,500 m^3/d
Average BOD_5 Loading	363 kg/d
Average TSS Loading	377 kg/d
Average TKN Loading	73.9 kg/d
Average TP Loading	13.4 kg/d

It must be noted that the raw wastewater design basis presented in Table 2.8 is used to allow the development and comparison of the alternate design concepts as part of the Class EA only. Due to uncertainties related to raw sewage flows currently entering the Arthur WWTP and uncertainties related to future wastewater quality that might be received from GVF, this design basis must be confirmed during the preliminary design of the preferred design alternative.

2.4 Future Effluent Limits

Table 2.9 presents the recommended future design effluent objectives and limits for the expanded Arthur WWTP that have been agreed to with MOE as part of the Class EA. The table also shows the current effluent limits as identified in the current CofA. Further information about the development of the effluent limits is contained within the Assimilative Capacity Study Technical Memorandum (XCG, 2013) and subsequent correspondence with the MOE (XCG, 2014).

Table 2.9 Future Design Effluent Objectives and Compliance Limits

Parameter	Existing CofA (Rated 1,465 m³/d)		Recommended Design (Rated 2,300 m³/d)	
	Average Annual Concentration Compliance Limit	Average Monthly Concentration Compliance Limit	Objective Concentration	Compliance Limit
BOD_5	10 mg/L	15 mg/L	5 mg/L	10 mg/L
TSS	10 mg/L	15 mg/L	5 mg/L	10 mg/L
TP	1 mg/L	1 mg/L	0.17 mg/L	0.25 mg/L
TAN	1.5 mg/L	2.3 mg/L	0.5 mg/L	3.5 mg/L (1) 2.8 mg/L (2)
E. coli (3)	-	-	-	100 cfus/100mL
pH	-	-	-	6 - 8

Notes:
1. For discharge during January, February, March, April, May, November, and December.
2. For discharge during October.
3. Based on a monthly geometric mean.

Based on Assimilative Capacity Study (XCG, 2013), the Arthur WWTP will only be permitted to discharge to the Conestogo River during the months of October through May. The actual allowable effluent flow rate will be dependant on the effluent total ammonia nitrogen (TAN) concentration and the flow rate in the Conestogo River. Table 2.10 presents the ratio of river flow to allowable plant effluent flow as a function of effluent TAN for each month from October through May. Table 2.11 presents the maximum allowable daily effluent flow from the Arthur WWTP.

Table 2.10 Allowable River Flow:Effluent Flow Ratio Table

Month	TAN (mg/L)					
	≤0.65	>0.65 - 1.0	>1.0 - 1.5	>1.5 - 2.0	>2.0 - 2.8	>2.8 - 3.5
January	0.9	0.9	1.7	2.7	4.7	5.8
February	0.7	0.7	0.7	0.9	1.8	2.6
March	1.0	1.0	1.8	2.9	4.9	6.0
April	2.3	4.2	7.5	10.7	15	18.8
May	3.5	5.7	11.4	15.3	22.9	45.8
October	1.4	1.7	3.8	4.8	9.5	- (1)
November	1.4	1.4	1.6	2.5	4.1	5.5
December	1.4	2.4	4.3	6.5	10.4	13

Notes:
1. Proposed ECA TAN effluent limit for October is 2.8 mg/L.

Table 2.11 Maximum Daily Effluent Flow from the Arthur WWTP

Month	Allowable Max Daily Flow (m^3/d)
January	5,000
February	5,000
March	5,000
April	3,200
May	1,300
October	1,400
November	4,600
December	3,800

Although the proposed TAN concentration limit is 2.8 mg/L for October and 3.5 mg/L for all other months, conceptual designs will be based on achieving the objecting effluent TAN of 0.5 mg/L to ensure that effluent TAN concentrations will not limit the allowable effluent discharge rate, as detailed in Table 2.10.

3. ALTERNATIVE TREATMENT DESIGN CONCEPTS

The following section provides a process-by-process review of available treatment options that would be applicable for the expansion of the Arthur WWTP. Site layouts for the various design options for the Arthur WWTP are included in Appendix A.

For the purposes of developing alternative design concepts, the following assumptions were made:

- All solutions include provision of new headworks building with flow metering to replace the existing grit channels, comminutor and manually raked bar screen;
- Full nitrification is required year-round;
- Existing infrastructure will be reused where possible; and,
- All proposed expansions to the existing WWTP will be located on the existing site.

3.1 Preliminary Treatment

Raw wastewater enters the headworks through two manually cleaned grit channels, followed by a comminutor. A manually raked bar screen is also provided in parallel with the comminutor to allow bypassing of the comminutor. According to the current CofA the grit removal, comminutor, and manual screen each have a capacity of 5,045 m^3/d.

Based on the design PIF, the existing headworks do not have the capacity to treat future peak flows. According to the Township, the preliminary treatment unit processes have reached the end of their useful life, require manual removal of grit, and therefore will require complete replacement. Upgrades to the preliminary treatment will include:

- Decommissioning of the existing inlet works.
- Provision of one automatically cleaned screen and one manually cleaned screen in parallel with a bypass line and all required appurtenances, each with a peak design capacity of 11,500 m^3/d.
- Provision of two parallel grit removal systems (i.e. aerated grit tanks, vortex separators, etc.) complete with a bypass line, each with a peak design capacity of 11,500 m^3/d.
- Provision of a screenings and grit handling system, complete with a classifier and bins enclosure.
- Provision of an influent flow meter to accurately measure plant flows and control the alum addition for chemical phosphorus removal.
- Construction of a new headworks building to house the preliminary treatment equipment. For conceptual level site layout purposes, it was assumed that the new headworks would be constructed on the north side of the existing WWTP, near the manhole where flows from the Preston St. Trunk Sewer and Frederick St. SPS are combined.

3.2 Secondary Treatment

The activated sludge process is a robust, well-proven process for treating wastewater under widely varying environmental conditions due to its operational flexibility. The activated sludge process is one of the most widely used secondary treatment processes. Further, the Arthur WWTP currently utilizes an activated sludge process for secondary treatment and operations staff are familiar with the general operation of such systems. Continued use of the activated sludge process will maximize the use of existing infrastructure and simplify future operation as only one process technology would be involved. Therefore, upgrades to the Arthur WWTP secondary treatment process will include the application of some form of the activated sludge process.

There are many variations of the activated sludge process, but all consist essentially of an aerated biological reactor (bioreactor) followed by a solids separation process. In the bioreactor, suspended biomass degrades the influent organic material. The biomass is subsequently separated from the wastewater using a solids separation technology, such as clarification or membrane ultrafiltration. Thickened biomass from the solids separation process is recycled to the bioreactor to maintain a desired biomass concentration. Operators can optimize the process for a given set of environmental conditions (i.e. temperature and loading variations) by varying the biomass inventory and sludge age.

Biological ammonia oxidation, a process called nitrification in which ammonia is converted to nitrate within the secondary treatment process, can be accomplished by operating the process at a minimum required solids retention time (SRT) while supplying adequate oxygen. The allowable effluent discharge flow rate at the Arthur WWTP is a function of the effluent TAN concentration. All conceptual designs will consider a target effluent TAN concentration of 0.5 mg/L to maximize nitrification and effluent discharge.

The Arthur WWTP currently treats raw wastewater using an extended aeration (EA) activated sludge process, which does not include primary clarification upstream of the aeration tanks. Additionally, the Arthur WWTP currently treats sludge through an aerobic digestion process and has significant infrastructure associated with aerobic digestion. The implementation of a secondary treatment process that includes primary clarification would result in difficult and costly retrofits to existing infrastructure. In addition, primary clarification processes have the potential to produce odours. Therefore, secondary treatment process with primary clarification, such as conventional activated sludge, were not considered for implementation at the Arthur WWTP.

The following secondary treatment options were investigated as potential treatment alternatives for the Arthur WWTP:

- Option 1: Extended aeration (EA) - Secondary Clarifier Expansion;
- Option 2: Extended aeration (EA) - Twin Existing Plant;
- Option 3: Integrated Fixed-Film Activated Sludge (IFAS); and,
- Option 4: Membrane Bioreactor (MBR).

Each alternative is described in more detail below.

3.2.1 Option 1: Extended Aeration - Secondary Clarifier Expansion

Currently, the Arthur WWTP operates an EA activated sludge process, characterized by a long SRT (over 15 days). The EA process has historically provided virtually completed nitrification at all temperatures. Coupled with chemical addition and tertiary filtration for phosphorus removal, effluent concentrations of TAN and TP have been well below current CofA limits and have the capability to achieve the limits that will apply to the expanded Arthur WWTP.

A previous stress test carried out on the Arthur WWTP evaluated the system performance at an equivalent average ADF of 3,044 m^3/d (Hydromantis, 2007). Although flows through the aeration tank were increased above the existing ADF capacity, the TAN concentration in the secondary effluent averaged 0.3 mg/L over the course of the test. Further, the average concentrations of $cBOD_5$ and TSS in the secondary effluent were 4 mg/L and 10 mg/L respectively, indicating a high level of treatment was maintained. During the stress test, the average SRT was 14 days, and the average temperature of 7.9°C. Based on the average effluent quality, it appears that an operating SRT of 14 days would be sufficient to meet the design effluent TAN concentration of 0.5 mg/L. However, several secondary effluent samples from this stress test showed elevated concentrations of nitrite greater than 1.0 mg/L. Because nitrite is an intermediate product in the nitrification process, increased concentrations can be an indication of unstable nitrification. Two effluent samples exceeded the design effluent TAN concentration, with an observed peak secondary effluent TAN concentration of 1.30 mg/L. The existing aeration tank volume is capable of providing an SRT of 14.8 days at a MLSS concentration of 5,000 mg/L, which should provide sufficient nitrification according to the results of the stress testing. Based on the stress test results, it is likely that the existing secondary treatment system is capable of consistently meeting required effluent TAN limits, although occasional exceedances of the effluent objective of 0.5 mg/L would be possible. As a result, effluent discharge rates may be restricted, especially during cold temperature months.

Implementation of this option at the Arthur WWTP would involve the construction of an additional secondary clarifier to provide additional settling surface area. No additional aeration tank volume is required for this option. Projected operational parameters of the aeration tank are presented in Table 3.1.

Table 3.1 Option 1 Aeration Tank Design Requirements

Parameter	Future Design Requirement	Typical Design Guideline
Total Aeration Volume (m^3)	1,073	n/a
ADF (m^3/d)	2,530 (1)	n/a
Operating MLSS (mg/L)	5,000	3,000 - 5,000 (6)
Estimated MLVSS:MLSS ratio	0.6 (7)	n/a
HRT (hours)	10.2	>15(2)
F/M_v (kg BOD/kg MLVSS·d)	0.11 (2)	0.05 - 0.15(2)
OLR (kg BOD/m^3·d)	0.34 (2)	0.17 - 0.24(2)
RAS Flow (m^3/d)	Up to 4,600	n/a
RAS SS (mg/L)	9,200 (4)	4,000 - 12,000 (6)
SRT (days)	14.8(5)	>15(2) 20 - 40(6)

Notes:
1. Based on design ADF plus an allowance for typical filter reject flow rate of 10% of ADF.
2. Design Guidelines for Sewage Works, MOE, 2008
3. Based on design BOD loading of 363 kg/d
4. From historical measurements (Hydromantis, 2007)
5. Assuming WAS yield (0.6 g VSS/g BOD_5), VSS:TSS Ratio (0.6 g VSS/g TSS), given operating MLSS concentration and future BOD_5 loading (363 kg/d)
6. Metcalf and Eddy (2003). Wastewater Engineering: Treatment and Reuse, 4th Ed.
7. Typical VSS:TSS ratio at an extended aeration plant using chemical phosphorus removal.

Design parameters, such as the organic loading rate and the hydraulic retention time, are outside the typical ranges of design parameters as prescribed by the MOE Design Guidelines; however, given the high level of treatment demonstrated during the stress test, it is expected that the aeration tanks will be able consistently meet the required effluent TAN limits, although occasional exceedances of the effluent objective of 0.5 mg/L would be possible, which may restrict effluent discharge rates, especially during cold temperature months.

Secondary clarifier sizing was based on the results of the stress testing of the secondary clarifier at the Arthur WWTP (Hydromantis, 2007). According to the results of the stress testing, the existing secondary clarifiers are capable of operating at a maximum SLR of 200 kg/m^2·d with no observed negative impacts on performance. Therefore, for the purposes of developing conceptual level sizing, a design SLR of 200 kg/m^2·d was used to size the secondary clarifiers, which is higher than the typical design guidelines value of 170 kg/m^2·d. The average SOR during the stress test did not exceed typical design guidelines values for maximum clarifier SOR; therefore, the design guideline SOR value of 37 m^3/m^2·d was used for secondary clarifier sizing.

Projected operating parameters for secondary clarification are presented in Table 3.2.

Table 3.2 Option 1 Secondary Clarifier Design Requirements

Parameter	Future Design Requirement	Typical Design Guideline
No. of New Secondary Clarifiers	1	n/a
No. of Existing Secondary Clarifiers	1	n/a
Total No. of Secondary Clarifiers	2	n/a
Total Clarifier Surface Area (m^2)	286	n/a
PHF (m^3/d)	10,580 (1)	n/a
MDF (m^3/d)	8,230 (2)	n/a
Peak Hourly SOR ($m^3/(m^2 \cdot d)$)	37	<37 (3) 24-32 (4)
Max Daily SLR ($kg/(m^2 \cdot d)$)	184 (5)	<170 (3) 168 (4) 200 (6)

Notes:
1. Estimated PHF is 90% of design PIF, plus an allowance for a typical filter reject flow rate of 10% of ADF.
2. Based on design MDF plus an allowance for a typical filter reject flow rate of 10% of ADF.
3. Design Guidelines for Sewage Works, MOE, 2008**.** Based on an activated sludge process with single-stage nitrification and chemical addition for phosphorus removal.
4. Metcalf and Eddy (2003). Wastewater Engineering: Treatment and Reuse, 4th Ed.
5. Based on a MLSS concentration of 5,000 mg/L, projected MDF, RAS flow of 100% of projected ADF, and typical filter reject flow of 10% of ADF.
6. Arthur WWTP Capacity Determination, Hydromantis, 2007.

Therefore, to meet future design flows, one new secondary clarifier would be required. The additional tank could be constructed immediately beside the existing secondary treatment train. The new proposed secondary clarifier would have the same dimensions as the existing secondary clarifier. The process schematic for Option 1 is presented in Figure 3.1.

Since the clarifiers have equal surface area, flow would be split equally between clarifiers and may require construction of a dedicated flow splitter box. This solution also creates some redundancy in the system for repairs or periods of low flow.

Upgrades to the return activated sludge (RAS) and waste activated sludge (WAS) pumping are required to ensure the RAS pumping has capacity to pump up to 200 percent of the projected ADF, as per the MOE design guidelines. During preliminary design, oxygenation requirements should be reviewed based on design loadings, and the existing oxygenation system upgraded as necessary.

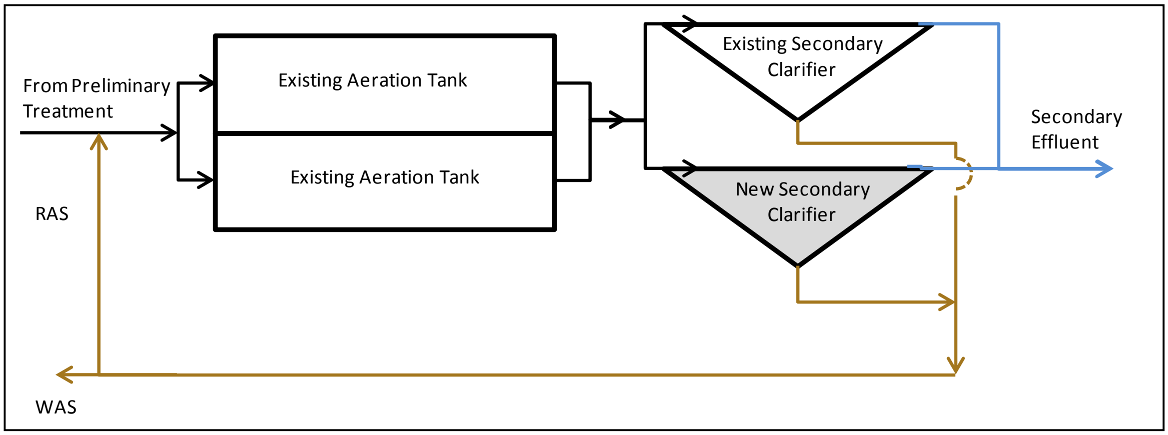


Figure 3.1 Option 1: Extended Aeration - Secondary Clarifier Expansion Process Schematic

3.2.2 Option 2: Extended Aeration - Twin Existing Plant

As noted under Option 1, the results of a stress test carried out on the biological treatment train indicate that the effluent TAN requirements can be met at an operating SRT of 14 days; however, periods of instability in the nitrification performance may restrict allowable effluent discharge rates, especially during cold temperatures. Therefore, to provide more process flexibility, this option involves the twinning of the existing treatment plant. This would increase the aeration tank volume and provide additional secondary clarifier capacity. Aeration tank design and performance is detailed in Table 3.3. Secondary clarifier design information is located in Table 3.4.

Construction of a twin treatment plant would double the available aeration volume to 2,146 m^3. Assuming an operating mixed liquor suspended solids (MLSS) concentration of 4,000 mg/L, the estimated SRT is 23.6 days. The long SRT would ensure complete nitrification and the capability to consistently meet effluent TAN objectives year round. Assuming identical MLSS concentrations between aeration tanks, predicted peak surface overflow rate (SOR) and solids loading rate (SLR) are at or below the recommended design maximum values.

Table 3.3 Option 2 Aeration Tank Design Requirements

Parameter	Future Design Requirement	Typical Design Guideline
No. New Aeration Tanks	2	n/a
No. Existing Aeration Tanks	2	n/a
Total No. of Aeration Tanks	4	n/a
Total Aeration Volume (m^3)	2,146	n/a
ADF (m^3/d)	2,530 (1)	n/a
Operating MLSS (mg/L)	4,000	2,000 - 5,000 (2) 3,000 - 5,000 (3)
Estimated MLVSS:MLSS ratio	0.6	n/a
HRT (hours)	20.4	>15 (1)
F/M_v (kg BOD/kg MLVSS·d)	0.07 (4)	0.05 - 0.15 (2)
OLR (kg BOD/m^3·d)	0.17 (4)	0.17 - 0.24 (3)
RAS Flow (m^3/d)	Up to 4,600	n/a
RAS SS (mg/L)	9,200 (5)	n/a
SRT (days)	23.6 (6)	>15 (2) 20 - 40 (3)

Notes:
1. Based on design ADF plus an allowance for typical filter reject flow rate of 10% of ADF.
2. Design Guidelines for Sewage Works, MOE, 2008.
3. Metcalf and Eddy (2003). Wastewater Engineering: Treatment and Reuse, 4th Ed.
4. Based on design BOD_5 loading of 363 kg/d.
5. From historical measurements (Hydromantis, 2007).
6. Based on typical WAS yield (0.6 g VSS/g BOD_5), VSS:TSS Ratio (0.6 g VSS/g TSS), MLSS concentration (**4**,000 mg/L) and future BOD_5 loading (363 kg/d).

Table 3.4 Option 1 - Secondary Clarifier Design Requirements

Parameter	Future Design Requirement	Typical Design Guideline
No. of New Secondary Clarifiers	1	n/a
No. of Existing Secondary Clarifiers	1	n/a
Total No. of Secondary Clarifiers	2	n/a
Total Clarifier Surface Area (m^2)	286	n/a
PHF (m^3/d)	10,580 [(1)]	n/a
MDF (m^3/d)	8,230 [(2)]	n/a
Peak Hourly SOR ($m^3/(m^2 \cdot d)$)	37	<37 [(3)] 24-32 [(4)]
Max Daily SLR ($kg/(m^2 \cdot d)$)	147 [(5)]	<170 [(3)] 168 [(4)]

Notes:
1. Estimated PHF is 90% of design PIF, plus an allowance for a typical filter reject flow rate of 10% of ADF.
2. Based on design MDF plus an allowance for a typical filter reject flow rate of 10% of ADF.
3. Design Guidelines for Sewage Works, MOE, 2008. Based on an activated sludge process with single-stage nitrification and chemical addition for phosphorus removal.
4. Metcalf and Eddy (2003). Wastewater Engineering: Treatment and Reuse, 4th Ed.
5. Based on a MLSS concentration of **4**,000 mg/L, projected MDF, RAS flow of 100% of projected ADF, and typical filter reject flow of 10% of ADF.

The additional plant could be constructed adjacent to the existing plant, and would be the same size as the existing package plant. The process schematic for Option 2 is presented as Figure 3.2. As both plants would have the same capacity, flow splits would be simplified and there would be redundancy for maintenance.

Upgrades to the RAS and WAS pumping are required to ensure the RAS pumping has capacity to pump up to 200 percent of the projected ADF, as per the MOE design guidelines. Other items to be considered during preliminary design include upgrades to the existing blower capacity, providing tapered aeration in the new aeration tanks, and installation of a selector at the tank inlet which would help reduce the growth of filamentous bacteria, and consequently improve the settleability of the sludge.

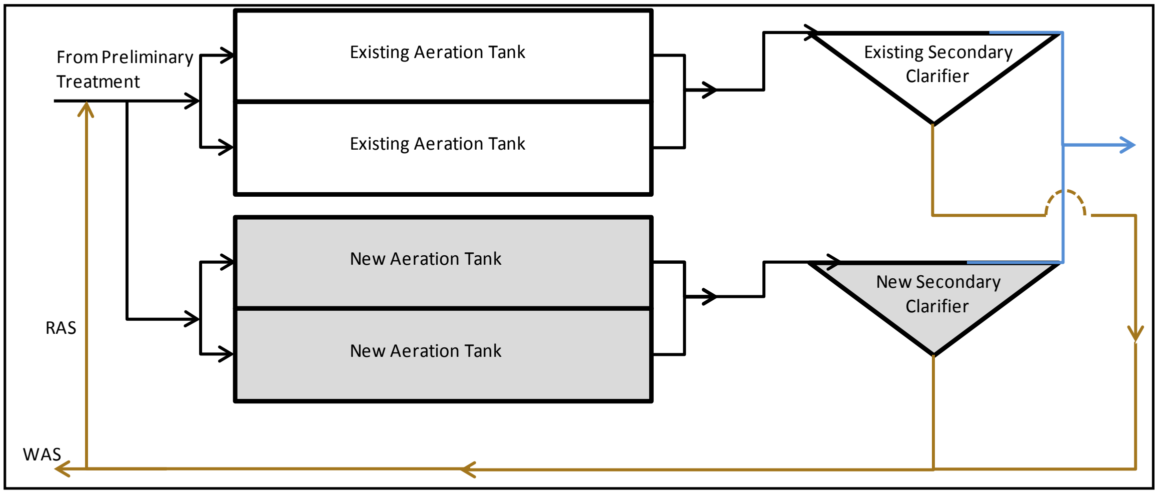


Figure 3.2 Option 2: Extended Aeration Twin Existing Plant Process Schematic

3.2.3 Option 3: Integrated Fixed-Film Activated Sludge (IFAS)

The IFAS combines fixed film biomass on carrier elements with suspended biomass in the form of mixed liquor in one process. By combining mixed liquor with fixed film biomass on the carrier elements, aeration tank volume requirements to maintain an equivalent biomass inventory are decreased in comparison to a conventional activated sludge (CAS) process.

Implementation of an IFAS process would increase the effective MLSS concentration, and therefore effective SRT, to provide the required treatment level within the existing tankage. In this way, this option is similar to Option 2 in that it provides a higher biomass inventory than Option 1; however, it does so within the existing aeration tank volume. For the purpose of this design, an IFAS supplier was contacted to provide conceptual level sizing for the Arthur WWTP expansion. The design and quote is included as Appendix B.

Details regarding the aeration tank and secondary clarifier requirements are located in Table 3.5 and Table 3.6, respectively.

Table 3.5 IFAS Aeration Tank Design Requirements

Parameter	Future Design Requirement	Typical Design Guideline
No. of New Aeration Tanks	0	n/a
Total Aeration Volume (m^3)	1,073	n/a
ADF (m^3/d)	2,530 (1)	n/a
Media Fill in Aeration Tank (% v/v)	30 (3)	20-30 (2)
Total Volume of Media (m^3)	322	n/a
Operating MLSS (mg/L)	2,000 (3)	2,000 (3)
OLR (kg BOD/m^3·d)	0.34 (4)	1.5 - 4.0 (2)

Notes:
1. Based on design ADF plus an allowance for typical filter reject flow rate of 10% of ADF.
2. Metcalf and Eddy (2003). Wastewater Engineering: Treatment and Reuse, 4th Ed.
3. Based on supplier recommendations (Headworks Bio, 2014).
4. Based on design BOD loading of 363 kg/d.

Table 3.6 IFAS Secondary Clarifier Design Requirements

Parameter	Future Design Requirement	Typical Design Guideline
No. of New Secondary Clarifiers	1	n/a
No. of Existing Secondary Clarifiers	1	n/a
Total No. of Secondary Clarifiers	2	n/a
Total Clarifier Surface Area (m^2)	286	n/a
PHF (m^3/d)	10,580 (1)	n/a
MDF (m^3/d)	8,230 (2)	n/a
Peak Hourly SOR (m^3/(m^2·d))	37	<37 (3)
Max Daily SLR (kg/(m^2·d))	73.6 (4)	<170 (3)

Notes:
1. Estimated PHF is 90% of design PIF, plus an allowance for a typical filter reject flow rate of 10% of ADF.
2. Based on design MDF plus an allowance for a typical filter reject flow rate of 10% of ADF.
3. Design Guidelines for Sewage Works, MOE, 2008. Based on an activated sludge process with single-stage nitrification and chemical addition for phosphorus removal.
4. Calculated assuming a assumed MLSS concentration of 2,000 mg/L, projected MDF, RAS flow of 200% of projected ADF, and typical filter reject flow of 10% of ADF.

Therefore, to meet future treatment requirements, the existing aeration tanks would be retrofitted with carrier retention screens and a new coarse bubble aeration system for mixing and oxygenation. A second secondary clarifier with the same dimensions as the existing unit would be constructed. Since the clarifiers have equal surface area, flow would be split equally between clarifiers and may require construction of a dedicated flow splitter box. A process schematic for Option 3 is shown as Figure 3.3.

Upgrades to the RAS and WAS pumping are required to ensure the RAS pumping has capacity to pump up to 200 percent of the projected ADF, as per the MOE design guidelines. During preliminary design, oxygenation requirements should be reviewed based on design loadings, and the existing oxygenation system upgraded as necessary.

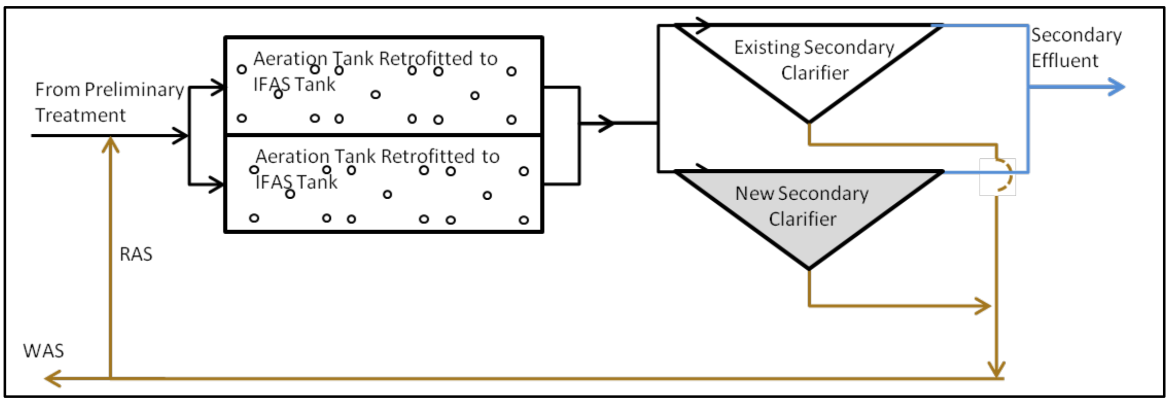


Figure 3.3 Option 3: IFAS Process Schematic

3.2.4 Option 4: Membrane Bioreactor (MBR)

MBR for municipal wastewater treatment consist of a suspended growth biological reactor integrated with a membrane system for solids separation. The MBR process is capable of providing a very high level of treatment to meet current and future effluent objectives. Typically, MBRs are designed to provide year round nitrification, and produce a tertiary level effluent with respect to TSS and TP.

The membrane ultrafiltration provided as part of the MBR system replaces the solids separation function of the secondary clarifier of an EA system. This eliminates many of the problems inherent with the secondary clarifier process in a typical activated sludge system and greatly reduces space requirements, while achieving tertiary treatment quality effluent.

Because the existing secondary clarifiers would no longer be required, the existing clarifier tankage could be used for influent flow equalization storage volume to reduce the design peak flows to the downstream bioreactors and membranes, or could be used for on-site liquid biosolids storage.

For purpose of this design, a MBR supplier was contacted to provide conceptual level sizing for the Arthur WWTP expansion. The design and quote is included as Appendix C.

Aeration tank requirements for the MBR process are outlined in Table 3.7. Membrane Tank requirements for the MBR process are presented in Table 3.8.

Table 3.7 Option 4: MBR Aeration Tank Design Requirements

Parameter	Future Design Requirement	Typical Design Guideline
No. of New Aeration Tanks	0	n/a
Total Aeration Volume (m^3)	1,073	n/a
ADF (m^3/d)	2,530 (1)	n/a
Operating MLSS (mg/L)	8,000 (3)	8,000 - 10,000 (2)
Estimated MLVSS:MLSS ratio	0.6	n/a
SRT	23.6 (5)	>15 (4)

Notes:
1. Based on design ADF plus an allowance for typical filter reject flow rate of 10% of ADF.
2. GE Water and Process Technologies Arthur WWTP budget proposal (2014)
3. Based on operating bioreactor MLSS concentrations used at other full-scale MBR treatment facilities.
4. MOE Design Guidelines (2008). Based on EA plant with nitrification.
5. Assuming WAS yield (0.6 g VSS/g BOD_5), VSS:TSS Ratio (0.6 g VSS/g TSS), MLSS Concentration (10,000 mg/L) and future BOD_5 loading (363 kg/d)

Table 3.8 Option 4: Membrane Tank Requirements

Parameter	Design Requirement (1) (without and with nitrification)	Typical Design Guidelines
Peak Flow through Secondary Treatment (m^3/d)	11,500	11,500
Number of Membrane Trains	4	n/a
Number of Cassettes per Train	3	n/a
Total Number of Cassettes	12	n/a
Total Number of Modules	528	n/a

Notes:
1. Design requirements provided by the manufacturer.

If the MBR is selected, the existing aeration tank volume is expected to be sufficient to maintain consistent year-round nitrification based on the high operating MLSS concentration, and consequently high SRT. Secondary clarifiers are not required, as membranes are used to separate solids from the liquid stream. A membrane tank and associated building would be constructed, complete with building to house the membrane tanks, membranes, blowers, cleaning chemicals, permeate pumps and other appurtenances. Therefore, volume previously used for a secondary clarifier could be retrofitted into an equalization tank, or a biosolids holding tank.

Because operations staff may not be familiar with the operation of an MBR system, additional training will be required to familiarize Operations Staff with this technology and its operational and maintenance requirements. This technology is utilizes specialized components, equipment, and chemicals for the operation and cleaning of the membranes including requirements for effluent pumping. Consequently, this alternative has significant operational and maintenance requirements as compared to the other alternatives.

Typically, other tertiary treatment process are not required for polishing MBR effluent; however, MBR effluent quality may degrade if stored in the lagoon. For the purposes of the Class EA, it has been assumed that all effluent will continue to be filtered and disinfected prior to discharge to the Conestogo River. Selection of the MBR process would also require upgrade and reconfiguration of the RAS and WAS pumps. The MBR process also requires much finer screening than a conventional activated sludge process to protect the membranes from fouling.

A process schematic of the proposed MBR process is detailed in Figure 3.4.

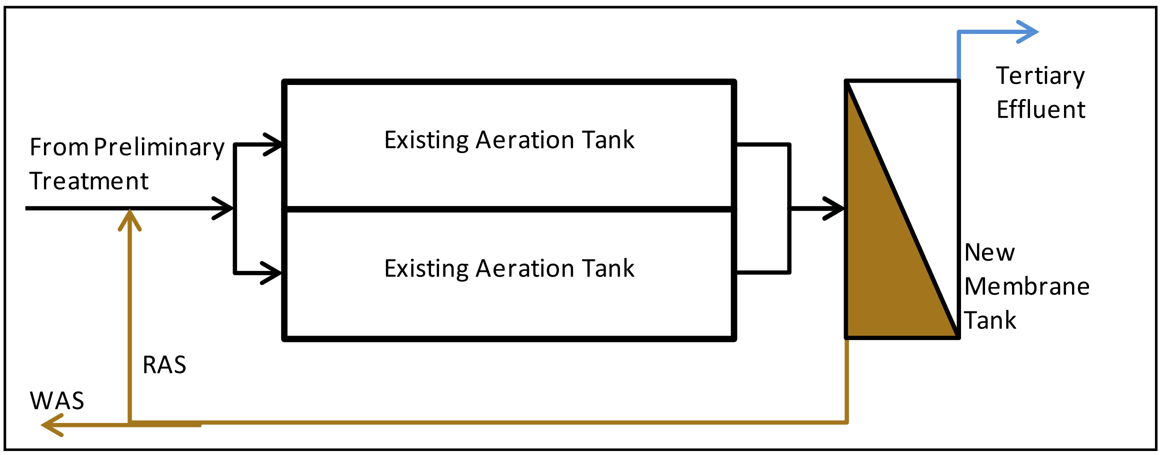


Figure 3.4 Option 4: MBR Process Schematic

3.3 Tertiary Treatment

The Arthur WWTP is equipped with tertiary filtration, which consists of six continuous upflow deep bed filter modules with a total filtration surface area of 27.9 m^2. Based on a typical filtration rate of 3.3 L/(m^2·s) (MOE, 2008), and with one filter offline, the filters have a peak flow capacity of 6,609 m^3/d.

Figure 3.5 presents historic effluent TSS concentrations vs. the recorded effluent flows. There are two historical occasions of effluent flow greater than 6,500 m^3/d, but the treatment level at those flows cannot be evaluated as effluent samples were not obtained during these periods.

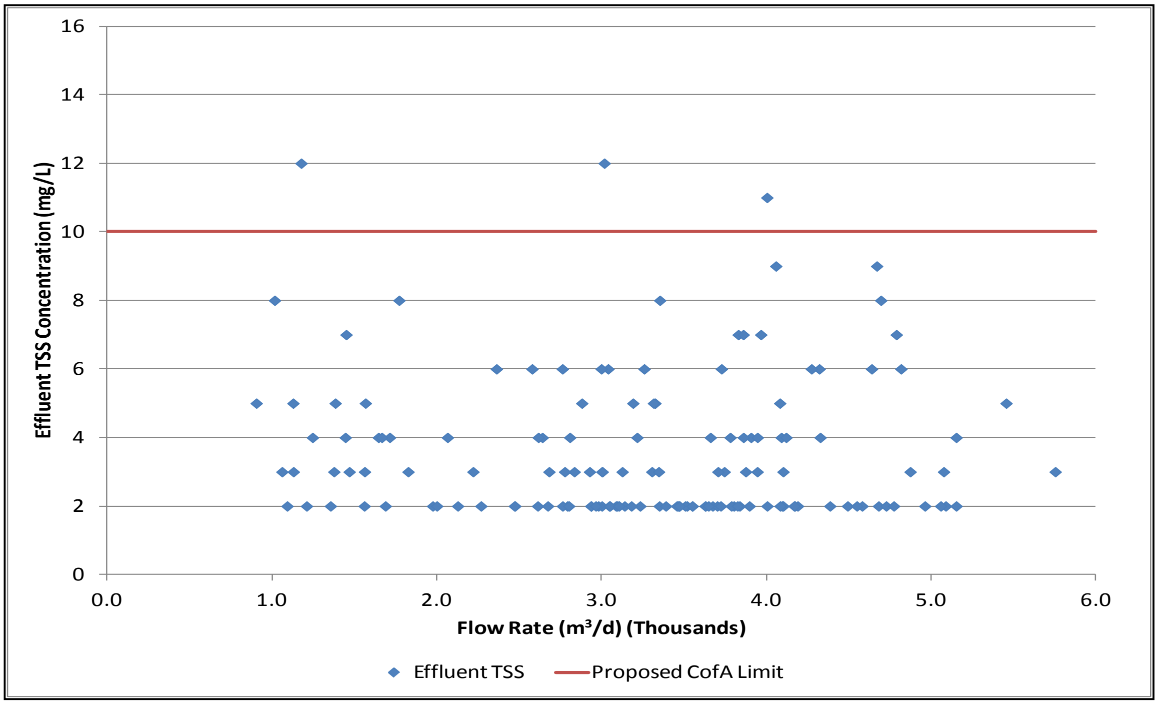


Figure 3.5 Effluent TSS vs. Effluent Flow Rate

While some individual samples shown in Figure 3.5 exceed the design effluent TSS limit of 10 mg/L, the Arthur WWTP effluent has historically been very high quality, with an average effluent TSS of 3.6 mg/L from 2007-2012. Based on Figure 3.5, there appears to be no correlation between effluent flow rate and effluent TSS concentration. According to Table 2.11, the maximum effluent flow from the Arthur WWTP is 5,000 m^3/d. As a result, the tertiary filters are expected to provide adequate performance at future effluent flows, and expansion of current filtration facilities is not required.

3.4 Chemical Addition

The chemical feed system at the Arthur WWTP consists of a 23 m^3 chemical storage tank, 450 L day tank, and two chemical metering pumps (one duty and one standby), each rated for 250 L/d. The coagulant addition point is immediately upstream of the secondary clarifier. Provisions exist to dose alum upstream of the tertiary filters. The Arthur WWTP currently uses alum as the precipitant. Currently, alum is added upstream of the secondary clarifiers.

Historically, the alum dosages ranged from 36 mg/L to 244 mg/L, the average alum dosage was 89 mg/L. This value is slightly lower than the MOE Design Guidelines recommended dosage of 110 mg/L to 225 mg/L (MOE, 2008); however, the low effluent TP concentrations suggest that the lower alum dosage has not had a negative impact on plant performance.

Based providing a design alum solution dosage of 110 mg/L (MOE, 2008), the existing firm capacity of the chemical metering pumps is equivalent to an ADF of 3,034 m^3/d, which should be sufficient to treat the design ADF of 2,300 m^3/d.

Based on the chemical metering pumps operating at firm capacity, the existing chemical storage tank has 92 days of chemical storage.

Table 3.9 shows the calculated monthly average effluent TP concentration for 12 different months from 2011-2012 when effluent discharge to the Conestogo River was recorded. A treatability study was conducted during this period to evaluate the effectiveness of using dual point alum addition for chemical phosphorus removal at the Arthur WWTP during two of those months (March and April, 2012). During all other months, the plant was operated typically, using single point alum dosing immediately upstream of the secondary clarifier.

Table 3.9 Historic Monthly Average Effluent TP Concentrations

Month	Monthly Average TP Concentration (mg/L)
January, 2011	0.33
February, 2011	0.45
March, 2011	0.20
April, 2011	0.14
November, 2011	0.24
December, 2011	0.24
January, 2012	0.23
February, 2012	0.29
March, 2012	0.09 (1)
April, 2012	0.04 (1)
November, 2012	0.25
December, 2012	0.24
Future CofA Objective	**0.17**
Future CofA Limit	**0.25**

Notes:
1. Dual point alum addition carried out.

Using single point alum addition, the recorded effluent TP was higher than the future effluent TP objective of 0.17 mg/L in 9 out of 10 months. In four of those months, the effluent TP was higher than the future effluent TP limit of 0.25 mg/L. For the two months when dual point chemical addition was in use, the effluent TP concentrations were lower than the future effluent TP objective, indicating a marked improvement in phosphorus removal using dual point addition over single point addition.

Figure 3.6 presents effluent phosphorus concentrations from February - April, 2012.

Dual point alum addition was commenced near the end of February, 2012. As can be seen in Figure 3.6, after implementation of dual point chemical addition, the measured effluent phosphorus concentration immediately decreased and remained consistently low for the remainder of the treatability test. This suggests that the implementation of dual point chemical addition at the Arthur WWTP will enhance phosphorus removal and, in conjunction with tertiary treatment, will allow the Arthur WWTP to consistently meet the future effluent TP objectives.

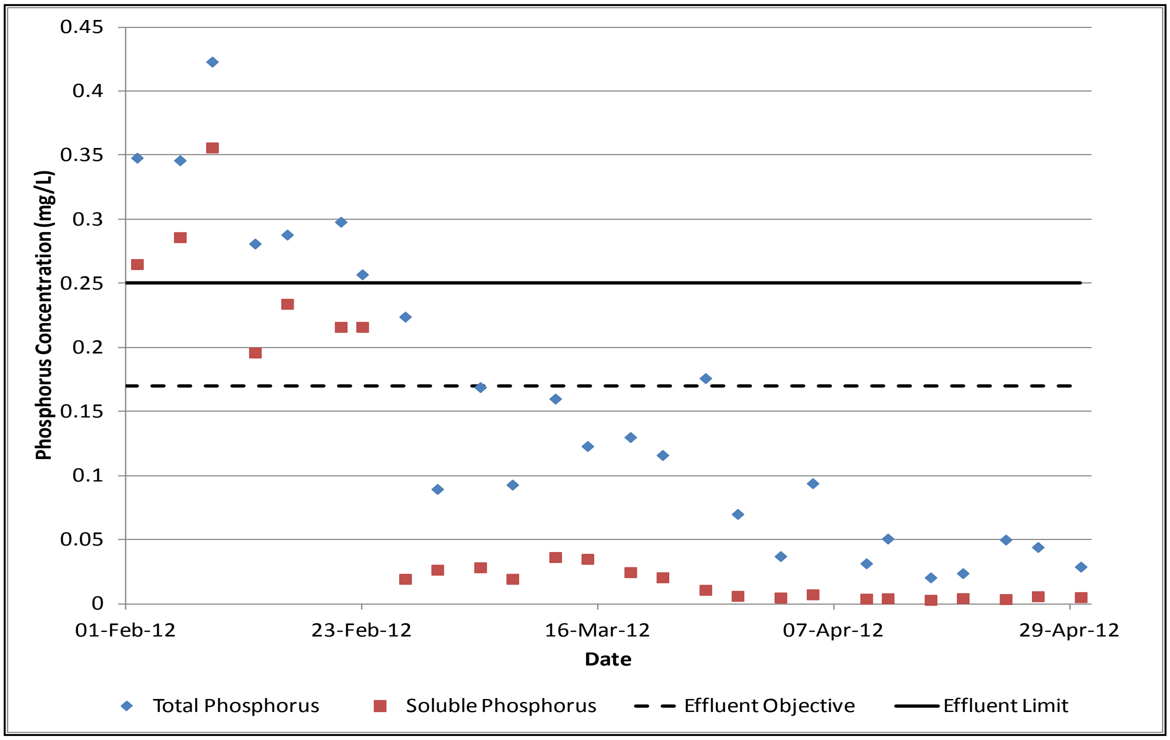


Figure 3.6 Effluent phosphorus concentration with dual point alum addition

3.5 Disinfection

The Arthur WWTP currently uses UV irradiation to disinfect tertiary treated effluent prior to discharge to the Conestogo River. The UV system is designed to provide a dose of approximately 25.9 watts-sec/cm^2 at 65 percent transmission and a peak flow capacity of 6,500 m^3/d.

The UV system was replaced in 2013 and has adequate capacity to meet the future discharge requirements at the proposed effluent flows; therefore, no upgrades to the UV system are required.

3.6 Other Considerations

In a Memorandum to the MOE dated January 6, 2014, XCG provided responses to MOE comments on the Assimilative Capacity Study. In the memorandum, XCG indicated that effluent pH adjustment may be required to achieve non-toxic effluent concentrations of un-ionized ammonia. The potential addition of pH adjustment should be re-evaluated during preliminary design. If required, it is not anticipated that this will significantly impact capital and operation and maintenance (O&M) costs. Further, pH adjustment would be applicable to all treatment options being considered for the Arthur WWTP and would impact all options equally.

3.7 Effluent Storage

Low flow in the Conestogo River limits the timing and volume of the Arthur WWTP discharge to the receiver. Historically, the plant has discharged from November to April (inclusive). During the remaining months, treated water is stored in storage lagoons. This section evaluates the ability of the conveyance system and storage lagoons to accommodate the increased design flows and storage requirements.

3.7.1 Conveyance System

Treated wastewater is pumped from the WWTP to the storage lagoons via a forcemain that is approximately 2.5 km long. The forcemain is a combination of older asbestos cement pipe (200 mm diameter) and newer ductile iron (250 mm diameter). There remains approximately 1.5 km of old forcemain that is scheduled to be replaced as roadwork is completed. All flow is pumped using two horizontal split case pumps onsite at the Arthur WWTP. Each pump is rated for 58.5 L/s (5,054 m^3/d) and 64 m TDH.

Based on preliminary hydraulic analyses, the existing conveyance system (forcemain and pumps) has insufficient capacity to transfer design peak flows to the lagoon. A new 300 mm forcemain will be required to convey future peak flows to and from the storage lagoons. The pumps will require replacement with pumps sized for the future design PIF of 11,500 m^3/d.

3.7.2 Storage Lagoons

The recently completed Assimilative Capacity Study (XCG, 2013) identifies a future discharge period from May and October. Although the design ADF is 2,300 m^3/d, flows to the Arthur WWTP will vary month to month. In order to estimate the storage requirements, the future monthly flows were projected based on historic average monthly flow factors to the plant. Table 2.10 presents the projected monthly flows for the months when limited or no discharge is allowed from the Arthur WWTP (May - October). The table includes estimated storage requirements based on the projected flows.

Table 3.10 Projected Monthly Flows (May - October) and Lagoon Storage Requirements

Month	Monthly ADF (m^3/d)	Storage Required (m^3)
May (1)	2,176	27,158
June	1,913	57,394
July	1,596	49,479
August	1,581	48,996
September	1,587	47,606
October(2)	1,784	11,916
Total Storage Requirements (m^3)		**245,548**

Notes:
1. Monthly rated discharge (1,300 m^3/d) was discounted from the monthly ADF to calculate the storage requirement.
2. Monthly rated discharge (1,400 m^3/d) was discounted from the monthly ADF to calculate the storage requirement.

According to the CofA, the existing capacity of the storage lagoon is approximately 340,000 m^3. Based on the projected storage requirement of approximately 246,000 m^3, no additional storage capacity is required.

3.8 Sludge Management

For the purposes of developing sludge management design concepts, the following assumptions were made:

- Biosolids will continue to be land applied;
- Existing infrastructure will be reused where possible; and,
- All proposed expansions to the existing WWTP will be located on the existing site.

3.8.1 Design Raw Sludge Generation Rates

Design raw waste sludge generation rates were developed based on the design raw wastewater loadings presented in Table 2.7. As historical operational data on the WAS concentrations or WAS generation rates were not available, a typical WAS yield (Y_{obs}) of 0.6 g VSS/g BOD_5 and a typical VSS:TSS ratio of 0.6 for activated sludge facilities without primary clarification were assumed. Maximum month loading rates were estimated based on a typical maximum month loading factor of 1.5 for BOD_5 from experience at similar sized facilities treating primarily domestic wastewater.

Design raw waste sludge generation rates, at the future design ADF of 2,300 m^3/d are presented in Table 3.11. WAS generation rates should be confirmed during preliminary design.

Table 3.11 Design Raw Waste Sludge Generation Rates – Arthur WWTP

Parameter	Design Value	Historic Recorded Value (2006 – 2009)
Influent BOD_5 Loading (kg/d)	363 (545) (1)	n/a
WAS Yield (kg VSS/(kg BOD_5·d))	0.6	
VSS:TSS ratio	0.6	
WAS TS (kg/d)	363 (545) (1)	n/a
WAS VS (kg/d)	218 (452) (1)	n/a

Notes:
Values in parentheses represent maximum month design values.
n/a – not applicable.
MLSS – mixed liquor suspended solids.
MLVSS – mixed liquor volatile suspended solids.
SS – suspended solids.
VS – volatile solids.
WAS – waste activated sludge.
1. Based on assumed typical maximum month loading factor of 1.5 for BOD_5.

3.8.2 Aerobic Digestion Conceptual Design

Historically in Ontario, conventional aerobic digestion has been used primarily in municipal extended aeration wastewater treatment facilities. This process is used primarily for plants with design flows of less than about 17,280 m^3/d (Metcalf & Eddy, 2003). The Arthur WWTP currently uses aerobic digestion to stabilize solids produced in the liquid treatment train. The plant has a primary digester volume of 305.5 m^3, and a total digester volume of 468 m^3. Sludge is then transferred to one of four storage tanks, each with a volume of 150 m^3. The primary digester, secondary digester and sludge storage tanks are all aerated by coarse bubble diffusers. Additional mixing is provided by submersible mixers, which are located in all tanks.

Because primary clarification is not a component of any of the alternative liquid treatment design concepts, and the scale of the expanded Arthur WWTP (2,300 m^3/d) would not support thermal or other stabilization processes, conceptual design of sludge stabilization at the expanded Arthur WWTP was based on expansion of the existing aerobic digestion process and provision of additional biosolids storage.

The process involves the oxidation of biodegradable matter and microbial cellular material by the biologically active mass of organisms. Sludge is aerated for an extended period of time, generally a minimum of 15 to 20 days, in one or more tanks. According to MOE Guidelines (2008), a total SRT should be a minimum of 45 days inclusive of the SRT in the liquid treatment train. Typically aeration occurs in an open, unheated tank and air is supplied by air diffusers or surface aerators. Temperature plays a critical role in the aerobic digestion process; lower temperatures within the process decreases the efficiency of stabilization. Decanting often occurs within the aerobic digestion process, allowing for biosolids thickening and minimizing the storage capacity required within the system.

Table 3.12 presents the tankage requirements for the aerobic digestion process based on the four options identified for secondary treatment. Operating parameter values are shown, along with typical design guideline values. The tankage requirements presented in Table 3.12 are based on thickening in the digester via decanting to a typical equivalent WAS solids concentration of 2.0 % TS (MOE, 2008).

Table 3.12 Aerobic Digester Tankage Requirements

Parameter	Future Design Requirements based on Secondary Treatment Options				Typical Design Guidelines
	Option 1 EA - New Secondary Clarifier	Option 2 EA - Twin Plant	Option 3 IFAS	Option 4 (1) MBR	
SRT Requirements (d)					
Aeration Tank SRT	14.8	23.6	14.8	23.6	
Digester SRT	30.2	21.4	30.2	21.4	
Total SRT	45	45	45	45	≥ 45
Existing Digester Volumes (m^3)					n/a
1st Stage	305.5	305.5	305.5	305.5	
2nd Stage	162.5	162.5	162.5	162.5	
Total	468	468	468	468	
Max. Month WAS Flow (m^3/d) (2)	27.2	27.2	27.2	18.1	n/a
Existing Digester SRT (d) (2), (3)	13.8	13.8	13.8	20.7	n/a
Convert Sludge Storage Tanks to Digesters (3,4)					n/a
1st Stage	3 tanks	1 tanks	3 tanks	1 tanks	
2nd Stage	1 tanks	1 tanks	1 tanks	0 tanks	
Total	4 tanks	2 tanks	4 tanks	1 tanks	
Total Digester Volumes (m^3)					n/a
1st Stage	755.5	455.5	755.5	455.5	
2nd Stage	312.5	312.5	312.5	162.5	
Total	1,.068	768	1,.068	618	
Digester SRT (d) (2), (3)	31.4	22.6	31.4	27.3	n/a
Total SRT (d)	46.2	46.2	46.2	50.9	≥ 45
VSS Loading to 1st Stage (kg/(m^3·d))(3)	0.539	0.895	0.539	0.895	≤ 1.6

Notes:

n/a – not applicable

SRT – solids retention time

1. It was assumed that a membrane thickener would be installed upstream of the aerobic digesters for the MBR option.
2. Based on assumption that digester contents are decanted to provide an equivalent WAS feed solids concentration of 2.0% (MOE, 2008).

Table 3.12 Aerobic Digester Tankage Requirements

Parameter	Future Design Requirements based on Secondary Treatment Options				Typical Design Guidelines
	Option 1 EA - New Secondary Clarifier	Option 2 EA - Twin Plant	Option 3 IFAS	Option 4 (1) MBR	
SRT Requirements (d)					
Aeration Tank SRT	14.8	23.6	14.8	23.6	
Digester SRT	30.2	21.4	30.2	21.4	
Total SRT	45	45	45	45	≥ 45
Existing Digester Volumes (m^3)					
1st Stage	305.5	305.5	305.5	305.5	n/a
2nd Stage	162.5	162.5	162.5	162.5	
Total	468	468	468	468	
Max. Month WAS Flow (m^3/d) (2)	27.2	27.2	27.2	18.1	n/a
Existing Digester SRT (d) (2), (3)	13.8	13.8	13.8	20.7	n/a
Convert Sludge Storage Tanks to Digesters (3,4)					
1st Stage	3 tanks	1 tanks	3 tanks	1 tanks	n/a
2nd Stage	1 tanks	1 tanks	1 tanks	0 tanks	
Total	4 tanks	2 tanks	4 tanks	1 tanks	
Total Digester Volumes (m^3)					
1st Stage	755.5	455.5	755.5	455.5	n/a
2nd Stage	312.5	312.5	312.5	162.5	
Total	1,.068	768	1,.068	618	
Digester SRT (d) (2), (3)	31.4	22.6	31.4	27.3	n/a
Total SRT (d)	46.2	46.2	46.2	50.9	≥ 45
VSS Loading to 1st Stage (kg/(m^3·d))(3)	0.539	0.895	0.539	0.895	≤ 1.6

3. An additional volumetric allowance of 25% was also included to provide plant staff with the ability to decant (MOE, 2008).
4. Determination of conversion of sludge storage to 1st or 2nd stage digestion was based on providing 2/3 of digester volume in the first stage, and 1/3 in the second (MOE, 2008).

Based on Table 3.12, the existing digesters do not have sufficient capacity to treat the projected future maximum month sludge generation rate for any of the secondary treatment options. In order to meet the design requirements, existing sludge storage tankage could be converted to digester volume. The number of tanks that require conversion is based on the SRT provided in the secondary treatment process, and the effective feed WAS concentration.

For Secondary Treatment Option 1 and Option 3, three of the existing sludge storage tanks would be converted to 1st stage aerobic digester volume, and one sludge storage tank would be converted to 2nd stage digester volume, providing total 1st and 2nd stage volumes of 755.5 m^3 and 312.5 m^3, respectively, and maintaining the recommended volumetric ratio between the 1st and 2nd stages. Because the secondary treatment SRTs for Option 2 and for Option 4 are higher than for Option 1 and Option 3, fewer existing sludge storage tanks will need to be converted to digesters. For Option 2, one sludge storage tank would be converted to 1st stage aerobic digester volume, and one sludge storage tank would be converted to 2nd stage digester volume, providing total 1st and 2nd stage volumes of 455.5 m^3 and 312.5 m^3, respectively.

For Secondary Treatment Option 4, it was assumed that membrane WAS thickening would be implemented along with the MBR secondary treatment technology, which would thicken WAS to 3.0 % TS, resulting in a decrease in sludge flow and resultant digester volume requirements. As a result, one sludge storage tank would be converted to 1st stage aerobic digester volume, and no additional 2nd stage digester volume would be required, for a total 1st and 2nd stage volume of 455.5 m^3 and 162.5 m^3, respectively.

The recommended conversions would provide total SRTs in excess of 46 days for Option 1, Option 2 and Option 3, and an SRT of almost 51 days for Option 4, which exceed the minimum requirement of 45 days according to the MOE Design Guidelines (2008). Volatile solids loading rate to the 1st stage digesters would also fall under the maximum recommended rate of 1.6 kg/($m^3 \cdot d$) (MOE, 2008).

Piping would be provided to allow waste sludge to be directed to either the first or second stage, so that individual stages could be taken offline for maintenance if required. Provision for decanting from the digester would also be provided. The existing aeration system in the existing sludge storage tanks may require upgrades for operation as 1st or 2nd stage aerobic digesters.

Design options that could be considered during the preliminary design phase include providing a means to equalize the addition of digester supernatant to the liquid treatment train to reduce the shock loading impact.

3.8.3 Alternative Biosolids Storage Design Concepts

The following biosolids storage alternatives were investigated as possible design concepts for the expanded Arthur WWTP:

- Alternative A - Liquid biosolids storage in on-site storage tanks; and
- Alternative B - Geotextile dewatering and cake storage in an on-site facility.

3.8.3.1 Biosolids Storage Alternative A - Liquid Biosolids Storage

Aerobically digested biosolids may be stored for extended periods, ensuring that thorough mixing of the contents, either by diffused air or mechanical mixing, is provided prior to transfer to land application equipment. Liquid biosolids storage requirements can vary depending on disposal practices and options available to the plant. Assuming liquid land application is the sole means of disposal, provision of 240 days storage is encouraged as a best practice (NMA, 2008).

Large storage tanks are often constructed out of concrete and smaller tanks out of carbon steel with a suitable coating or liner. All equipment within the tank should be constructed out of corrosion-resistant materials such as polyvinyl chloride, polyethylene, stainless steel or glass lined steel (MOE, 2008).

If liquid biosolids storage is selected as the preferred alternative, a detailed evaluation of mixing equipment and materials selection should be completed during preliminary design to select the most cost effective liquid biosolids storage option.

Table 3.13 presents the tankage requirements to provide 240 days of storage of liquid biosolids from the Arthur WWTP. For the purposes of developing the tankage requirements, a volatile solids destruction of 38 percent in the digestion process was assumed, resulting in an average design biosolids generation rate is 280 kg/d from the Arthur WWTP. Operating parameter values are shown, along with typical design guideline values. The storage requirements for Option 1, Option 2 and Option 3 are based on the assumption that the biosolids are thickened to a concentration of 2.0 % TS via decanting from the liquid biosolids storage tank. It was assumed that membrane WAS thickening would be used for Option 4, resulting in a biosolids concentration of 2.3 % TS.

Table 3.13 Alternative A - Liquid Biosolids Storage Requirements

Parameter	Future Design Requirement			
	Option 1 (1) **EA - New Secondary Clarifier**	**Option 2 (2)** **EA - Twin Plant**	**Option 3 (1)** **IFAS**	**Option 4 (3)** **MBR**
Average Biosolids Generation (1)	280 kg/d	280 kg/d	280 kg/d	280 kg/d
Total Storage Required	3,276 m^3 (2)	3,276 m^3 (2)	3,276 m^3 (2)	2,904 m^3 (3)
Total Existing Storage	0 m^3 (4)	300 m^3 (5)	0 m^3 (4)	450 m^3 (6)
Total Additional Storage Required	3,276 m^3	3,051 m^3	3,276 m^3	2,454 m^3

Notes:
1. Based on the average WAS generation rate of 363 kg/d and assuming 38% VSS destruction in the digestion process.
2. Assuming 240 days of storage to be provided on-site and a biosolids concentration of 2.0 %.
3. Assuming 240 days of storage to be provided on-site and a biosolids concentration of 2.3 % based on membrane thickening of WAS to 3.0 % prior to digestion.
4. All existing sludge storage tanks would be converted to aerobic digester volume.
5. Two existing sludge storage tanks would be converted to aerobic digester volume and two existing sludge storage tanks would be retained for storage.
6. One existing sludge storage tank would be converted to aerobic digester volume and three existing sludge storage tanks would be retained for storage.

The volume of liquid biosolids storage required to provide 240 days of storage is based on the volume of existing sludge storage after conversion of tankage to aerobic digester volume, and the biosolids concentration.

For Secondary Treatment Option 1 and Option 3, all of the existing sludge storage tanks would be converted to aerobic digester volume; therefore, approximately 3,300 m^3 of liquid biosolids storage would be required. Option 2 would require approximately 3,050 m^3 of storage and Option 4 would require 2,450 m^3 of storage based on the increased biosolids concentration of 2.3 % TS.

3.8.3.2 Biosolids Storage Alternative B - Geotextile Dewatering and Cake Storage

Geotextile dewatering involves long term storage of sludge or biosolids in geotextile containers. The outer liner of the geotextile container is typically fabricated from high tenacity woven polypropylene. The high strength polypropylene fabric allows liquid to permeate through the tube walls while maintaining solids in the container. To improve dewatering, polymer is added to the sludge prior to being pumped into the geotextile container.

Sludge is normally held within the geotextile container for periods of six months to a year. Geotextile dewatering containers are currently being used for WAS storage at the Eganville WWTP in Ontario. The process produces a sludge cake with a total solids concentration of approximately 18 percent. Dewatered biosolids cake storage would reduce onsite storage requirements as compared to liquid biosolids storage. Dewatered biosolids cake could also be landfilled provided that the dewatered biosolids meet all requirements for landfilling, further reducing onsite storage requirements.

Following digestion, biosolids would be stored and dewatered in temporary geotextile containers. Sludge would be maintained in the geotextile containers for up to 240 days. For the purpose of this evaluation, the geotextile dewatering technology is based on the Geotube® manufactured by TenCate Geosynthetics.

Filtrate from the Geotube® would be collected and directed to the headworks for treatment. The local supplier of the Geotube® technology (Bishop Water Technology Inc.) was contacted with respect to sizing and provided costs associated with the technology.

Table 3.14 presents a summary of the Geotube® design requirements. A detailed quote from the supplier is included in Appendix D.

Table 3.14 Alternative B - Geotextile Dewatering and Cake Storage Requirements

Parameter	Average Day
Average Biosolids Generation	280 kg/d (1)
Design Dewatered Sludge Concentration	18 % TS (2)
Estimated Volumetric Dewatered Sludge Volume Requiring Storage (3)	420 m^3
Recommended Number of Geotube® Units (2)	3
Size of Each Geotube® Unit (2)	13.7 m circumference x 17.4 m length (45 ft circumference x 57 ft length)

Notes:
1. Based on the average WAS generation rate of 363 kg/d and assuming 38% VSS destruction in the digestion process
2. Based on quote supplied by Bishop Water Technologies Inc. included in Appendix D.
3. Based on 240 days of storage.

Based on Table 3.12, a total of two 13.7 m circumference x 22 m length Geotube® units will be required for biosolids dewatering and storage. An area of 16.8 m x 22 m (55 ft x 72 ft) will be required for storage of both dewatering units; however, additional area could be provided for a provisional third dewatering unit. A 10 m x 22 m area enclosed by a heated greenhouse structure is required for one of the dewatering units for operation during the winter according to the supplier. The sub-grades of the dewatering cells must be replaced with sand, re-graded with a 0.5 percent slope, and compacted to ensure stability. Trenches and berms with an impermeable liner will be constructed to contain the filtrate and run-off in the dewatering cells. A geotextile layer will be installed over the membrane to protect the membrane against traffic and the Geotube® filter fabric will be laid over the material to promote dewatering.

A new heated building will be required to house the polymer activation and feed system. A new control system as well as SCADA upgrades will be required to provide flow proportional control of polymer. Filtrate from the Geotube® will be directed to a 38 m^3 filtrate holding tank for collection and transferred to the headworks during low flow periods.

4. PRELIMINARY EVALUATION OF DESIGN OPTIONS

4.1 Evaluation Methodology

The evaluation criteria are described below in Table 4.1. Both the construction and operation phases were evaluated based on impacts to the following categories: natural environment, social/cultural/community environment, technical environment and cost.

Each evaluation criteria was scored as follows:

- Score of 1 - Does not meet criterion/negative impact/highest cost
- Score of 2 - Meets some aspects of the criterion/potential for negative impact
- Score of 3 - Meets most aspects of the criterion/little to no negative impact
- Score of 4 - Meets criterion objectives/positive impact/lowest cost

For each alternative, a total score was calculated as the sum of the individual criteria scores. The presented alternative designs were ranked according to the total scores, and the alternative design with the highest total score was selected as the preferred alternative.

4.2 Comparison of Secondary Treatment and Biosolids Storage Options

An information matrix that qualitatively evaluates each secondary treatment option based on the evaluation criteria is presented in Table 4.2 and Table 4.3 for the construction and operation phases respectively.

As outlined in Section 5.3, both on-site liquid biosolids storage and geotextile dewatering and cake storage are feasible options for implementation at the Arthur WWTP. Table 4.4 presents a comparison of the advantages and disadvantages of each of the alternative biosolids storage concepts.

Table 4.1 Evaluation Criteria

Group	Criteria	Definition
Construction Phase		
Natural Environment	Effect on surface waters	This criterion refers to the effects of the construction of the alternative design concept on the surface water quality, quantity and aquatic ecosystems
	Disruption of terrestrial features	This criterion refers to the temporary disruption or displacement of terrestrial features during construction activities.
Social/Cultural/ Community Environments	Disruption of adjacent residential, community and recreational features (noise, dust, odour, traffic)	This criterion addresses the potential nuisance impacts on adjacent land owners and residents as a result of construction.
Economic Environment	Capital costs of construction	This criterion provides an estimate of capital cost of the alternative.
Technical Environment	Constructability	This criterion addresses the ability to maintain the performance of the treatment process during construction.
Operation Phase		
Natural Environment	Effect on surface waters	This criterion refers to the effects of operation of the alternative on surface water quality.
Social/Cultural/ Community Environments	Disruption of adjacent residential, community and recreational features (noise, dust, odour, traffic)	This criterion addresses the potential nuisance impacts (noise, odour, traffic, visual intrusion) on adjacent land owners and residents as a result of the operation of the facility at the re-rated capacity with operation of the design alternative.
Economic Environment	Annual operating costs for processes that vary between the alternatives	This criterion addresses the cost of operation of the alternative. The alternatives were scored for this criterion based on the estimated annual operating costs of processes that vary between the alternatives. Processes that are similar between the alternatives and the labour at the WWTP were assumed constant.
Technical Environment	Performance and experience in similar climates and size	The criterion refers to the performance and experience of operating other WWTPs similar in size and design to the alternative design concept, in comparable climates as the Victoria Harbour area.
	Operating requirements	This criterion refers to the operational complexity of the alternative in terms of operator attention and staffing requirements.
	Compatibility with existing infrastructure	This criterion refers to the compatibility of the alternative with existing infrastructure in terms of the application/use of existing equipment and ability for retrofit.
	Ability to consistently meet effluent criteria	This criterion refers to the ability for the alternative to consistently be able to meet the WWTP C of A effluent criteria.

Table 4.2 Comparison of Secondary Treatment Options During the Construction Phase

Evaluation Criterion	Alternative 1A EA (1A)	Alternative 2 EA (2)	Alternative 3 IFAS	Alternative 4 MBR
Natural Environment				
Effect on surface waters	All construction impacts can be mitigated through good construction techniques.	All construction impacts can be mitigated through good construction techniques.	All construction impacts can be mitigated through good construction techniques.	All construction impacts can be mitigated through good construction techniques.
Disruption of terrestrial features	Medium construction footprint	Large construction footprint	Medium construction footprint	Smallest construction footprint.
Social/Cultural/Community Environments				
Disruption of Adjacent Residential, Community and Recreational Features	Minor noise and dust on adjacent land owners and residents during construction activities.	Minor noise and dust on adjacent land owners and residents during construction activities.	Minor noise and dust on adjacent land owners and residents during construction activities.	Minor noise and dust on adjacent land owners and residents during construction activities. Potential for shortest construction duration.
Technical Environment				
Constructability	Current process could be maintained while additional secondary clarifiers are constructed. Tying in the secondary clarifiers may result in minor constructability issues. Retrofitting aeration system, if necessary, can be accomplished by taking only ½ of aeration capacity offline at a time.	Current process could be maintained while additional treatment train is constructed. Tying in the additional train may result in minor constructability issues. Retrofitting aeration system, if necessary, can be accomplished by taking only ½ of aeration capacity offline at a time.	Retrofits to the existing aeration basins to IFAS tanks could be done one at a time. Construction could be targeted during expected low flow times. The new secondary clarifier would be constructed while the current process is maintained. Tying in the secondary clarifier may result in minor constructability issues.	No new tankage is required. The new membrane building would be constructed, and membranes commissioned, prior to converting the existing secondary clarifier to equalization storage or liquid biosolids storage.

Table 4.3 Comparison of Secondary Treatment Options During the Operation Phase

Evaluation Criterion	Alternative 1 Expand Secondary Clarifiers	Alternative 2 Twin Existing EA Plant	Alternative 3 IFAS	Alternative 4 MBR
Natural Environment				
Effect on surface waters	Negligible impacts as future design effluent limits can be met.	Negligible impacts as future design effluent limits can be met.	Negligible impacts as future design effluent limits can be met.	Negligible impacts as future design effluent limits can be met. Provides tertiary level treatment.
Social/Cultural/Community Environments				
Disruption of adjacent residential, community and recreational features (noise, dust, odour, traffic)	Low disruption anticipated. Solution unlikely to increase potential for odours.	Low disruption anticipated. Solution unlikely to increase potential for odours.	Low disruption anticipated. Solution unlikely to increase potential for odours with proper mixing.	Low disruption anticipated. Solution unlikely to increase potential for odours.
Technical Environment				
Performance and experience in similar climates and size	Very good experience/performance Proven treatment process with long history of application in similar climates.	Very good experience/performance. Proven treatment process with long history of application in similar climates.	Relatively new technology. Limited experience in Ontario (demonstrations at Lakeview, Highland Creek, and full scale experience at Peterborough WWTPs).	Relatively new technology. Limited experience in Ontario (Port McNicoll, Creemore, and Komoka WWTPs).
Operational complexity/familiarity of Operations staff with process	Low complexity. Operations staff familiar with processes involved in treatment by EA.	Low complexity. Operations staff familiar with processes involved in treatment by EA.	Medium complexity. Flow through process with relatively simple operational control requirements. Operations staff do not have experience operating IFAS process; however.	High complexity. Membranes represent a barrier to flow through the plant, requiring complex control of permeate pump operation. Membranes have intensive maintenance requirements. Operations staff do not have experience operating MBR process

Table 4.3 Comparison of Secondary Treatment Options During the Operation Phase

Evaluation Criterion	Alternative 1 Expand Secondary Clarifiers	Alternative 2 Twin Existing EA Plant	Alternative 3 IFAS	Alternative 4 MBR
Operating requirements/Operation time usage	Low operating requirements.	Low operating requirements.	Limited additional operating requirements relative to EA solutions.	Highest operating requirements compared to the other alternatives.
Compatibility with existing infrastructure	Good compatibility with existing infrastructure. Need only expansion of secondary clarifier.	Good compatibility with existing infrastructure. Need only to expand aeration and secondary clarification volumes.	Good compatibility with existing infrastructure. Need only to retrofit aeration tanks with IFAS technology, and construct additional clarifier capacity.	Good compatibility with existing infrastructure. Existing secondary clarifier is not required, however this tankage could potentially be reused for flow equalization volume and/or liquid biosolids storage. Effluent filters not required, but will likely be retained to polish water stored in the lagoon.
Ability to consistently meet effluent requirements	Able to consistently meet effluent criteria. High required MLSS concentration provides little room for process flexibility/increased treatment capacity	Able to consistently meet effluent criteria. Additional aeration and clarifier capacity provide process flexibility in case of variation in influent loading	Able to consistently meet effluent criteria. Reduced risk for washout of nitrifying bacteria during cold / wet weather months. Additional process flexibility in case of variation in loading	Able to consistently meet effluent criteria. Reduced risk for washout of nitrifying bacteria during cold / wet weather months. Potential for improved effluent quality, especially in terms of TSS and TP, over other alternatives. Potential to ‘over treat’ effluent that will be sent to storage lagoon.

Table 4.4 Biosolids Storage Design Alternatives – Advantages and Disadvantages

	Biosolids Storage Alternative A Liquid Biosolids Storage	Biosolids Storage Alternative B Geotextile Dewatering and Cake Storage
Advantages	Simple process Operations Staff are familiar liquid biosolids handling equipment and storage	Lower capital costs Smaller footprint requirement Smaller haulage costs as a result of decreased volume of biosolids Dewatered cake may be landfilled when land application is not possible
Disadvantages	Higher capital costs Large tank sizing and footprint requirements Increased haulage costs due to increased volume of biosolids	More complex operation and control requirements More equipment is required Caution must be exercised in the control of leachate and stormwater run-off Large volume of centrate or filtrate must be treated in the liquid treatment train

4.3 Evaluation of Arthur WWTP Design Options

For the purposes of evaluating the design options for the expanded Arthur WWTP, each of the four secondary treatment options was evaluated in combination with each of the two biosolids storage alternatives, resulting in a total of eight Design Options, namely:

- Option 1A - Construct New Secondary Clarifier with new Liquid Biosolids Storage
- Option 1B - Construct New Secondary Clarifier with new Geotextile dewatering and Cake Storage
- Option 2A - Twin Existing EA Plant with new Liquid Biosolids Storage
- Option 2B - Twin Existing EA Plant with new Geotextile dewatering and Cake Storage
- Option 3A - Retrofit Existing EA to IFAS with new Liquid Biosolids Storage
- Option 3B - Retrofit Existing EA to IFAS with new Geotextile dewatering and Cake Storage
- Option 4A - Retrofit Existing EA to MBR with new Liquid Biosolids Storage
- Option 4B - Retrofit Existing EA to MBR with new Geotextile dewatering and Cake Storage

Conceptual level site layouts for the Arthur WWTP Design Options are included in Appendix A. Locations of new tankage as presented in the conceptual level site layouts are preliminary only, and subject to change during preliminary design.

4.3.1 Conceptual Level Costing

Conceptual level life cycle cost analyses were conducted for each secondary treatment option in combination with each of the two biosolids storage options. For the purposes of developing conceptual level cost estimates, it was assumed that all design options include:

- New preliminary treatment consisting of flow metering, mechanically cleaned bar screens with standby manual bar screen, vortex grit separators and headworks building complete with odour control and all appurtenances;

- Decommissioning of the existing headworks;
- Upgraded blower capacity and all appurtenances;
- Construction of new conveyance system to the effluent storage lagoon consisting of new forcemain, upgraded effluent pumps and all appurtenances;
- Additional standby power and increased electrical service; and
- An allowance for modifications to the existing sludge storage tanks to aerobic digester volume, including modifications to diffusers, piping, blower and pump capacity.

Conceptual level life cycle cost analyses were conducted for the Arthur WWTP Upgrade Options based on an inflation rate of 3 percent and an interest rate of 5 percent and are presented in Table 4.5. Capital costs estimates were based on a conceptual level of design and are generally considered to be accurate to -25% to +40%. Actual costs will depend on site specific factors such as soil and groundwater conditions, the engineering design applied, construction conditions at the time of tendering, and the extent of additional upgrades to the works that may be included in the final design. The costs presented include all equipment and appurtenances, replacement, maintenance, chemical usage, energy consumption (prorated based on historic average cost per unit of wastewater treated, and experience at other similar facilities), a 30 percent allowance for contingency and a 12% allowance for engineering and approvals. 240 day on-site biosolids storage period and land applications of biosolids were assumed for all alternatives in order to assess the effect of the relative biosolids disposal costs on annual O&M costs. Detailed capital and O&M cost estimates are included in Appendix E.

Based on Table 4.5, Option 1B - Construct New Secondary Clarifier with new Geotextile dewatering and Cake Storage has the lowest 25 year life cycle cost, approximately $1.3M lower than the next lowest life cycle cost for Option 2B - Twin Existing EA Plant with new Geotextile dewatering and Cake Storage. It should be noted that the 25-year life cycle costs for Options 1B, 2B and 3B are within approximately $1.3M at $23.6M, $24.9M and nearly $25.0M, respectively.

4.3.2 Preliminary Evaluation of Design Options

Any of the Arthur WWTP design options defined in Section 4.3 of the TM would fulfill the Class EA Problem Statement, meeting the study objectives and specific site constraints identified.

Table 4.6 presents the results of the preliminary evaluation of the Arthur WWTP design options.

Table 4.5 Conceptual Level Cost Estimate for Arthur WWTP Design Options

Parameter	Option 1A Secondary Clarifier w/ Liquid Storage	Option 1B Secondary Clarifier w/ Cake Storage	Option 2A Twin EA Plant w/ Liquid Storage	Option 2B Twin EA Plant w/ Cake Storage	Option 3A IFAS w/ Liquid Storage	Option 3B IFAS w/ Cake Storage	Option 4A MBR w/ Liquid Storage	Option 4B MBR w/ Cake Storage
Capital Costs:								
Liquid Treatment	$11,200,000	$11,200,000	$12,500,000	$12,500,000	$12,400,000	$12,400,000	$18,900,000	$18,900,000
Sludge Management	$5,100,000	$2,300,000	$5,100,000	$2,300,000	$5,100,000	$2,300,000	$4,300,000	$2,300,000
Total Capital Cost (1)	**$16,300,000**	**$13,500,000**	**$17,600,000**	**$14,800,000**	**$17,500,000**	**$14,700,000**	**$23,200,000**	**$21,200,000**
Annual O&M Costs:	**$422,000**	**$405,000**	**$422,000**	**$405,000**	**$427,000**	**$410,000**	**$551,000**	**$533,000**
25-Year NPV O&M Cost (2)	$10,550,000	$10,125,000	$10,550,000	$10,125,000	$10,675,000	$10,250,000	$13,775,000	$13,325,000
25-Year Life Cycle Cost (2)	**$26,850,000**	**$23,625,000**	**$28,150,000**	**$24,925,000**	**$28,175,000**	**$24,950,000**	**$36,975,000**	**$34,525,000**

Notes:
All costs are conceptual level opinions of probable costs and are considered to be accurate to within -25 to +40 percent and are exclusive of HST.
1. Includes a 30% allowance for contingency and 12% allowance for approvals, permits and engineering.
2. Based on interest rate of 5%, and inflation rate of 3%.

Table 4.6 Summary of Evaluation of Options

Evaluation Criterion	Option 1A	Option 1B	Option 2A	Option 2B	Option 3A	Option 3B	Option 4A	Option 4B
Construction Phase								
Natural Environment								
Effect on surface water quality	3	3	3	3	3	3	3	3
Disruption of terrestrial features	2	3	2	3	2	3	2	4
Social/Cultural/Community Environments								
Disruption of adjacent residential, community and recreational features	3	3	3	3	3	3	3	3
Economic Environment								
Capital costs of construction	3	4	3	4	3	4	2	1
Technical Environment								
Constructability	3	3	4	4	3	3	4	4
Operation Phase								
Natural Environment								
Effect on surface waters	3	3	3	3	3	3	4	4
Social/Cultural/Community Environments								
Disruption of adjacent residential, community and recreational features	3	3	3	3	3	3	3	3
Economic Environment								
Annual Operating Costs	3	4	3	4	3	4	1	2
Technical Environment								
Performance and experience in similar climates and size	4	3	4	3	3	2	3	2
Operational complexity /familiarity of Operations staff with process	4	3	4	3	2	2	1	1
Operating requirements / Operation time usage	4	4	4	4	4	4	2	2
Compatibility with existing infrastructure	4	4	4	4	4	4	4	4
Ability to consistently meet effluent requirements	2	2	3	3	3	3	4	4
Total Score	**41**	**42**	**43**	**44**	**39**	**41**	**36**	**37**

Based on Table 4.6, Option 2B - Twin Existing EA Plant with new Geotextile dewatering and Cake Storage was ranked the highest with a score of 43. Option 2A - Twin Existing EA Plant with Liquid Biosolids Storage was ranked second highest with a score of 42.

All of the liquid treatment train design concepts could be successfully implemented at the Arthur WWTP; however, liquid treatment train Alternative 2 - Twin Existing EA Plant provides more process flexibility and redundancy than Alternative 1 - Expand Secondary Clarifiers, and is based on a secondary treatment process with a long history of application in Ontario as compared to Alternative 3 - IFAS, and Alternative 4 - MBR. As a result, Alternative 2 - Twin Existing EA Plant was selected as the preferred liquid treatment train design alternative.

As noted above, two biosolids storage alternatives were considered for each liquid treatment train option, namely Alternative A - Liquid Biosolids Storage and Alternative B - Geotextile Dewatering and Cake Storage. Alternative B has lower capital, O&M and 25 year lifecycle costs than Alternative A due to the reduced biosolids storage and haulage requirements. However, Alternative A utilizes a biosolids storage option that has a long history of application in Ontario and is the current means of biosolids storage at the Arthur WWTP, while Alternative B is based on a relatively unproven biosolids dewatering system, with only one other full-scale installation in Ontario that is similar to that considered for the upgraded and expanded Arthur WWTP. Based on these considerations, the final evaluation and selection of a biosolids storage option will be completed as part of the preliminary design phase of this project.

Therefore, Option 2A/B - Twin Existing EA Plant with new Liquid Biosolids Storage or Geotextile Dewatering and Cake Storage is recommended for implementation for the expansion of the Arthur WWTP.

5. PREFERRED DESIGN CONCEPT

The preferred design concept for upgrading and expanding the Arthur WWTP includes:

- New preliminary treatment consisting of flow metering, mechanically cleaned bar screens with standby manual bar screen, vortex grit separators and headworks building complete with odour control and all appurtenances;
- Decommissioning of the existing headworks;
- Twin existing package extended aeration plant;
- Upgraded blower capacity and all appurtenances;
- Construction of new conveyance system to the effluent storage lagoon consisting of new forcemain, upgraded effluent pumps and all appurtenances;
- Providing Geotextile dewatering and cake storage or liquid biosolids storage (with final evaluation an selection to be completed during preliminary design);
- Additional standby power and increased electrical service; and
- An allowance for modifications to the existing sludge storage tanks to aerobic digester volume, including modifications to diffusers, piping, blower and pump capacity.

Site plan showing the conceptual layout of the upgraded and expanded Arthur WWTP are presented in Figures 5.1 (assuming liquid biosolids storage) and 5.2 (assuming geotextile dewatering and cake storage). Locations of new tankage as presented in the conceptual level site layouts are preliminary only, and subject to change during preliminary design

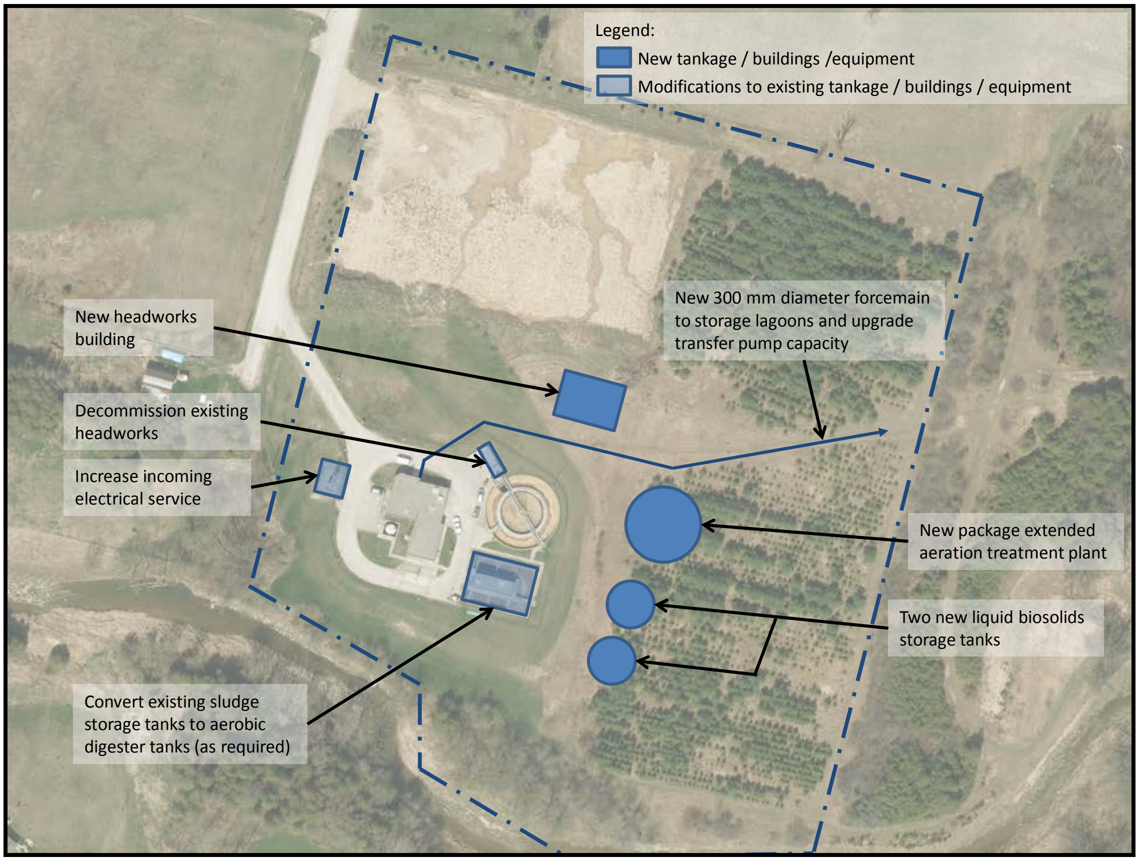


Figure 5.1 Option 2A - Twin Existing EA Plant with new Liquid Biosolids Storage

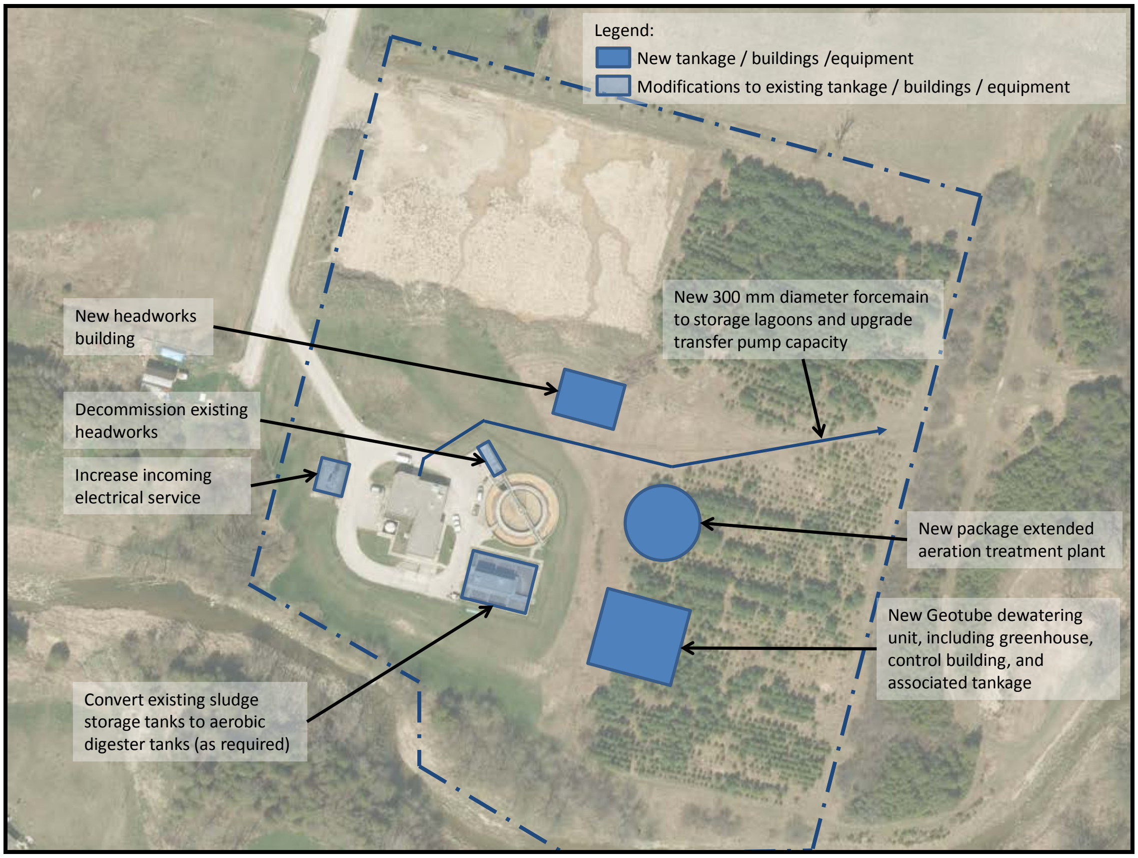


Figure 5.2 Option 2B - Twin Existing EA Plant with new Geotextile Dewatering and Cake Storage

REFERENCES

GE Water & Process Technologies (2014). Budget Proposal for Arthur WWTP.

Headworks BIO™ Inc. (2014). Arthur WWTP Expansion Budgetary Proposal.

Hydromantis (2007). Arthur Wastewater Treatment Plant Capacity Determination.

Metcalf and Eddy (2003). Wastewater Engineering: Treatment and Reuse, 4th Ed.

MOE (2008). Guidelines for the Design of Sewage Treatment Works.

MOE (1985). Guidelines for the Design of Sanitary Sewage Systems.

Triton Engineering Services Ltd. (2012). Class Environmental Assessment Master Plan Study for water supply and sanitary sewage systems: Community of Arthur.

WEF (1992). WEF Manual of Practice No. 8 - Design of Municipal Wastewater Treatment Plants, Volume 1.

WEF (1999), Manual of Practice No. 8.

XCG (2013). Technical Memorandum - Proposed Design Flows - Arthur Wastewater Treatment Plant Class EA.

XCG (2013). Technical Memorandum - Assimilative Capacity Study - Arthur Wastewater Treatment Plant Class EA.

APPENDIX A
CONCEPTUAL LEVEL SITE LAYOUTS

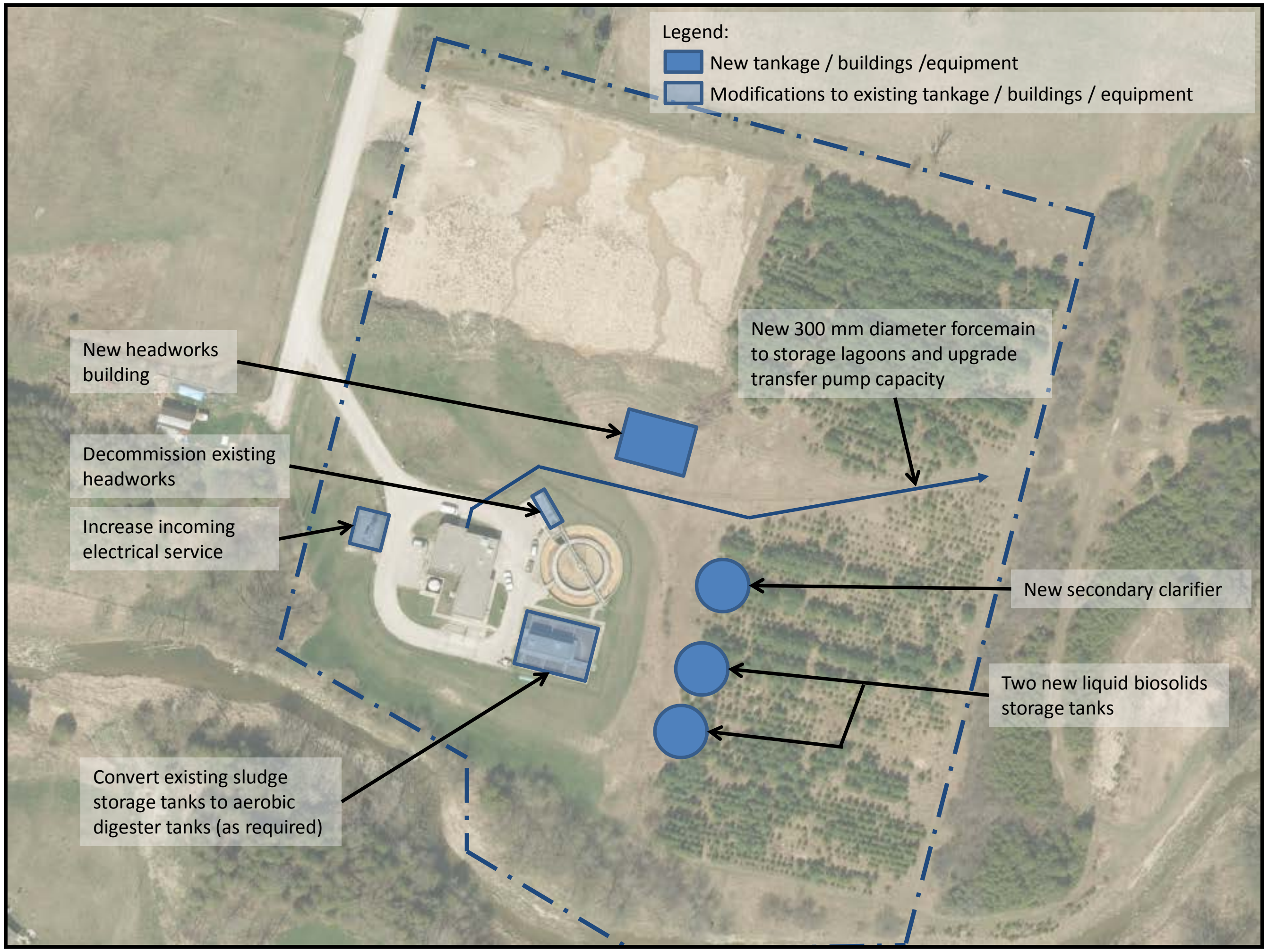


Figure A.1 Option 1A - Construct New Secondary Clarifier with new Liquid Biosolids Storage

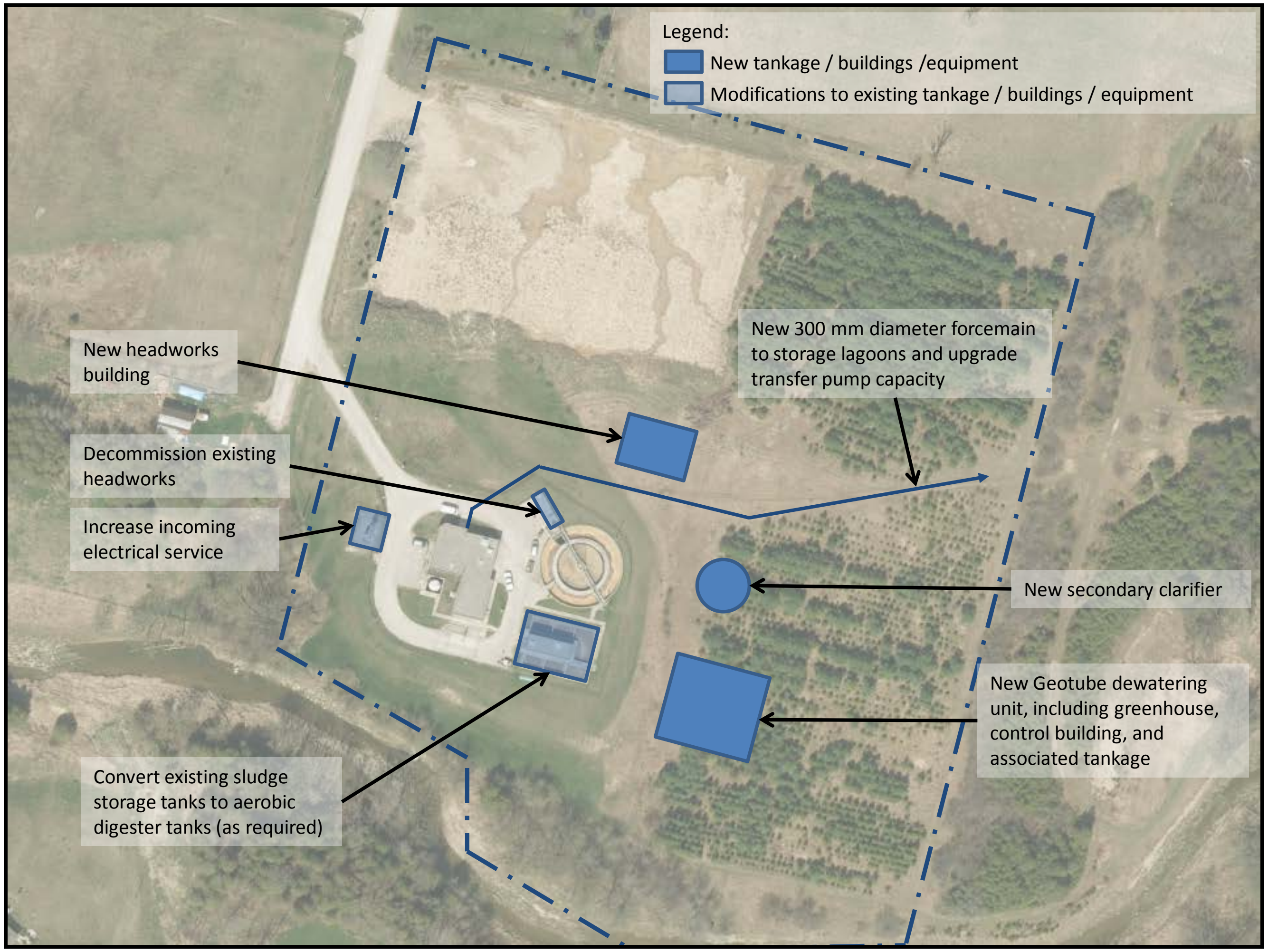


Figure A.2 Option 1B - Construct New Secondary Clarifier with new Geotextile Dewatering and Cake Storage

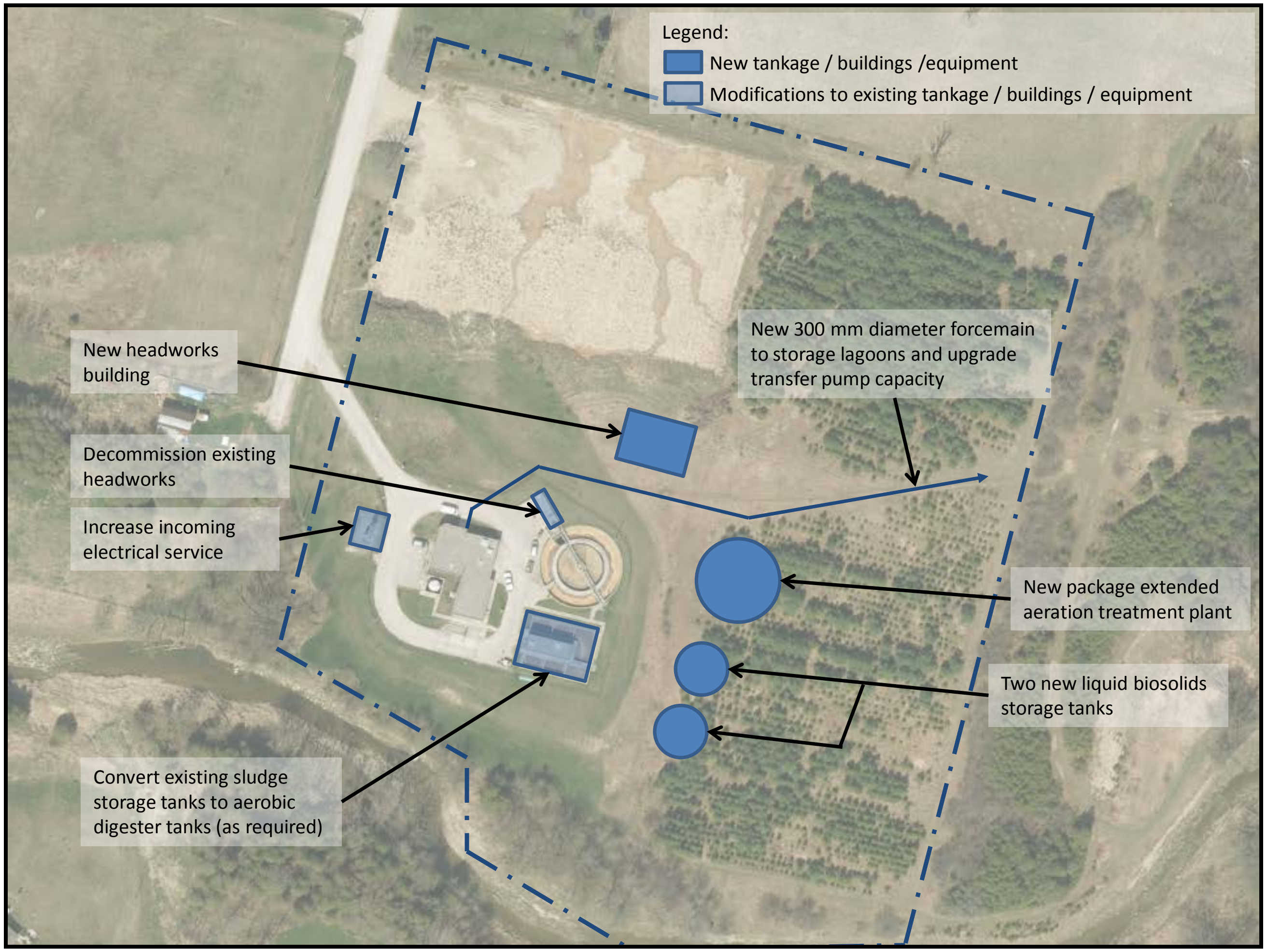


Figure A.3 Option 2A - Twin Existing EA Plant with new Liquid Biosolids Storage

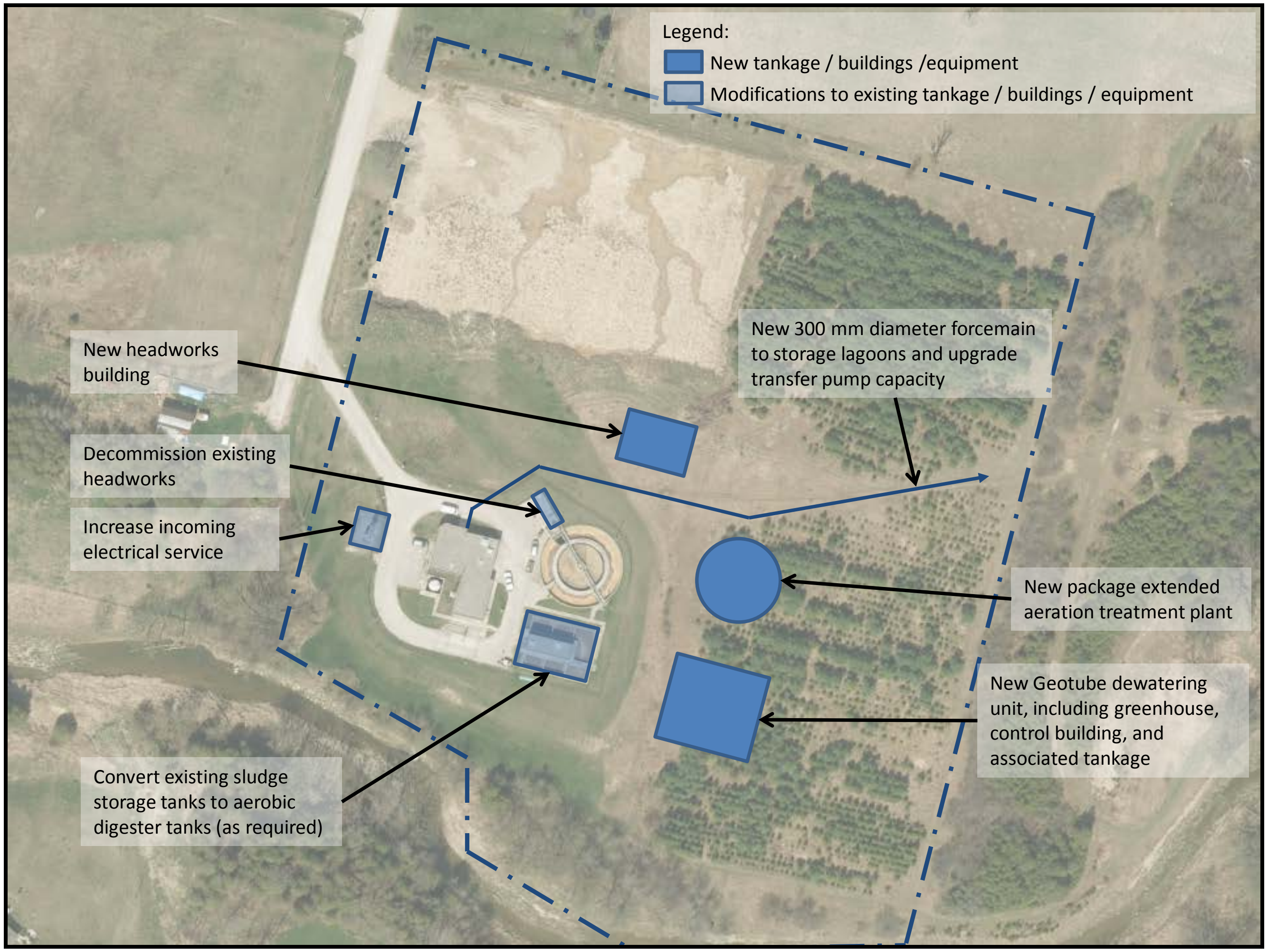


Figure A.4 Option 2B - Twin Existing EA Plant with new Geotextile Dewatering and Cake Storage

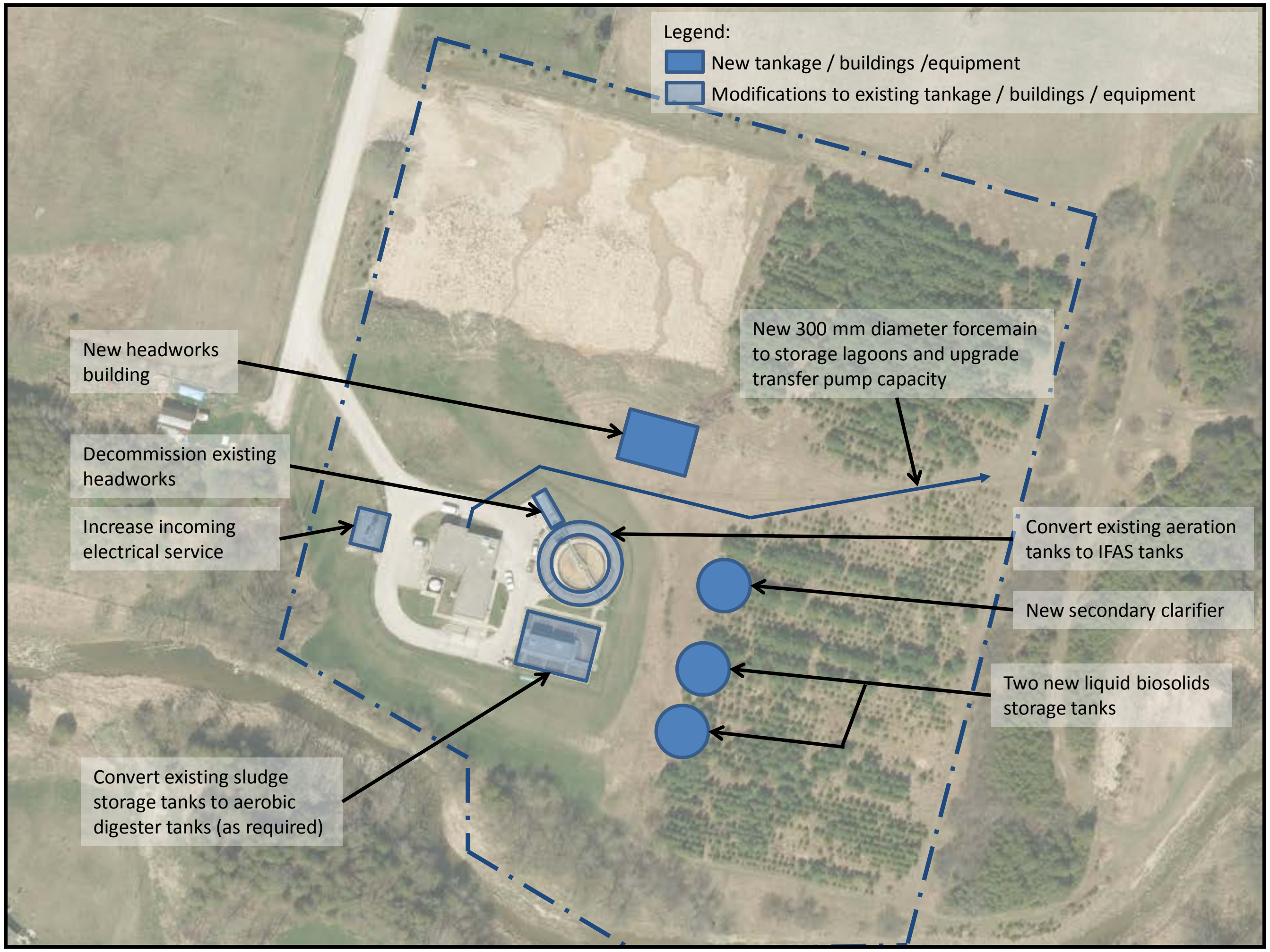


Figure A.5 Option 3A - Retrofit Existing EA to IFAS with new Liquid Biosolids Storage

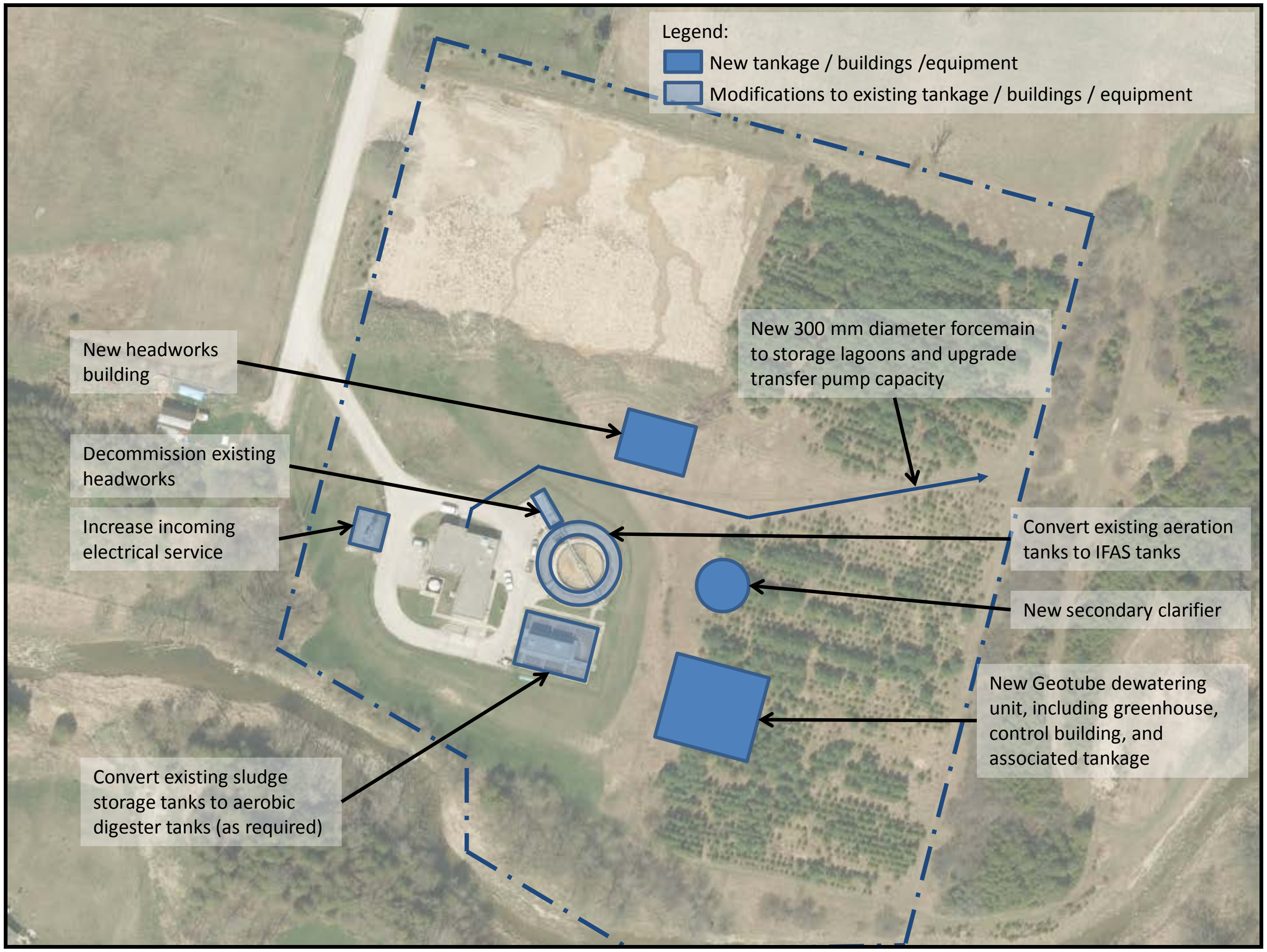


Figure A.6 Option 3B - Retrofit Existing EA to IFAS with new Geotextile Dewatering and Cake Storage

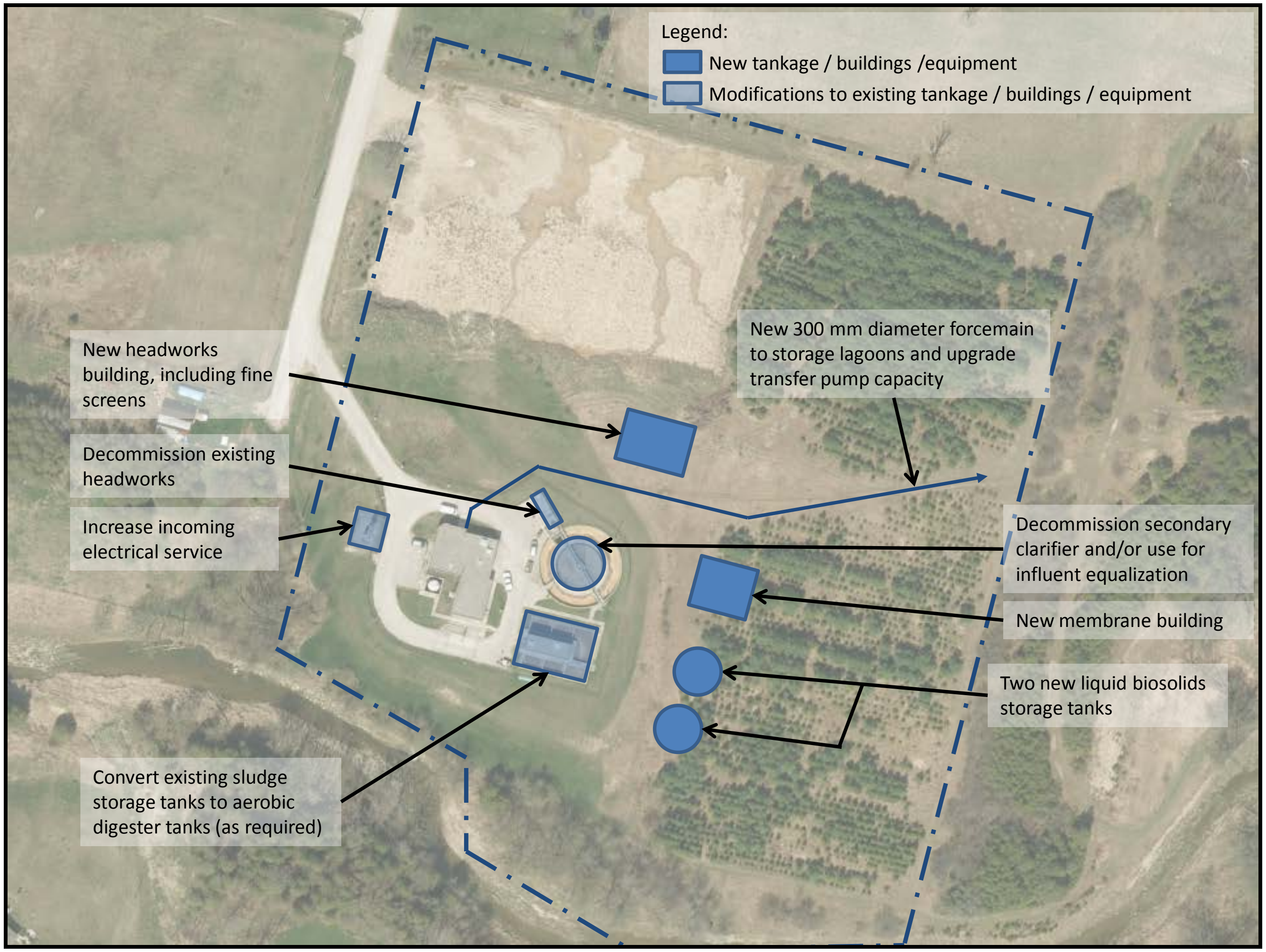


Figure A.7 Option 4A - Retrofit Existing EA to MBR with new Liquid Biosolids Storage

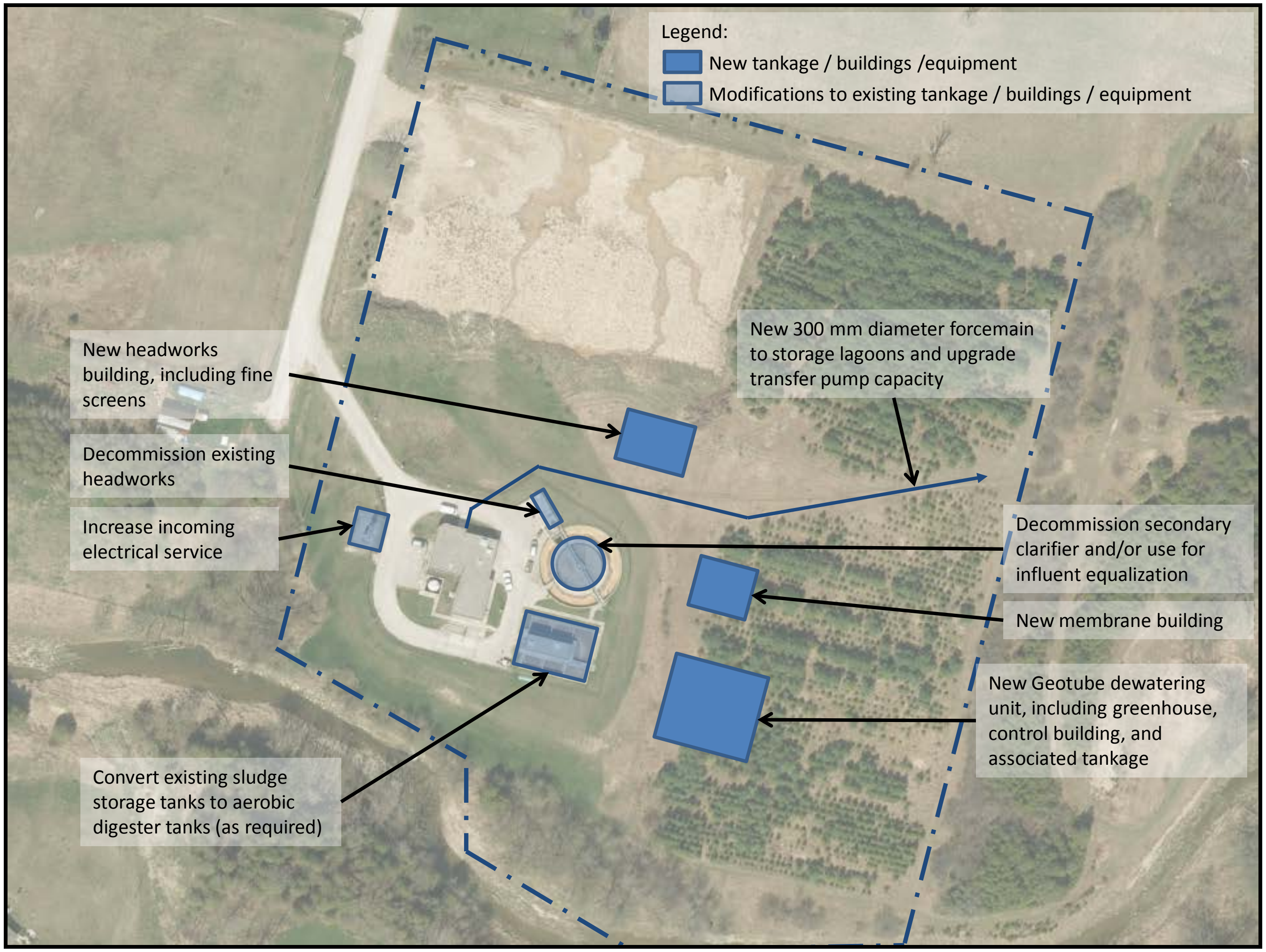


Figure A.8 Option 4B - Retrofit Existing EA to MBR with new Geotextile Dewatering and Cake Storage

APPENDIX B
INTEGRATED FIXED FILM ACTIVATED SLUDGE QUOTE

Headworks BIO™

Proposal for Supply Of:

ActiveCell®

IFAS, Integrated Fixed Film Activated Sludge System

Prepared For:

XCG Consultants Ltd.
Arthur WWTP Expansion
Budgetary Proposal A-02587 Rev 1

Submitted By:

Headworks BIO™ Inc.

Submission Date: February 13, 2014

Headworks BIO Inc. is a WBE / MBE Business

Certified WBENC Women's Business Enterprise

Headworks Inc. is a nationally certified
WBENC Women's Business Enterprise

XCG Consultants
Graham Seggewiss
Process Specialist

RE: Arthur WWTP IFAS Retrofit

February 13, 2014

Headworks BIO Inc. appreciates the opportunity to submit this budgetary proposal for the provision of the equipment for an Integrated Fixed Film Activated Sludge (IFAS) Treatment System based on the ActiveCell® process. Headworks BIO's 12 years of wastewater design experience, coupled with a hard-working dedicated staff enable us to select and supply the best treatment option to meet your needs.

To meet your treatment requirements, the following will be supplied by Headworks BIO Inc.

1. Treatment system design
2. Biofilm carriers (media) for the biology to grow in the aerobic IFAS process
3. Aeration grids to provide oxygen required for biological degradation of the BOD.
4. Media retention screens and supports to keep the biofilm carriers in the reactor.
5. Other required components such as the reactor tank, aeration blowers, feed pumps, and any instrumentation and controls are to be provided by others.

Pricing

Price for the above listed equipment, delivered DAP Arthur, Ontario is **$483,741** USD. Please find attached the design parameters and applicable Commercial Terms and Conditions for this proposal.

Thank you for considering our offer. Please contact us if you have any questions or would like any additional explanations.

Sincerely,

Gerald Seidl
Senior Vice President
Headworks BIO Inc.
Tel: 713-647-6667, Fax: 713-647-0999
Email: gseidl@headworksusa.com

CONTENTS

1. INTRODUCTION

The biological process proposed is the ActiveCell IFAS process. The process employs Headworks BIO's proprietary mobile biofilm carriers (ActiveCell 920) to support a very high concentration of attached biomass; and has excellent mass transfer conditions. The system achieves much higher loading rates than other biological treatment systems and is not prone to sludge bulking problems, oxygen deficiency or mechanical problems that can occur with other systems.

Based on wastewater influent parameters and the effluent requirement, the proposed treatment is a single stage IFAS system to remove BOD and Ammonia from the plant's wastewater. The IFAS equipment will be installed in a 2 parallel trains of a single retrofitted basin each.

The BOD reduction and nitrification tanks will be operated under aerobic conditions so that bacteria will consume the BOD and nitrify the ammonia in the wastewater while utilizing the oxygen for metabolism and growing the bacterial colonies. The neutrally buoyant HDPE ActiveCell biofilm carriers within each reactor tank provide a stable base for the growth of a diverse community of microorganisms. Every biofilm carrier has a very high surface-to-volume ratio, allowing for a high concentration of biological growth to thrive within the internally protected areas.

To retain the ActiveCell biofilm carriers elements inside the bioreactors, stainless-steel screens are fitted to the tanks outlets. The screen material is a stainless steel wedge wire mesh with welded construction. The screens should not require any maintenance for the life of the system.

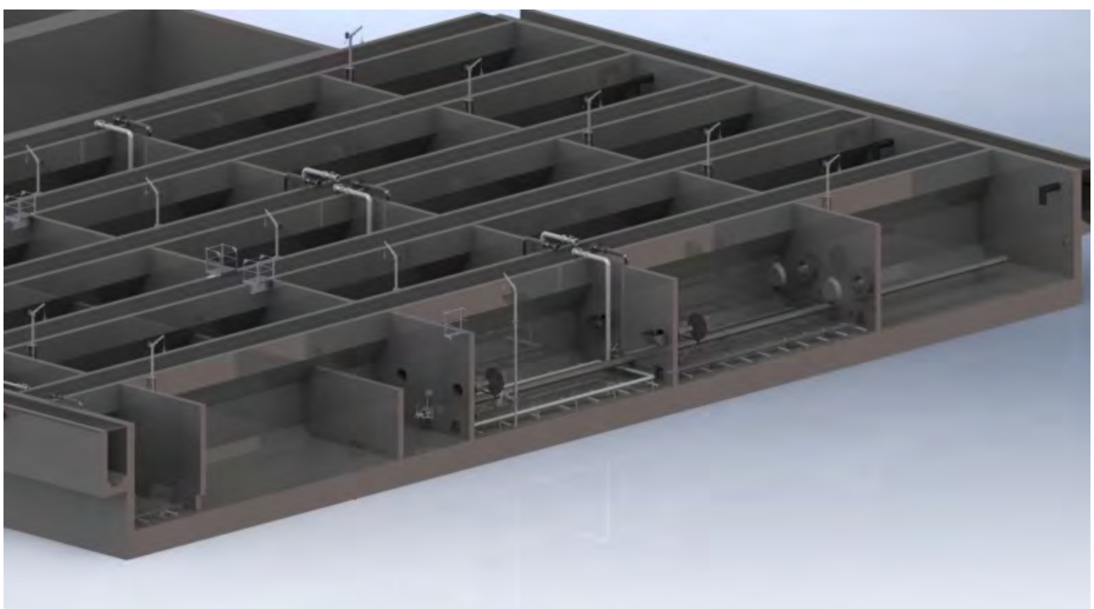


Figure 1: Typical Municipal IFAS basins

2. WASTEWATER DESIGN DATA

2.1 SYSTEM DESIGN PARAMETERS

The proposed system is based on the following influent characteristics and effluent requirements:

Table 1: System Design Parameters

Parameter	Influent	Effluent Limit
BOD_5 (mg/l)	158	< 5
COD (mg/l)		
TSS (mg/l)	169	< 5
FOG (mg/l)		
TKN (mg/l)	32.6	
NH_3-N (mg/l)		< 0.5
TN (mg/l)		
TP (mg/l)	5.8	< 0.2
Turbidity		
TDS (mg/l)		
Alkalinity (mg/l)	TBD	
pH		
Design Temperature (°C)	8 - 20	

The proposed system design is based on the parameters summarized in Table 2:

Table 2: Wastewater influent conditions and effluent limits

IFAS Design Summary (Each Train)				
Parameter		**Quantity**		**Comment**
Flow	Design (Monthly Max)	1,725	CMD	
	Peak hourly:	5,500	CMD	
	Peak daily:	4,000	CMD	
IFAS Bioreactor - Volume		537	m3	Existing
IFAS Bioreactor - Dimensions		TBD x 4.18 m SWD		BOD Oxidation & Nitrification
IFAS Bioreactor - Media		161	m3	ActiveCell 920
IFAS Bioreactor - Air Requirement		1,860	m3/hr	at 20 C & at 0.50 bar
Biofilm carrier fill fraction		30	%	
MLSS		2,000	mg/L	
RAS		40 -50	% of Q	
Internal Recycle		NA		
Sludge Produced		TBD	m3/day	depends on clarifier design
Carbon Source Dosing		NA	mg/L	

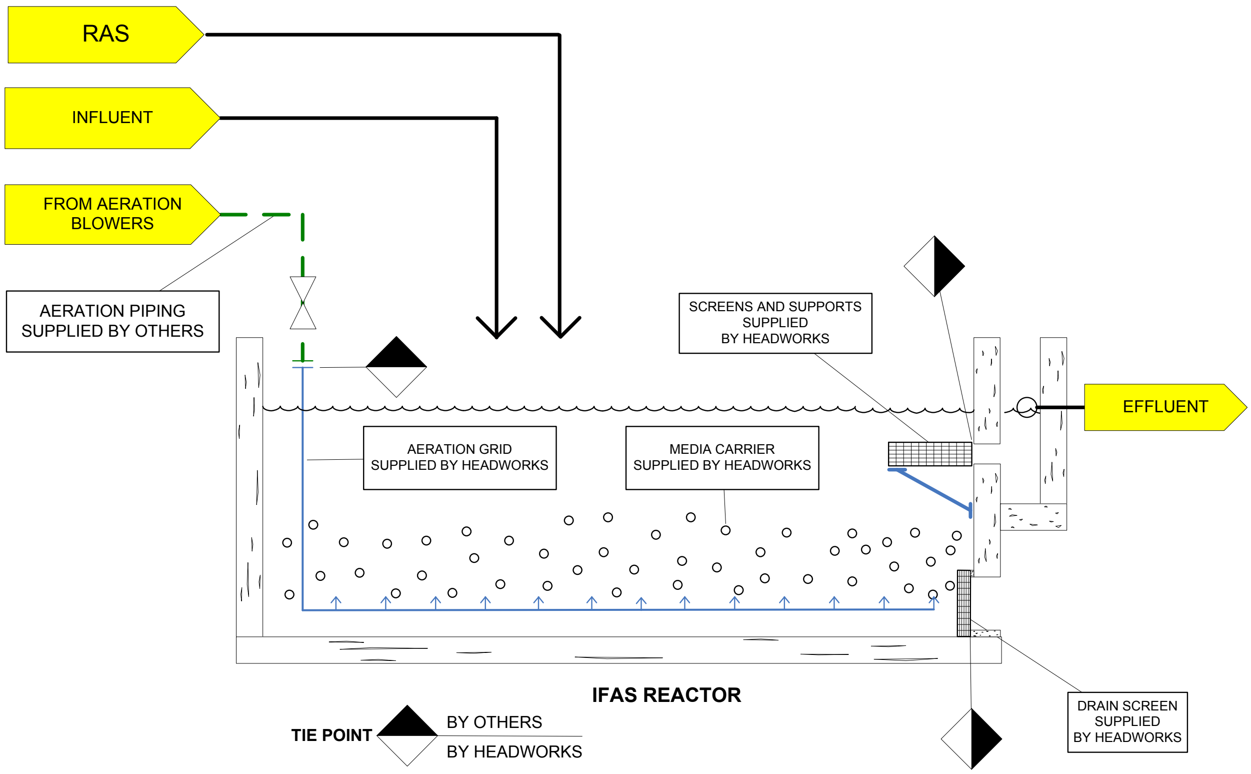
Note: The above design is for a single train treating 1,725 m3/day.

Other Equipment	Quantity	Comment
Equalization	N/A	
Primary Screen	By Others	Removes solids > 6 mm
Primary Clarifier	N/A	TSS Removal
Mechanical Mixers	N/A	
Blowers	By Others	
Secondary Clarifier	By Others	TSS Removal
Polishing Filter	By Others	
Disinfection	By Others	As Necessary
Pumps, Etc.	By Others	As Necessary
Instrumentation, Dosing, and Control Systems	By Others	As Necessary

Provided all the influent characteristics are as described in Tables 1 and 2, fit within the normal operating conditions, and the system is installed and operated in accordance with Headworks BIO Inc. installation and operating instructions, the guaranteed effluent quality will meet or exceed the discharge criteria. The parameter performance is to be based on the geometric average of a minimum of five samples taken over a minimum of five days.

3. PROCESS DESCRIPTION

For this project, a single-stage ActiveCell IFAS process is proposed to remove constituents to levels required for discharge. The following flow diagram provides a simple overview of the proposed treatment system.



4. DESIGN BASIS

The proposed treatment has been designed based on information provided by the customer and our extensive experience in designing IFAS systems for various types of wastewaters. The following assumptions have been made in the treatment system design:

- The wastewater is assumed to be easily biodegradable with no toxic chemicals or bio-inhibitory compounds.
- An equalization tank is recommended to equalize the flow, concentrations, and pH to the extent possible.
- Defoamer will be added to the bioreactors to control foaming as necessary.
- A secondary DAF or clarifier is required to recycle/waste the biosolids.
- The existing aeration tanks No. 1 and No. 2 will be used as is, with the addition of retention screens and a new aeration grid for each basin.
- Phosphorus removal by chemical precipitation, by others.

5. SCOPE OF SUPPLY

5.1 EQUIPMENT AND MATERIALS SUPPLIED BY HEADWORKS BIO

Headworks BIO will be supplying the following system components that will need to be off-loaded and installed into the treatment tanks:

Table 3: Scope of Supply

Description	Quantity
ActiveCell 920 biofilm carriers	322 m^3 (161 m^3 each basin)
304 stainless steel coarse bubble aeration grid consisting of: ▪ Dropleg, manifold, fixed headers, diffuser pipes ▪ Mounting brackets ▪ Termination point shall be flange(s) at the top of the tank(s)	4 (2X per basin)
304 stainless steel carrier retention screen consisting of: ▪ Flanged end ▪ Wedge wire screen material ▪ Mounting brackets	4 (2X per basin)
304 stainless steel drain screen consisting of: ▪ Wafer type ▪ wedgewire	2 (1X per basin)

5.2 DESIGN AND DELIVERY DOCUMENTATION

HWBio will provide relevant design material including project schedule, detailed process & instrumentation drawings (P&ID) for the HWBio scope of supply.

In addition two (2) electronic copies of the IFAS operating and maintenance documentation and training material will be provided in electronic format. O&M manuals for components purchased by HWBio and incorporated into the supplied system are included as appendicies in the IFAS O&M. The IFAS O&M manual is provided with the system in preliminary form, and is then updated to its final form after the startup is completed.

5.3 EQUIPMENT AND MATERIALS NOT PROVIDED BY HEADWORKS BIO

- Any modification to existing structures, disinfections, preliminary treatment, pumps, is to be supplied by others
- All secondary solids removal required after IFAS process
- RAS pump(s) and control
- All interconnecting piping, valves, fasteners as required
- Offloading and installation of Headworks BIO supplied equipment
- All civil works; including: tanks, pads, foundations, demolition and structural modification to any existing structures
- Any other items not specified in Headworks BIO's scope of supply

6. EQUIPMENT DESCRIPTION

6.1 BIOFILM CARRIERS

The biological process is the ActiveCell biofilm process which employs Headwork BIO's proprietary mobile biofilm carriers (ActiveCell 920) to support a very high concentration of attached biomass. ActiveCell is a self-sustaining biological process, and operation is simplified due to the self-regulating nature of a fixed film system.

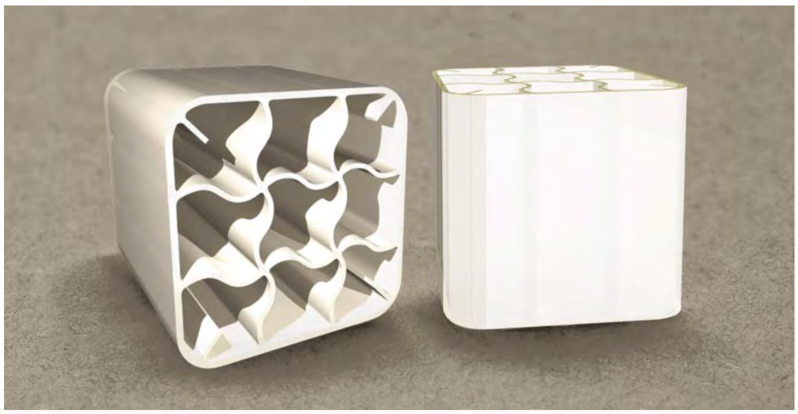


Figure 2: Media Carrier ActiveCell920

6.2 AERATION GRID

- A "coarse bubble" aeration system provides both the oxygen required by the microorganisms and the mixing action necessary to ensure proper distribution of the biocarriers and waste contaminants throughout the reactor.
- Headworks BIO proposes the use of its custom designed aeration system. The design makes use of custom diffusers to offer a well proven, reliable, robust approach to medium bubble aeration systems.
- The diffusers are self cleaning due to their open bottom design. This eliminates all cleaning and maintenance requirements for the aeration grid.
- The system will consist of two aeration grids per basin comprising a downpipe, manifold and diffuser assemblies.
- Each drop pipe will have a 125# connection flange located above water level.
- Drop pipes and manifolds will be made of schd. 10, 304L SS.
- Aeration diffusers material is 316 SS
- Pipe supports will be made of 304 SS

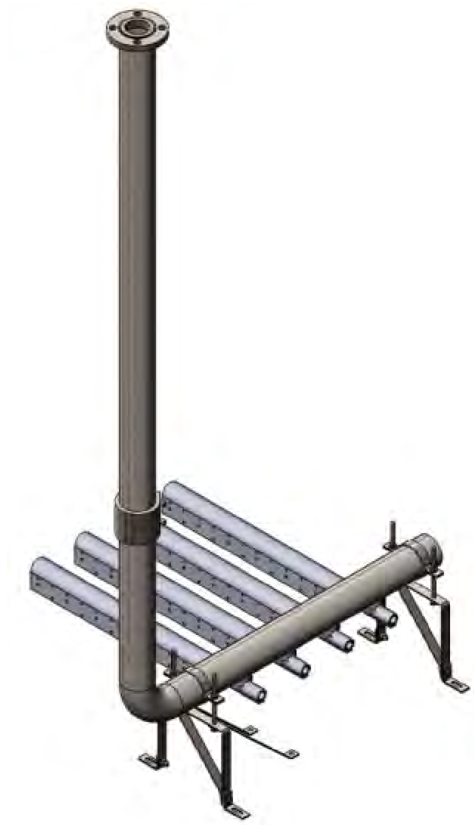


Figure 3: Aeration Grid (typical)

Figure 4: Diffuser (typical)

6.3 BIOFILM CARRIER RETENTION SCREEN

To retain the ActiveCell biofilm carriers inside the bioreactors, stainless-steel screens are fitted to the normally operated tank inlets and outlets. The screen material is a wedge wire mesh with 10 mm square openings or less and welded construction. The screens should not require any maintenance for the life of the system.

- Specifications
  - Screens material is 304 SS
  - Screens wedge wire spacing – 8mm

Figure 5: Media Retention Screen (typical)

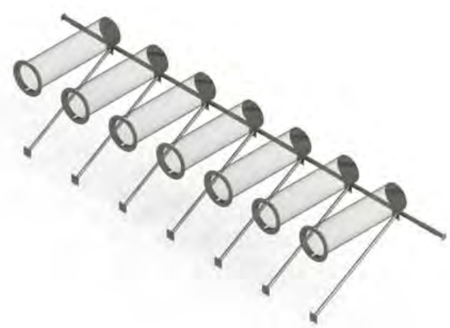


Figure 6: Retention Screen Mounting Configuration (typical)

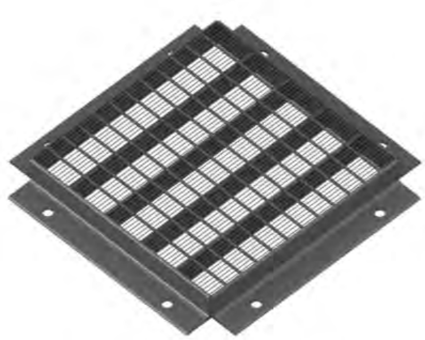


Figure 7: Flat Drain Screen

7. GENERAL TERMS AND CONDITIONS

7.1 APPLICABLE TERMS

These terms govern the purchase and sale of the equipment and related services if any (collectively, “Equipment") referred to in Seller's quotation, proposal or acknowledgement, as the case may be (Seller's "Documentation"). Whether these terms are included in an offer or an acceptance by Seller, such offer or acceptance is conditioned on Buyer's assent to these terms. Seller rejects all additional or different terms in any of Buyer's forms documents.

7.2 PRICING

The price of the Equipment is based upon the following conditions:

15% Upon Approval of Submittals
80% due net 30 days from date of equipment shipment
5% Retainage due net 30 days from date of Start-Up, but no later than 180 days from shipment.

These terms are independent of and not contingent upon the time and manner in which the purchaser receives payment from the site owner or any other person. Acceptance of order subject to credit approval. All monies not paid when due shall bear interest from the due date to the date paid either (i) at the fluctuating rate of 3% above the Prime Rate as defined below or (ii) the highest rate allowed by law, whichever is lesser. "Prime Rate" is the prime rate in effect on the first business day of the month in which a change occurs, as published in the Wall Street Journal on the next business day.

7.3 VALIDITY OF QUOTATION

30 days from date of offer.

7.4 OWNERSHIP OF MATERIAL

All devises, designs (including drawings, plans and specifications), estimates, prices, notes, electronic data and other documents or information prepared or disclosed by Seller, and all related intellectual property rights, shall remain Seller's properties. Seller grants Buyer a non-exclusive, nontransferable license to use any such material solely for Buyer's use of the equipment. Buyer shall not disclose any such material to third parties without Seller's prior written consent.

7.5 CHANGES

Seller shall not implement any changes in the scope of work described in Seller's documentation unless Buyer and Seller agree in writing to the details of the changes and any resulting price, schedule, or contractual modifications. This includes any changes necessitated by a change in applicable law occurring after the effective date of any contract including these terms.

7.6 STAINLESS STEEL AND NATURAL GAS PRICE INCREASES

All Orders accepted, are subject to the following terms:

Headworks BIO reserves the right to adjust the price of the equipment based on increases in the price of stainless steel or natural gas. This increase would be based on stainless steel and/or natural gas price increases (including surcharges) as published monthly in the U.S. with the base price being that price (including surcharges, if any) published on the date of this offer. Such price increase only affects the cost of the stainless steel material portion of the affected equipment.

7.7 FORCE MAJEURE

“Force Majeure” shall mean any act or event which is outside the reasonable control of a party including, without prejudice to the foregoing generality, Acts of God, epidemics, tidal waves, explosions, lightning, earthquakes, hurricanes, wars (whether declared or not), riots, strikes and industrial actions (other than among the employees of party seeking to rely on such event, or its subcontractor), civil and military disturbances and unrest, acts of the public enemy, action or inaction of the government or governmental authorities or of representatives thereof. If Headworks BIO is prevented from or delayed in performing its obligations as a result of Force Majeure, such prevention or delay shall not be considered a breach of the Agreement, but shall for the duration of such event relieve Headworks BIO of its respective obligations thereunder. Should the Force Majeure suspension period last for more than one (1) month, Headworks BIO may terminate this quote or agreement.

7.8 FREIGHT TERMS

Equipment is sold DAP Arthur, Ontario, Canada.

The equipment will be delivered in approximately 4 truck trailers.

7.9 SUBMITTAL PREPARATION

Technical submittal drawings for review, authority examination and approval shall be furnished to the buyer within 2 - 4 weeks of order acceptance. The buyer shall approve the submittals within 4 weeks from receipt; otherwise the Stainless Steel and Natural Gas Price Increases clause described above will become applicable.

7.10 DELIVERY SCHEDULE

12 – 16 weeks ex works after receipt of approved submittals.

7.11 START-UP, COMMISSIONING TRIPS

A total of 2 trips by a Headworks BIO technician, 3-days each; giving a total of 6 days on site, are included in this offer. The visits will cover:

- An installation inspection visit to verify correct installation of Headworks Bio Supplied equipment. At this time the technician will also typically assist the local plant operators and contractors with guidelines and expectations for the startup, along with development of a site/client specific startup plan.
- A training/commissioning visit to verify correct startup and operation of the system, evaluation of the process parameters. This visit will culminate in a final O&M manual based on actual operational parameters. This includes setpoints/targets, ongoing sampling plans, any special procedures that might be required, etc. A ~4 hour training session is also included covering:
    - Biology 101: Using PowerPoint presentation, the objective is to present why we treat wastewater, how the bioreactors work (and the biomass carriers), and what conditions are favourable for the bioreactors (pH levels, DO, soluble BOD, etc.)
    - System overview – Health and safety: Wastewater precautions, clean-up of spilled polymer, defoamer handling, H2S dangers and precautions.
    - Component description and walk through system: each component supplied by HWBio is explained in detail and what happens at each stage from a process point of view.
    - Recommended system logs, re-starting from a shutdown, daily checks, etc.
    - Maintenance schedule – cover regular items (blower air filters, instrument cleaning, etc, as required)
    - Review, questions, and completion certificates given out.

7.12 TAXES

Federal, state and local taxes, if any, are not included in the above prices. All applicable taxes are for the purchaser's account.

7.13 PATENT PROTECTION

Various Headworks BIO Inc. equipment contain proprietary information covered by a number of patents and patents pending in the USA and in many international countries. For a full list of the approved patents, please contact Headworks BIO legal department in Houston, Texas.

7.14 WARRANTY

The seller warrants all equipment of its own manufacture to be free of defects caused by faulty material or workmanship for a period of eighteen (18) months from date of shipment or twelve (12) months from date of start-up, whichever first occurs. In the event that defects develop during the warranty period, under normal and proper use, Headworks BIO Inc. is to be notified promptly and with their consent the products are to be returned to Headworks F.O.B. Headworks factory.

In the case of components purchased by Headworks BIO and incorporated into the equipment, such as Electrical Controls, Instrumentation, Electrical Motors, Gear Reducers and related items, Headworks BIO's warranty is limited to the individual manufacturer's warranty for that component, usually one year. This warranty does not apply to equipment or parts thereof which have been altered or repaired other than by a representative of Headworks BIO or damaged by improper installation, application, erosion or corrosion of any sort, or subjected to misuse, abuse, neglect or accident.

THIS WARRANTY, INCLUDING THE STATED REMEDIES, IS EXPRESSLY MADE BY HEADWORKS BIOINC. AND ACCEPTED BY PURCHASER IN LIEU OF ALL OTHER WARRANTIES, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, WHETHER WRITTEN, ORAL, EXPRESS, IMPLIED, OR STATUTORY. HEADWORKS BIOINC. NEITHER ASSUMES NOR AUTHORIZES ANY OTHER PERSON TO ASSUME FOR IT ANY OTHER LIABILITIES WITH RESPECT TO ITS EQUIPMENT. HEADWORKS BIOINC. SHALL NOT BE LIABLE FOR NORMAL WEAR AND TEAR, NOR FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGE DUE TO INOPERABILITY OF ITS EQUIPMENT FOR ANY REASON NOR ANY CLAIM THAT ITS EQUIPMENT WAS NEGLIGENTLY DESIGNED OR MANUFACTURED.

7.15 TERMINATION

Buyer may at any time terminate this order or any part hereof for its sole convenience. In the event of such termination, Seller shall immediately stop all work hereunder, and shall immediately cause any of its suppliers or subcontractors to cease such work. Seller shall be paid a reasonable termination charge consisting of a percentage of the order price reflecting the percentage of the work performed prior to the notice of termination, including without limitations any and all engineering work completed in submittal preparation, plus actual direct costs resulting from termination. Seller shall not be paid for any work done after receipt of the notice of termination, nor for any costs incurred by the Seller's suppliers or subcontractors which Seller could reasonably have avoided. Buyer will make no payments for finished work, work in process, or raw material fabricated or procured by the Seller in excess of any order or release.

7.16 LIMITATION OF LIABILITY

In no event shall Seller be liable for anticipated profits or for incidental or consequential damages. Seller's liability on any claim of any kind for any loss or damage arising out of or in connection with or resulting from this contract or from the performance or breach thereof shall in no case exceed the price allocable to the goods or services which gives rise to the claim. Seller shall not be liable for penalties of any description. Any action resulting from any breach on the part of Seller as to the goods or services delivered hereunder must be commenced within one (1) year after the cause of action has accrued.

APPENDIX C
MEMBRANE BIOREACTOR QUOTE

GE
Water & Process Technologies

Budget Proposal for

Arthur WWTP

Z-MOD™-L MBR System

Submitted to:

XCG Consultants
2620 Bristol Circle
Oakville ON L6H 6Z7
CANADA

Attn: Graham Seggewiss, M.A.Sc, E.I.T

March 6th , 2014

Proposal Number : 956651

GE Water & Process Technologies
Geoff Totten, Regional Sales Manager
Tel: (905) 465-3030 ext. 3215
Email: Geoff.Totten@ge.com

Local Representation By:
Pro Aqua Inc.
Scott Lenhardt, P. Eng
Tel: (416) 861-0237
Email: scott@proaquasales.com

GE Water & Process Technologies
Confidential and Proprietary Information

GE Water and Process Technologies ("Seller") submits the information contained in this document for evaluation by **XCG Consultants.** ("Buyer") only. Buyer agrees not to reveal its contents except to those in Buyer's organization necessary for evaluation. Copies of this document may not be made without the prior written consent of Seller's Management. If the preceding is not acceptable to Buyer, this document shall be returned to Seller.

This proposal is for budgetary purposes only and does not constitute an offer of sale.

Table of Contents

1 ZMOD Introduction

Z-MOD™ MBR Systems are GE Water's pre-engineered, modular MBR systems that bring proven ZeeWeed® membrane bioreactor (MBR) technology to municipal, industrial, or land development applications.

Engineered to enable a high level of flexibility with a multitude of design options, features and benefits to enable engineers, clients and operators to design and configure the MBR system that best fits each individual application.

The ZMOD range of systems is designed with 3 key attributes in mind:

- Lowest Lifecycle Cost MBR – lowest cost of ownership for the Owner
- Simple Operations – simple & automated operations coupled with GE Water support for the operating team
- Robust Design – prove design parameters with scope and configuration flexibility and options for a wide variety of conditions

ZMOD™ Systems are focused on the Ultrafiltration system as the heart of the MBR process, with the ability to add biological or other additional components into the system as required.

2 ZMOD - Low LifeCycle Cost MBR

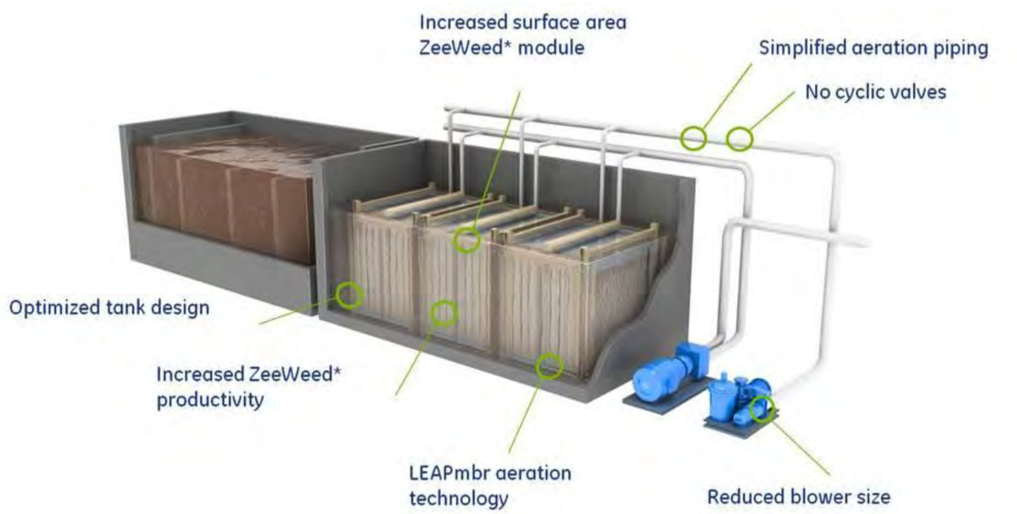
At the heart of ZMOD are the two most important parameters in a Low Lifecycle Cost MBR which are efficiency in MBR design & operation and the best chance of long membrane life in operation.

2.1 LEAPmbr...Simple, Reliable, Efficient

ZMOD is designed to incorporate the latest innovations of LEAPmbr technology making ZMOD the most energy efficient and productive MBR that GE Water is able to provide to owners.

LEAPmbr's combined initiatives will directly impact your plant design by:

- ❑ Improving your Productivity by 15%,
- ❑ Decreasing your membrane system footprint by 20%,
- ❑ Removing equipment needed to provide aeration to your membranes by 50%,
- ❑ Saving you over 30% in MBR power costs



2.2 Membrane life, cleanability & replacement

ZMOD incorporates GE Water's ZW500 membrane technology with the following key benefits to ensure an owner's peace of mind for the life of their MBR facility:

- ❑ ZeeWeed MBR membrane with a proven membrane life and high resistance to upset conditions
- ❑ System designed with multiple cleaning options to ensure the highest chance of achieving maximum membrane life
- ❑ GE Water as a single point of responsibility provides an integrated supply chain between the system & membrane warranty provider and the membrane manufacturer
- ❑ A straight forward membrane warranty with clear performance triggers

3 ZMOD - Simple MBR Operations

ZMOD is designed to ensure the MBR system is simple to operate without compromising any operational robustness.

The operators have a range of flexible options to ensure the MBR system is able to meet varying operating conditions should they arise.

3.1 Membrane Aeration System Design

Aeration is one of the most important operations for successful long term MBR operation and is a significant proponent of operating cost.

ZMOD utilizes a very simple aeration strategy which minimizes the amount of instrumentation and controls required to achieve a energy efficient method for membrane aeration.

No complex control loops or complicated airflow measurement devices are required for LEAP MBR Aeration Technology to achieve energy efficiency.

3.2 Membrane Cleaning Systems

GE has developed MBR design principles based on best engineering practices that ensure the permeability of the membrane is maintained over the life of the membranes.

A fully automated suite of membrane maintenance procedures will ensure long-term, successful operation, including:

- In situ chemical membrane cleaning performed directly in the membrane process tanks so your operators don't waste time moving cassettes,
- The ability to increase or decrease the frequency of maintenance cleans to fit the operating conditions.
- The ability to backpulse when needed to greatly improve your operator's ability to recover from non-design conditions.

The above cleaning systems are automated resulting in operators having available a full suite of comprehensive cleaning systems which are simple to use and initiate.

4 ZMOD - Robust Design Basis

ZMOD systems are designed to ensure operators have a system with sufficient design robustness to accommodate a wide range of potential conditions.

4.1 Positive Displacement Permeate Pumps

ZMOD uses positive displacement permeate pumps to draw effluent through the membranes.

- The positive displacement design of these pumps allows for variations within the hydraulic profile that will not adversely affect the pump performance.
- The pumps come complete with an ability to backpulse the membranes should sludge conditions deteriorate
- A wide range of pump turndown provides the operator to wide window of flow adjustment for a variety of situations.

This pump selection provides a high level of security and flexibility for engineers and operators.

4.2 Permeate for Cleaning Solution

ZMOD systems ensure a volume of clean permeate is always stored ready for use for cleaning solutions.

- ZMOD takes permeate from its production cycle and stores this treated water in the backpulse tank ready for use. This ensures no reliance or costs from a potable water system to supply cleaning solution to the site for the membrane cleaning process.
- ZMOD systems include a backpulse tank which provides the operations staff with a readily available source of water for cleaning whenever it is required.

This allows cleaning processes to occur automatically while allowing the operator flexibility to select different cleaning methods

4.3 Mixed Liquor Operating Range

GE Water MBR systems rely solely on the pore size of the membrane to effect filtration of the mixed liquor. This allows the MBR at a wide range of mixed liquor concentrations.

This reduces the need for mixed liquor concentrations to be within the intended operating range during start-up processes or low flow scenarios.

4.4 Electrical Design

ZMOD systems are designed based on the following electrical architecture:

- Central PLC and common equipment I/O panel
- Remote I/O panel, process pump VFD and Disconnect mounted on the permeate pump skid

This design basis allows the system to readily accommodate additional trains and allows operators to isolate or troubleshoot individual trains without the loss of the central PLC.

5 Basis of Design

This proposal is offered based on GE supplying a Z-MOD™-L Membrane Bioreactor System (MBR), for the Arthur WWTP project, designed to treat flows listed below. The system can support the average daily flow with one ZeeWeed membrane train offline for cleaning and maintenance purposes for periods not exceeding 24 continuous hours.

The following tables summarize the main design parameters on which the Z-MOD™-L MBR system has been designed.

5.1 Influent Flow Data

The influent design flows are summarized in the table below.

	Design Flows Without EQ	**Design Flows with EQ**	
Average Day Flow (ADF)	2300	2300	m^3/d
Maximum Month Flow (MMF)	2875	2875	m^3/d
Maximum Week Flow(MWF)	2990	2990	m^3/d
Maximum Day Flow (MDF)	8000	8000	m^3/d
Peak Hourly Flow (PHF)	**479**	**375**	m^3/h
Maximum Flow with one train offline for maintenance or cleaning (less than 24 hrs)	2300	2300	m^3/d

Note: Any flow conditions that exceed the above-noted flow limits must be equalized prior to treatment in the membrane bioreactor unit.

- Average Day Flow (ADF) – The average flow rate occurring over a 24-hour period based on annual flow rate data.
- Maximum Month Flow (MMF) – The average flow rate occurring over a 24-hour period during the 30-day period with the highest flow based on annual flow rate data.
- Maximum Week Flow (MWF) – The average flow rate occurring over a 24-hour period during the 7-day period with the highest flow based on annual flow rate data.
- Maximum Day Flow (MDF) – The maximum flow rate averaged over a 24-hour period occurring within annual flow rate data.
- Peak Hour Flow (PHF) – The maximum flow rate sustained over a 1-hour period based on annual flow rate data.

5.2 Influent Quality

The design solution proposed is based on the wastewater characteristics detailed below.

Minimum Influent Temperature	7 – 22	°C
BOD_5	158	mg/L
TSS	169	mg/L
TKN	32.6	mg/L

NH_3-N [1]	24.5	mg/L
TP	5.8	mg/L
Alkalinity [1, 2]	n.a.	-

Note 1: Parameter value assumed

Note 2: GE is assuming that sufficient influent alkalinity is available to ensure proper performance of the biological system. If influent alkalinity level is not sufficient, chemical addition by Buyer will be required.

Below are influent characteristic to the unltrafiltration system that was considered for this offered design, any change to the below will impact the Ultrafirtaion design.

Mixed Liquor Characteristics for Warranty Purposes

Parameter	Design Value	Accepted Operating Range
Mixed liquor temperature (°C)	7	7 - 22
MLSS concentration in membrane tanks (mg/L) [1]	10000	10,000 – 12,000
pH of mixed liquor in membrane tanks (SU)	7.0	6.5 – 7.5
Soluble $cBOD_5$ concentration in mixed liquor entering membrane tanks (mg/L)	5	≤ 5
NH_3-N concentration in mixed liquor entering membrane tanks (mg/L)	< 1	≤ 1.0
Colloidal TOC (cTOC) concentration in mixed liquor entering membrane tanks (mg/L) [2]	7	≤ 10
Soluble alkalinity of mixed liquor entering membrane tanks (mg/L as $CaCO_3$)	100	50 – 150
Time to filter (TTF) of mixed liquor in membrane tanks [3]	100	≤ 200
Material greater than 2-mm in size in mixed liquor in membrane tanks (mg/L) [4]	0	≤ 1
Fats, Oil & Grease (FOG) (mg/L)	Refer to Note 6	

1. Membrane tank MLSS concentration of 12,000 mg/L is permissible during MDF and PHF events only. Membrane tank MLSS concentration to be 8,000 to 10,000 mg/L during all other flow conditions.
2. Colloidal TOC (cTOC) is the difference between the TOC measured in the filtrate passing through a 1.5 μm filter paper and the TOC measured in the ZeeWeed membrane permeate.
3. Per Seller's standard Time to Filter (TTF) procedure (available upon request).
4. Per Seller's standard Sieve Test procedure (available upon request).
5. Chemicals that are not compatible with the ZeeWeed PVDF membrane are not permitted in the membrane tank.
6. FOG concentration shall not exceed 150 mg/L of emulsified FOG in the feed with no free oil and less than 10 mg/L of mineral or non-biodegradable oil.

5.3 Effluent Quality

The following performance parameters are expected upon equipment startup and once the biological system has stabilized based on the data listed in sections 5.1 and 5.2.

BOD_5 [1]	<5	mg/L
TSS	<5	mg/L
NH_3-N [1]	<0.5	mg/L
TP [1,2]	<0.17	mg/L
Turbidity	< 1	NTU

Note 1: Expected effluent quality listed if GE design and provided the biological equipment based on data provided in section 5.1& 5.2

Note 2: With coagulant addition (by others)

5.4 Influent Variability & Equalization

The system may be optimized by incorporating equalization into the design. The potential for equalization should be reviewed to optimize membrane surface area and to reduce capital costs associated with equipment sizing and membrane tank volume.

Flows or loads in excess of the design criteria defined above must be equalized prior to the MBR system. In the event that the influent exceeds the specifications used in engineering this proposal, or the source of influent changes, the ability of the treatment system to produce the designed treated water quality and/or quantity may be impaired. Buyer may continue to operate the system, but assumes the risk of damage to the system and/or additional costs due to increased membrane cleanings, potential for biological upset and/or increased consumable usage.

The process may be easily enhanced for significant phosphorus reduction by adding a metal salt, such as ferric chloride or alum. As the Z-MOD™ MBR process does not rely on settling for solids-liquid separation, a minimal volume of metal salts is needed to create “pin-flocs”. The membrane then effectively blocks the microscopic floc from entering the effluent stream resulting in effluent phosphorus levels down to below 1 mg/L.

5.5 Biological System Design

GE recommend the following design for the biological system for this project which consists of aerobic zones. The corresponding volumes for each zone are listed in the table below.

Biological design and equipment for this specific opportunity are by others.

	Design Without EQ	Design With EQ	
Flow Basis of Biological Design	2875		m^3/d
Temperature Range	7 - 22		°C
Total Est. Aerobic Working Volume (excluding membranes)	1465	2540	m^3
Design HRT	14.4		hours
Design SRT	41.7		days
Bioreactor MLSS	8,000 – 10,000		mg/L
Estimated Activated Sludge	36		m^3/d
Estimated Supplemental Air Required	420	480	scfm
Minimum water depth	5.6		m

Note 1: Tank dimensions are preliminary only and may change once final detail design commences.

Note 2: The biological system provided by others is designed for installation within concrete tanks supplied by Buyer

5.6 Ultrafiltration System Design

The ultrafiltration design of this system is described in the table below where membrane modules are assembled into cassettes and cassettes are installed in concrete tanks supplied by Buyer.

	Design Without EQ	Design With EQ
Type of Membrane	ZeeWeed® 500d	
Number of Trains	4	
Number of ZMOD L Permeate Pump Skids	4	
Size of Pump Skid	8”	
Type of Cassette (16 or 48Module)	48	
Number of Cassettes Installed per Train	3	3
Number of Cassettes Spaces per Train	3	4
Total Number of Cassettes Installed	12	12
Total Number of Modules Installed	528	432

Note 1: The system and design offered such that three membrane trains can be in operation during ADF, MMF & MWF while require to have four membrane trains in operation during MDF & PHF.

5.7 Z-MOD™-L Equipment Description

The following is a description of the equipment included in GE's Scope of Supply. Pre-assembled components include the permeate pump skids, membrane cassette assemblies, and chemical addition system skids. Critical items that will be shipped loose for installation by Buyer include the master control panel, motor control center, backpulse tank, blowers, RAS pumps and other equipment. Please refer to section 5.8 below for a complete list of GE supplied equipment.

Master PLC Panel

An Allen-Bradley Compact Logix Programmable Logic Controller (PLC) and Panel View 6 1250 HMI with a Human Machine Interface (HMI), installed in the main control panel, monitors and manages all critical process operations.

The master PLC panel will also include I/O for common equipment items such as membrane blowers, air compressors, RAS pumps and other items (if included in GE Scope)

Level controls monitor the level of mixed liquor in the process tanks and transmit this information to the Z-MOD™ PLC. The PLC will automatically adjust the flow of the Z-MOD™ trains based on proportional control to the process or membrane tank levels.

Permeate and Backpulse Pump Equipment

One permeate pump per train is employed to draw water through the membranes. The permeate pump, associated valves and piping for the train are mounted on a factory assembled, epoxy-coated carbon steel skid.

Each permeate skid is designed to include a remote I/O panel which distributes control wiring to the pump, skid mounted pump's VFD and instruments located on the permeate pump skid.

Also mounted on the skid are the permeate pump VFD, motor disconnect and instrumentation including pressure transmitter and magnetic flowmeter required to operate the pump system.

Optional turbidity meter is available for inclusion onto the permeate pump skid for turbidity monitoring of each individual membrane train.

Membrane Scour Aeration System

One duty membrane blower per train will be supplied with one common standby blower to be shared by all trains.

Blowers will typically come complete with required isolation valves, check valves, pressure relief valve, pressure indicators and flow indicators.

Sludge Wasting System

Sludge wasting is accomplished by periodically diverting mixed liquor from the recirculation return line, via manual control or by pulling directly from the bioreactor. The frequency of wasting is a function of influent characteristics, reactor design and operator preference. In certain operating circumstances, bioreactors can be designed to accommodate client preferences with regards to wasting frequencies.

Mixed Liquor Recirculation Equipment

Recirculation pumps are used to transfer mixed liquor from the bioreactor to the membrane tank. The sludge returns to the bioreactor using gravity.

Recirculation pumps will be supplied complete with check valves, isolation valves and pressure indicator.

For this application it was assumed that draining the membrane tank will be by gravity.

Sodium Hypochlorite Dosing System

The Sodium Hypochlorite Dosing system is used during membrane cleaning applications to remove organic fouling from the membrane surface.

Citric Acid Dosing System

The Citric Acid Dosing system is used during membrane cleaning applications to remove inorganic scaling from the membrane surface.

Effluent Flow Measurement

Each train will include a flow meter, however a common effluent flow meter can be included to provide daily discharge flow measurements.

Effluent Turbidity Analyzer

Effluent turbidity analyzers monitor effluent water quality and alert operators if effluent turbidity rises beyond acceptable parameters. Each train can accept an optional turbidity meter per system to be mounted on the permeate pump skid if required or a common permeate turbidity meter can also be provided.

InSight Monitor Service

InSight Monitor Service has been provided with your MBR system for the first year of operation. With Monitor Service, a GE Process Expert is specifically assigned to your plant and will monitor key parameters on a regular rhythm using the InSight platform - a powerful plant process support tool that provides process data monitoring and trend analysis. The Process Expert will be in frequent contact with the key members of your operations team to discuss and resolve performance, process and operational issues. While supporting your operations team with day-to-day issues, the Process Expert will also use InSight to bring attention to long term trends and provide recommendations that will help increase membrane life and reduce costs. As part of the service, your Process Expert will provide process and performance review reports that contain insights to help you improve performance and avoid operational downtime. If the need for troubleshooting does arise, you will have a GE Process Expert on your team, deeply familiar with your system and empowered with information to assist.

5.8 Scope of Supply by GE

The below scope of supply is representing the GE offered design based on treating the peak hourly flow listed under "**Design without EQ**" in section 5.1 above.

Quantity	Description
The MBR System will consist of four (4) ZMOD-L1120 System including the following equipment:	
ZeeWeed® Membranes & Tankage	
4	Membrane tank cassette mounting assemblies
12	ZeeWeed® 500 membrane cassettes
528	Membrane modules
4 sets	Permeate collection & air distribution header piping
1	Membrane tank level transmitter per train
Master Control Panel	
1	Master Control Panel w/ Allen Bradley Compact Logix PLC and Panelview 1250 HMI and Flexlogic I/O
Permeate Pump Skid	
4	Permeate pump equipment skid - epoxy coated carbon steel
4	Positive Displacement, Reversible Lobe Permeate pump
4	Required Pump Isolation Valves and Check Valves
4	Remote I/O Panel - includes Allen Bradley Flex I/O.
4	Motor Disconnect
4	Permeate Pump VFD's
Lot	Pressure transmitter, pressure gauge, flow meter
Lot	Chemical Injection Ports and Valves
4	One Turbidimeter per train - includes isolation valves, throttle valve and backplate.
Backpulse System	
Incl	Permeate pumps will also provide backpulse duty
1	Non-Flow Through Backpulse water storage tank, with tank level control and associated valves
Membrane Air Scour Blowers	
5	Four duty one stand by Membrane air scour blowers - includes isolation valves, flow switches, pressure gauges and acoustical enclosures
Mixed Liquor Recirculation Equipment	
5	Four duty and one stand by Mixed liquor recirculation pumps, used to transfer mixed liquor from the bioreactor to the membrane tanks - includes isolation valves
Membrane Cleaning Systems	
1	Sodium hypochlorite chemical feed system - includes dosing pump and associated valving.
1	Citric acid chemical feed system - includes dosing pump, tank mixer, associated valving

Quantity	Description
Miscellaneous	
2	One duty and one stand by Air compressor for pneumatic valve operation and refrigerated air drier
General	
Included	P&IDs and Equipment general arrangement and layout drawings
Included	Operating training
Included	Operating & maintenance manuals
Included	Field service and start-up assistance * - 45 days support over 3 site visits from GE Water field-service personnel for commissioning, plant start-up and operator training
Included	InSight Remote Monitoring & Diagnostics Monitor Service – 1 year
Included	24/7 emergency phone support – 1 year
Included	Equipment mechanical warranty - 1 year or 18 months from shipment
Included	Membrane warranty– 2 year full

Note1: Additional man-hours will be billed separately from the proposed system capital cost at a rate of $1,300 per day plus living and traveling expenses. Detailed GE Water service rates are available upon request.

Note2: All GE supplied equipment is designed for installation in an unclassified area.

Note3: To receive complete 24/7 Emergency Telephone Technical Support Service and to allow for InSight Monitor Service, a suitable secure remote internet connection, by Buyer, is required.

Note2: GE offered 2 mm screen is based on a mximum influent TSS of 300 mg/L.

6 Buyer Scope of Supply

The following items are for supply by Buyer and will include, but are not limited to:

- Overall plant design responsibility
- Installation on site of all GE Water-supplied skids and loose-shipped equipment
- Review and approval of design parameters related to the membrane separation system
- Review and approval of GE Water-supplied equipment drawings and specifications
- Detail drawings of all termination points where GE Water equipment or materials tie into equipment or materials supplied by others
- Equipment foundations, civil work, full floor coverage equipment contact pads, buildings, etc.
- Receiving, unloading and safe storage of GE Water-supplied equipment at site until ready for installation
- HVAC equipment design, specifications and installation (where applicable)
- UPS, Power Conditioner, Emergency power supply and specification (where applicable)
- Lifting devices including Crane able to lift 5 ton for membrane removal, lifting davit crane and anyother lifting device required.
- MCC , Starters for 3-ph motors and VFD's except for the permeate pumps
- Equalization tank – as required
- Transfer Pumps
- 1 to 2 mm Pretreatment fine screen
- Grit removal
- Bioreactor tanks – complete with aerobic zones
- Design and provide Biological Process Equipment – including process blowers, and diffusers
- Acoustical enclosures for membrane and process blowers
- Membrane tanks c/w Tank Coating to be suitable for appropriate chemical contact
- Sludge handling system
- All Pretreatment system required upstream MBR, such as but not limited to; PH adjustment and Phosphorus removal
- Treated water storage tank – as required

- ❑ Process and utilities piping, pipe supports, hangers, valves, etc. including but not limited to:
  - Piping, pipe supports and valves between GE-supplied equipment and other plant process equipment
  - Piping between any loose-supplied GE equipment
  - Process tank aeration system air piping, equalization tank system piping, etc.
  - Interconnecting pipe between GE-supplied Skids and Tanks (as applicable)
- ❑ Electrical wiring, conduit and other appurtenances required to provide power connections as required from the electrical power source to the GE control panel and from the control panel to any electrical equipment, pump motors and instruments external to the GE-supplied enclosure
- ❑ Suitable, secure remote internet connection for 24/7 Emergency Telephone Technical Support Service and InSight Remote Monitoring & Diagnostics Service
- ❑ All bolts, brackets and fasteners to install GE-supplied equipment. Seismic structural analysis and anchor bolt sizing.
- ❑ Alignment of rotating equipment
- ❑ Raw materials, chemicals, and utilities during equipment start-up and operation
- ❑ Supply of seed sludge for process start-up purposes
- ❑ Disposal of initial start-up wastewater and associated chemicals
- ❑ Weather protection as required for all GE supplied equipment. Skids and electrical panels are designed for indoor operation and will need shelter from the elements.
- ❑ All permits

7 Commercial

7.1 Pricing Table

Pricing for the proposed equipment and services, as outlined in Section 5.8, is summarized in the table below. All pricing is based on the operating conditions and influent analysis that are detailed in Section 5 of the proposal. The pricing herein is for budgetary purposes only and does not constitute an offer of sale. No sales, consumer use or other similar taxes or duties are included in the pricing below.

Price: All Equipment & Service	
Z-MOD™–L1120 system, as per Section 5.8.	**$ 2,588,280 CAD**
Price Deduct for equalizing the Peak Flow	
Price deduct for the GE offered design based on flows listed in section 5 under "Design Flows With EQ"	**($ 225,960) CAD**

7.2 Freight

The following freight terms used are as defined by INCOTERMS 2000.

All pricing is FCA from Guelph, ON.

7.3 Bonds

Performance or Payment Bonds are not included in the system price. These bonds can be purchased on request but will be at additional cost.

7.4 Equipment Shipment and Delivery

Equipment Shipment is estimated at 24 to 36 weeks after order acceptance. The Buyer and Seller will arrange a kick off meeting after contract acceptance to develop a firm shipment schedule.

Typical Drawing Submission and Equipment Shipment Schedule

		6-8 weeks	2 weeks	16-26 weeks		2 weeks
Acceptance of PO						
Submission of Drawings						
Drawings Approval						
Equipment Manufacturing						
Equipment Shipment						
Plant Operations Manuals						

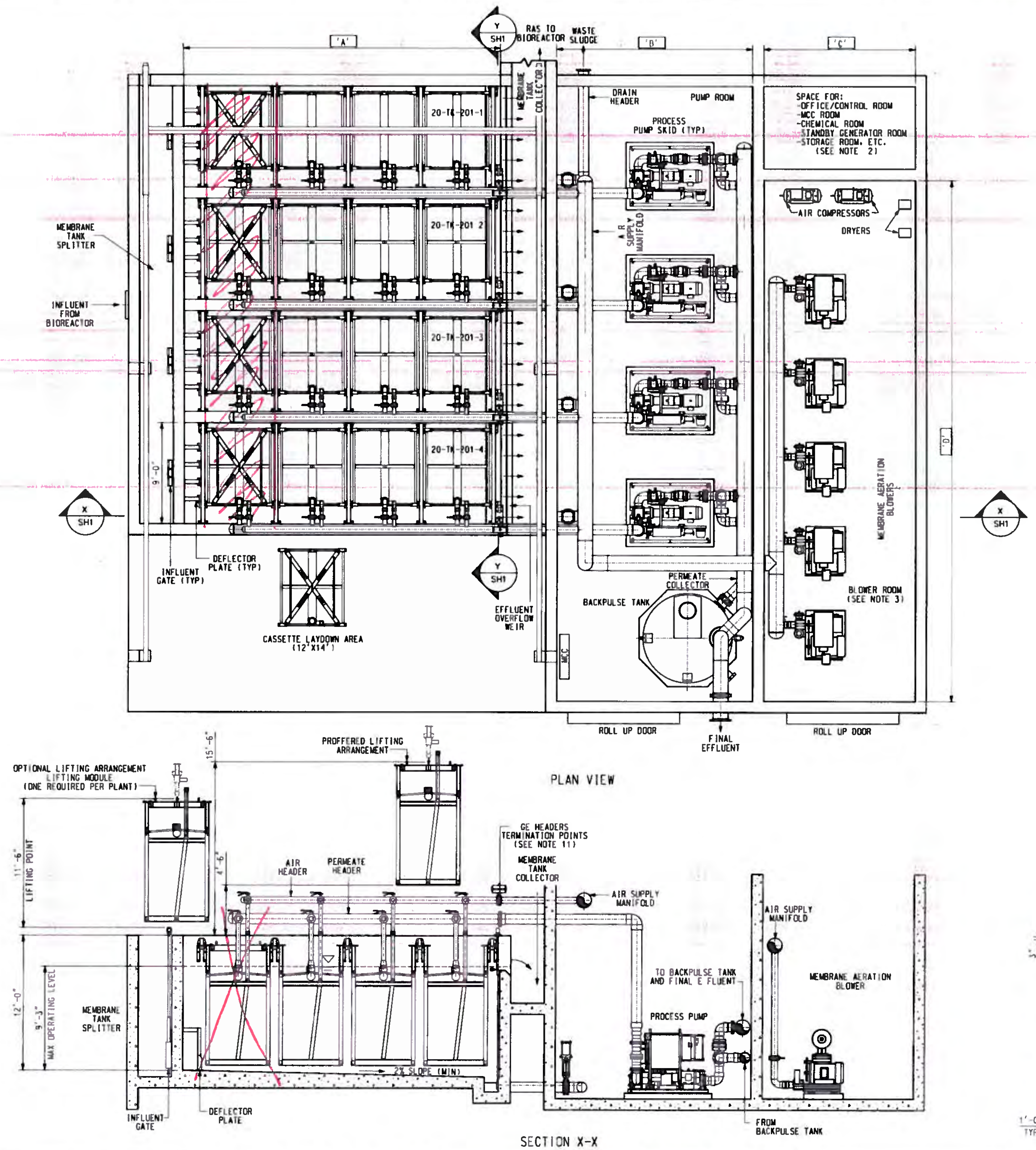
The delivery schedule is presented based on current workload backlogs and production capacity. This estimated delivery schedule assumes no more than 2 weeks for Buyer review of submittal drawings. Any delays in Buyer approvals or requested changes may result in additional charges and/or a delay to the schedule.

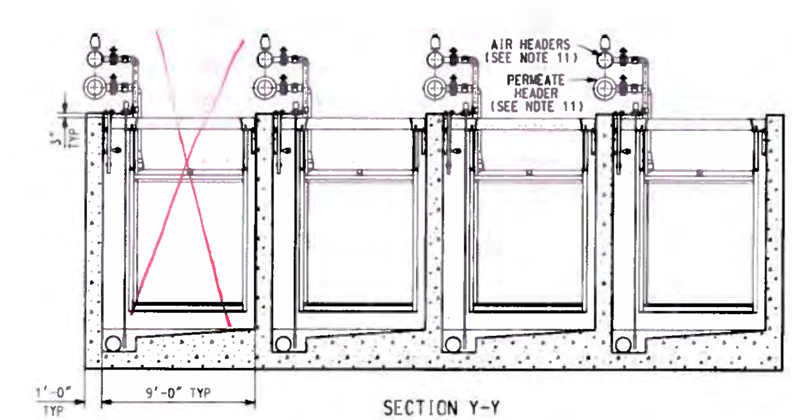
7.5 Pricing Notes

- All prices quoted are in **Canadian**
- Any applicable sales or value added tax is not included,
- The Buyer will pay all applicable Local, **State/Provincial**, or **Federal** taxes and Duties
- The equipment delivery date, start date, and date of commencement of operations are to be negotiated.
- Commercial Terms and Conditions shall be in accordance with Seller's Standard Terms and Conditions of Sale.

7.6 Conditional Offering

Buyer understands that this proposal has been issued based upon the information provided by Buyer, and currently available to Seller, at the time of proposal issuance. Any changes or discrepancies in site conditions (including but not limited to system influent characteristics, changes in Environmental Health and Safety ("EH&S") conditions, and/or newly discovered EH&S concerns, Buyer's financial standing, Buyer's requirements, or any other relevant change, or discrepancy in, the factual basis upon which this proposal was created, may lead to changes in the offering, including but not limited to changes in pricing, warranties, quoted specifications, or terms and conditions. Seller's offering in this proposal is conditioned upon a full Seller EH&S, and Buyer financial review.





MAJOR TANK & BUILDING DIMENSIONS

CASSETTES 'N' PER TRAIN	'A'	'B'	'C'	'D'
1	8'-6"	17'-6"	13'-6"	25'-0"
2	15'-0"	17'-6"	13'-6"	32'-0"
3	21'-8"	17'-6"	13'-6"	40'-0"
4	28'-4"	17'-6"	13'-6"	46'-6"

NOTES

1. FOR SCOPE OF GE-SUPPLIED EQUIPMENT AND TECHNICAL DATA REFER TO THE PROPOSAL AND P&IDs.
2. SIZE AND LOCATION OF LISTED ROOMS ARE PRESENTED FOR REFERENCE ONLY. SYSTEM INTEGRATOR TO DETERMINE SIZE AND LOCATION OF ALL AMENITIES.
3. BIOLOGICAL PROCESS AERATION BLOWERS ARE NOT INCLUDED IN THE BLOWER ROOM. BOTH GROUPS OF BLOWERS CAN BE PLACED IN THE SAME ROOM.
4. SYSTEM INTEGRATOR IS RESPONSIBLE FOR DESIGN OF CONCRETE TANKS, GRAVITY MEMBRANE TANK SPLITTER (GRAVITY CHANNEL OR PIPE MANIFOLD), INFLUENT GATES, EMERGENCY OVERFLOW, WALKWAYS/HANDRAILS ON TOP OF WALLS (IF REQUIRED). THESE ARE NOT SHOWN IN THIS DRAWING FOR CLARITY.
5. TANK BOTTOM AND DRAIN SUMP DESIGNS ARE NOT BY GE. HOWEVER IT IS RECOMMENDED THAT MEMBRANE TANK BOTTOM IS TO BE CONFIGURED AS A ONE WAY SLOPE TOWARDS DRAIN TRENCH CROSSING THE ENTIRE TANK WIDTH. DRAIN SUMP CAN BE LOCATED ANYWHERE INSIDE THE TRENCH, WITH A TRENCH SLOPE TAPERING INTO THE SUMP ON ONE OR BOTH SIDES OF IT, DEPENDING ON THE LOCATION OF THE DRAIN PUMP.
6. BOTTOM OF VERTICAL DRAIN SUCTION SPOOL HAS TO BE AT LEAST 6" BELOW ELEVATION OF A TOP OF A DRAIN SUMP.
7. TANKS TO BE COVERED FOR ACCESS TO CASSETTES AND EQUIPMENT. DESIGN, SUPPLY AND INSTALLATION OF MEMBRANE TANK COVERS ARE BY OTHERS (TANKS MUST BE VENTED). GE SUPPLIED CASSETTE SUPPORT BEAMS INCLUDE A 3" ALLOWANCE FOR TANK COVERS THAT HAVE TO BE FLUSH WITH TOP OF TANKS. SPECIFIC DESIGN HAVE TO BE COORDINATED WITH GE. FOR ADDITIONAL INFORMATION REFER TO THE GE DESIGN GUIDELINE LISTED BELOW (NOTE 16a).
8. CONCRETE MEMBRANE TANK MUST BE LINED APPROPRIATELY FOR CONTACT WITH MEMBRANE CLEANING CHEMICALS. FOR ADDITIONAL INFORMATION REFER TO THE GE DESIGN GUIDELINE LISTED BELOW (NOTE 16b).
9. ALL INTERNAL DIMENSIONS ARE GIVEN TO THE FINISHED CONCRETE AND COATING SURFACE; CONTRACTOR TO CALCULATE THE THICKNESS OF THE COATING BEFORE POURING THE CONCRETE (NOTE 16c).
10. BAFFLE PLATE DESIGN AND SUPPLY ARE BY OTHERS. FOR ADDITIONAL INFORMATION REFER TO THE GE DESIGN GUIDELINE LISTED BELOW (NOTE 16d).
11. DESIGN AND SUPPLY OF SUPPORTS FOR PERMEATE AND AIR HEADERS ARE BY OTHERS. OVERALL SYSTEM ENGINEER TO DETERMINE DESIGN, NUMBER AND LOCATION OF SUPPORTS. GE TIE POINTS MUST NOT BE USED TO SUPPORT INTERCONNECTING PIPING.
12. SYSTEM INTEGRATOR TO CONSIDER PROVISION FOR FOAM/SLUDGE SURFACE WASTING AT THE DETAILED ENGINEERING STAGE.
13. MINIMUM OPERATING LEVEL IN THE BACKPULSE TANK (IF APPLICABLE) TO ALWAYS STAY ABOVE TOP OF CASING OF THE PROCESS PUMP.
14. THE BACKPULSE TANK IS OF IN-LINE (FLOW-THROUGH) CONFIGURATION IF PD PROCESS PUMPS ARE USED; IT IS OF OFF-LINE CONFIGURATION IF CENTRIFUGAL PROCESS PUMPS ARE USED.
15. ESTIMATED CASSETTE SHIPPING WEIGHT 4,500 LBS [2,040 KG]. ESTIMATED CASSETTE MAX WEIGHT(SLUDGED) 10,000 LBS [4,535 KG]. MEMBRANE LIFTING DEVICE (TRAVELING BRIDGE-CRANE) TO BE SIZED FOR 5,000 KG (NOTE 16e).
16. THE FOLLOWING DESIGN GUIDELINES ARE AVAILABLE FROM GE UPON REQUEST:

a. TANK COVER GUIDELINES FOR ZEEWEED 500 SYSTEMS.
b. MG-09012-C CONCRETE TANK COATING GUIDELINES FOR ZEEWEED SYSTEMS.
c. MG-09011-A MEMBRANE TANK TOLERANCES.
d. BEP #2007-04 BAFFLE DESIGN.
e. ZEEWEED 500 SERIES MEMBRANE LIFTING EQUIPMENT GUIDELINE.

GE Water & Process Technologies
ZENON Membrane Solutions

REFERENCE ONLY
DO NOT USE FOR CONSTRUCTION

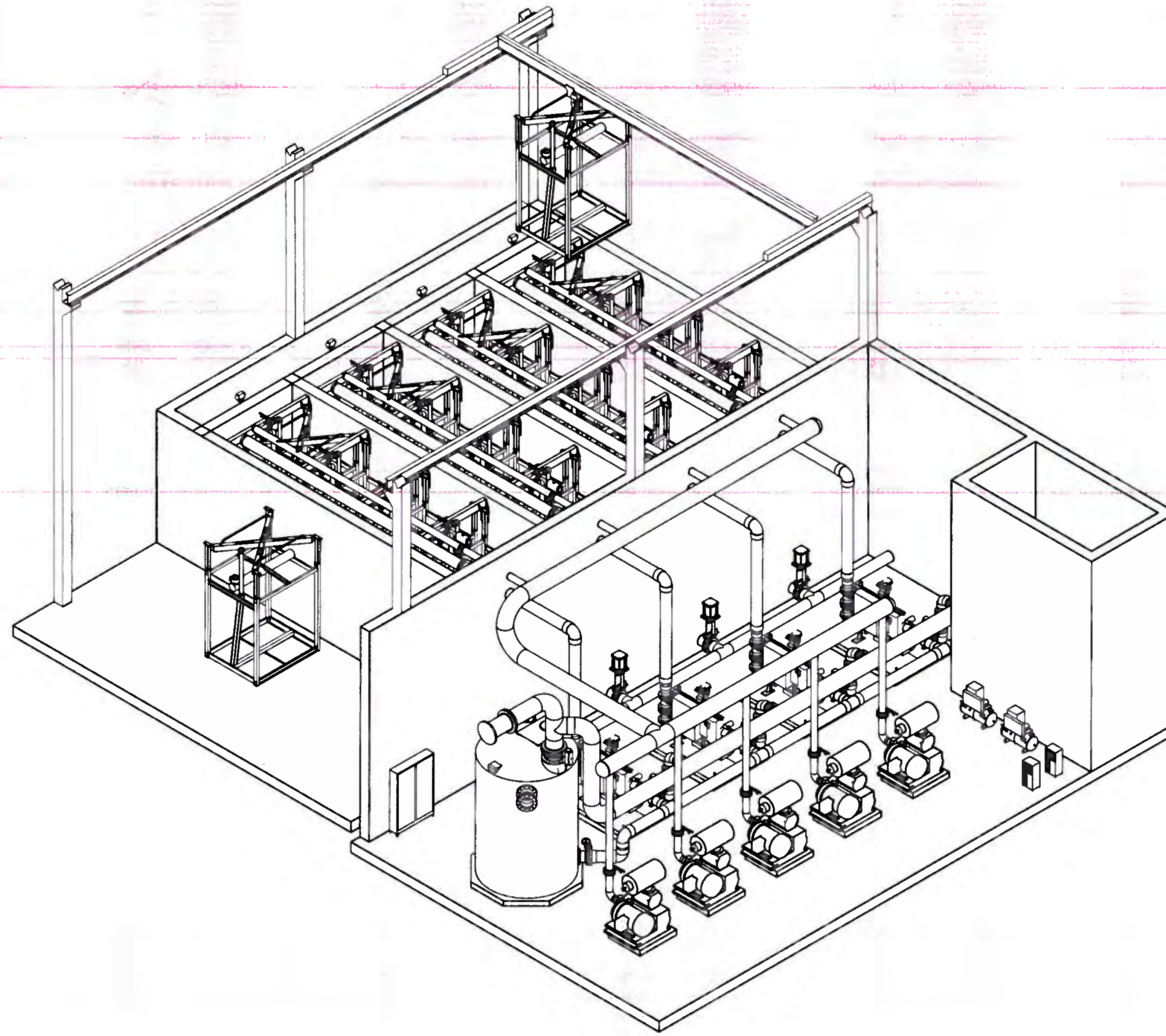
REV	DESCRIPTION	ECO	DWN	APVD	DATE	CHKD
A	INITIAL RELEASE/SAP IMPLEMENTATION	15311	RI	JM	26NOV12	RB

TOLERANCES UNLESS NOTED: DECIMALS .X .030, .XX .015, .XXX .010; ANGLES .5; FRAC 1/8
DIMENSIONS IN INCHES
DO NOT SCALE
THIRD ANGLE

DRAWN BY	SR	DATE 25JUL12
CHECKED BY	MZ	DATE 25JUL12
APPROVED BY	CB	DATE 25JUL12
APPROVED BY		DATE

GE Water & Process Technologies
GLOBAL HEADQUARTERS TREVOSE, PA USA +1-215-355-3300 WWW.GEWATER.COM

CLIENT/JOB: PUMP TO ZW500D 48M LEAPMBR STANDARD SYSTEM
FILE: MICROSTATION
TITLE: PLOT PLAN FOR 4 TANKS/- 4 CASSETTES MAX
MATERIAL:
SIZE: D
DRAWING NO.: 2801000C-AG-01
REV: A
PROJECT: 2801000
SCALE: 1:64
SHEET: 1OF2
P/N 1161682-R4P01



RIGHT ISO VIEW

(WALL REMOVED FOR CLARITY)

REV	DESCRIPTION	ECO	DWN	APVD	DATE	CHKD
A	INITIAL RELEASE/SAP IMPLEMENTATION	15311	RI	JM	26NOV12	RB

TOLERANCES UNLESS NOTED

DECIMALS		ANGLES
.X	.030	.5
.XX	.015	FRAC
.XXX	.010	1/8

DIMENSIONS IN INCHES DO NOT SCALE

THIRD ANGLE

	DATE
DRAWN BY SR	25JUL12
CHECKED BY MZ	25JUL12
APPROVED BY CB	25JUL12
APPROVED BY	

GE Water & Process Technologies

GLOBAL HEADQUARTERS : TREVOSE, PA USA +1-215-355-3300 WWW.GEWATER.COM

CLIENT/JOB: PUMP TO ZW500D 48M LEAPMBR STANDARD SYSTEM

TITLE: PLOT PLAN LAYOUT FOR 4 TANKS/- 4 CASSETTES MAX

FILE: MICROSTATION

MATERIAL:

SIZE: D

DRAWING NO.: 2801000C-AG-01

REV: A

PROJECT: 2801000

SCALE: 1:64

SHEET: 2 OF 2

P/N 1181682-RHP01

APPENDIX D
GEOTUBES® QUOTE

Bishop Water Technologies

P.O Box 669, 110-B Bonnechere St. W
Eganville, Ontario Canada, K0J 1T0
Phone: 613-628-5266
Fax: 613-628-5978
kevin@bishopwater.ca
www.bishopwater.ca

TENCATE Geotube®

Intelligent Solutions For Water

March 24, 2014

Rhys Cavill, C.E.T.
Senior Technologist
R.J. Burnside & Associates Limited
15 Townline Orangeville, Ontario L9W 3R4
Rhys.Cavill@rjburnside.com
tel: 519.941.5331 x310

RE: Budgetary Costing to implement Geotube® dewatering technology to dewater and contain biosolids produced at the Arthur Waste Water Treatment Facility.

Project Parameters

Project parameters are based on the information which has been provided to Bishop Water Technologies.

- For purposes of this proposal: 1.6% solids
- Maximum estimated total 240 day biosolids production: 4,370 cubic meters
- Total Bone Dry Metric Tons: 70 BDMT per 240 days
- Minimum expected dewatered percent solids: 18%
- Estimated dewatered volume: 420m^3

Required Geotube® Units

Bishop Water Technologies recommends a total of Three (3) Geotube® units to dewater the 240 day production of biosolids. The Geotube® units will measure 45' in circumference x 57' length. One Geotube unit will be housed in a greenhouse for winter dewatering. We anticipate adequate redundancy and expansion capabilities at very little additional cost, both operationally and capital wise.

Geotube® Specifications

	Maximum Pump Height (ft)		Estimated Filled Width and Length (ft)		Estimated Dewatered Volume (m3/tube)	
Geotube® Size: Circ x Length	**Silt and Organics**	**Sands and Minerals**	**Silt and Organics**	**Sands and Minerals**	**Silt and Organics**	**Sands and Minerals**
45' x 57'	7	5.5	19 x 54	20 x 54	156	132

Geotube® Specifications

A. Geotube® Container Material: The Geotube® container material shall be fabricated from GT500, a "Specially Engineered Dewatering Textile" manufactured from high tenacity polypropylene multifilament and monofilament yarns, which are woven into a stable network such that the yarns retain their relative position. The Geotube® container material shall be inert to biological degradation and resistant to naturally encountered chemicals, alkalis and acids.

B. The Geotube® container shall be fabricated by sewing together mill widths of the GT500 woven engineered textile to form a tubular shape. The sewn seams shall be two parallel rows of 401 "lockstitch" with 3/8" to 1/2" spacing between rows. The sewing thread shall be multi-ply polyester.

C. Geotube® containers 45 ft**.** or greater in circumference must be fabricated with the mill roll length of the GT500 woven engineered textile and the adjacent seams being in the circumferential direction with the closure of the Geotube® container having a longitudinal seam on the bottom of the container. Each Geotube® container shall be fabricated with one or more PVC filling ports located along the top centerline of the Geotube® container. The filling port is comprised of approx. 1.5" thick (inside and outside) flange rings that sandwich the Geotube® GT500 woven engineered textile between 1/8" thick rubber gaskets and secured with ¾" bolts. The resulting connection strength exceeds that of a traditional sewn-in, textile filling port. In addition to the flanges, the fill port shall include a fabric sleeve that may be secured around the feed line to prevent leakage.

D. PVC Fill Ports are for the attachment of the dredge or pump discharge line to the Geotube® container and shall be located at intervals of no more than 100 feet, or as recommended by the manufacturer. Fill ports shall be ridged PVC with an inner port body and outer port body each comprising one or more cellular surfaces capable of distributing a force caused by the clamping of the inner port body and outer port body together with steel bolts and nuts. Fill ports shall be either **4" (GP4)** or **8" (GP8)** in diameter with a 30-inch long, flexible non-woven 8 oz. geotextile sleeve.

E. "Specially Engineered Dewatering Textile" material and factory-sewn seams utilized in the construction of the Geotube® container shall meet or exceed the values shown in Table 1.

Geotube® Specifications continued

Table 1: GT500 Polypropylene - "Specially Engineered Dewatering Textile"

GT500 is composed of high-tenacity polypropylene yarns, which are woven into a stable network such that the yarns retain their relative position. GT500 is inert to biological degradation and resistant to naturally encountered chemicals, alkalis and acids.

Mechanical Properties	Test Method	Unit	Minimum Average Roll Value	
			MD	CD
Wide Width Tensile Strength (at ultimate)	ASTM D4595	kN/m (lbs/in)	78.8 (450)	109.4 (625)
Wide Width Tensile Elongation	ASTM D4595	%	20 (max.)	20 (max.)
Factory Seam Strength	ASTM D4884	kN/m (lbs/in)	70 (400)	
CBR Puncture Strength	ASTM D6241	N (lbs)	8900 (2000)	
Apparent Opening Size (AOS)	ASTM D4751	mm (U.S. Sieve)	0.43 (40)	
Water Flow Rate	ASTM D4491	$l/min/m^2$ (gpm/ft^2)	813 (20)	
UV Resistance (% strength retained after 500 hrs)	ASTM D4355	%	80	

Filtration Properties	Test Method	Unit	Typical Value
Pore Size Distribution (O_{50})	ASTM D6767	Micron	80
Pore Size Distribution (O_{95})	ASTM D6767	Micron	195

Table 1: GT500 Polypropylene - "Specially Engineered Dewatering Textile" continued

Physical Properties	Test Method	Unit	Typical Value
Mass/Unit Area	ASTM D5261	g/m^2 (oz/yd^2)	585 (17.3)
Thickness	ASTM D5199	mm (mils)	1.8 (70)

Basic Components of the Proposed Facility:

- Geotube® Dewatering Cell
- Process/Polymer Control Building
- Sludge Holding Tank *(if required)*
- Filtrate Holding Tank
- Greenhouse Enclosure

Geo-membrane Dewatering Cell Specifications

One dewatering cell will be required to accommodate a total of 2 Geotube® units measuring 45’ in circumference x 57’ in length.

The total **lay down area** of the dewatering cell will measure 45’ x 57’. This does not include the required berms or trench.

The site must be removed of all obstructions that could damage the Geotube® containers.

The sub-grade of the dewatering cell will be constructed of sand and compacted to ensure stability.

A collection trench will be constructed along the end of the dewatering cell, measuring 45’. The trench must be constructed inside the parameter of the cell to control the flow of effluent from the Geotube® container. The trench will measure 3.5’ deep x 5’ in width. This can be covered with a steel grid off which will make it easier for equipment access during disposal.

The dewatering cell will be sloped at a maximum of 0.5% to the trenched end of the cell.

An exterior berm must be constructed around the perimeters of the dewatering cells, with the exception of the trenched end and will measure a minimum of 1/3 the maximum pump height of the 45’ circumference Geotube® unit.

An internal berm will be set at the same height of the two outside berms this will separate the winter laydown area from the 3 season Geotube. The winter storage building will be installed into this berm.

After the base of the cell is constructed to the recommended specifications, an impermeable membrane must be installed over the entire floor, berm and trenches of the cell. Lining the floor, berm and trenches an impermeable membrane will limit the risk of effluent discharge to the environment.

After the membrane has been installed a non-woven Geo-textile will be installed over the floor of the cell to protect the membrane against heavy machine traffic.

Geotube® Filtration Fabric will then be laid over the non-woven material in order to promote dewatering from the bottom of the Geotube® units.

Alternatively the dewatering cells can be constructed of concrete should the client desire, we have not provided costing for this method. The size and specifications will be the same.

The Dewatering Cells described above is subject to change based on site specific conditions.

Geotube® Dewatering Cell Constructed using geo-membrane liner

Geotube® Dewatering Cell Constructed of concrete

Chemical(s) and Equipment for Chemical(s) Injection

Polymer, polymer injection equipment and pump controls can be housed in an insulated and heated, wood framed, metal clad building measuring approximately 24’ x 14’.

(Polymer mixing chamber)

Bishop Water Technologies can supply a polymer activation system which will deliver a fixed percent of activated polymer solution to the activated polymer metering pump. The activation percent is set by the operator. Neat polymer flow is directly proportional to the activation water flow based on this setting. The activated polymer metering pump delivery rate is proportionally controlled by the measured sludge flow.

The operator will select the activated polymer injection rate based on information provided by the polymer supplier. As sludge flow varies the polymer metering pump delivery rate varies proportionally to the sludge flow. Flow from the activated polymer is delivered directly to the metering pump to match the metering pump delivery rate. When sludge flow stops all flow from the metering pump and activation system stops.

The activated polymer is injected onto the sludge flow in the blending/flocking system. Turbulent flow generated by the blending/flocking system disburses the activated polymer into the sludge creating a fully flocked sludge ready for dewatering.

<u>Variable Flow Polymer Activation System Including PLC Controls and Mag Flow Meter</u>

APPLICATION:

Make up and delivery of up to 20 liters/min of up to .5% solution activated polymer.
Water Supplied from local storage tank. Pressure booster pump required.

EQUIPMENT:

1 only THUNDER VEPAS-20-V-B Liquid Polymer Activation System with remote polymer injection rate. Includes:

- THUNDER Neat Polymer Hose Metering Pump with:
    - Integrated and programmable speed control system.
    - Manual or automatic (via 4-20 ma input signal) variable flow adjustment between 0.95 and 19 liters/hour.
    - 1/60/120V power required.
- THUNDER non-mechanical Polymer Activator

- THUNDER BLEND activated polymer low shear dispersion mixers. Divides the activated polymer flow into multiply flow steams and then recombines them into uniform blended, activated flow.

• Adjustable water pressure regulator.

• Water pressure gauge.

• Activated polymer injection pressure gauge.

• Goulds model 1eV water pressure booster pump rated for 5 USGPM at 40 PSI. Complete with ½ HP, 1/60/120V, TEFC electric motor

• Necessary PVC pipe and fittings for a complete system.

• Flexible neat polymer suction line with drum suction wand.

• All mounted on a co-polypropylene chemical and corrosion resistant base plate.

1 only 4" Magnetic flow meter with ANSI flanged connections and grounding rings (if connected to non-metallic piping). Includes:

• Remote mounted programmable control mounted on VEPAS support frame pre-wired to polymer pump.

• Flow meter shipped loose with 10 meters of power and control cable for wiring on site after flow meter installation.

• 1/60/110V power supply required.

1 only Thunder PLC based automatic polymer activation system for variable concentration make-down and delivery. Provides automated control of polymer activation systems and water booster pump on/off based on sludge flow rate being present and volume being pumped. Includes:

•FRP or Powders Steel Nema 4X enclosure

• Requires 1/60/120V power supply.

• PLC based control with all necessary programing

• Touchscreen operator interface for setting polymer delivery rate, alarms, water booster pump control.

• Necessary electrical components, terminal blocks, fusing, etc. for a complete system

• CSA approval

Engineering approval drawings

O&M manuals, printed (up to 3 copies) plus electronic copy.

All mounted and prewired on a common fabricated steel baseplate with pressure tested piping and connections. Flow meter is shipped loose for installation on site.

Bench testing of the sludge will determine the optimal polymer and polymer injection equipment for conditioning the sludge.

Process Control Building

All polymer, polymer injection equipment should be housed indoors to prevent freezing during the winter months. A wood framed, metal clad building measuring 24’ x 14’ can be used for this purpose. Alternatively, if there is an existing building onsite capable of housing this material, it may be utilized.

Structure to House the Geotube® Units (For Winter Dewatering)

In order to dewater the waste stream throughout the winter months one Geotube® unit measuring 45’ in circumference x 57’ in length will need to be housed in a heated ventilated structure, capable of maintaining a temperature above 0^{O} Celsius.

A freestanding greenhouse structure measuring 27 in width x 60’ in length can be utilized for this purpose. This Greenhouse will cover one of the Geotube units and be installed onto the pad.

(Freestanding greenhouse and Process Control Building used at the Eganville Geotube® Facility)

Sludge Holding Tank

A 10,000 gallon subsurface holding tank may be required for sludge storage prior to processing, which will allow for batch entering into the Geotube® units. It should be remembered that ideal chemical conditioning is easier when the sludge holding tank is homogenized. We would recommend a mechanical mixing system for this.

May not be required if onsite storage exists.

Sludge Feed Pump

1 only Myers 4” recessed impeller pump with 5HP, 3/60/230V, electric motor suitable for operation by variable speed control. Complete with:

4x4 lift out rail system, this allows removal of pump for service without disturbing piping.

Upper rail bracket(others to supply 1.5” pipe rails)
Lifting Chain
Lifting Bail

1 only variable speed pump control panel, required 1/60/230V power:

Operates from a flow signal from the flow meter, operator will set the required flow rate and the pump will automatically adjust speed to provide the set point specified.

Receiving Tank Mixer

As this is a permanent installation, we highly recommend a mixer be installing in the 10,000 gallon tank. This will provide a more consistent sludge density during the processing and will help prevent possible sludge settling.

Tank details are required to confirm mixer selection

To avoid special motors, the simplest and most cost effective method for providing a mixer that will operate on 1/60/230V power is to operate with a VFD.

1 only 2 HP lightning mixer with 3/60/230V electric motor suitable for operation with a VFD and clean edge impeller to prevent ragging and build up on the impeller, sized for a 10,000 gallon tank.

1 only 2 HP mixer VFD with 1/60/230V power in 3/60/230V power out

Filtrate Holding Tank

A 10,000 Gallon subsurface holding tank can be used for the collection and transfer of filtrate back to the head works of the WWTP for further processing prior to discharge to the environment. This will allow the Plant Operators to feed the filtrate to the WWTP in batches during low flow periods.

Methodology

Prior to transferring biosolids to the Geotube® units for dewatering, the materials should circulated in a storage tank in order form a well blended mixture which is consistent in percent solids. This will allow for easier chemical conditioning and less instances of dosage rate adjustments to match changes in the percent solids of the material. A jar test should be performed to calculate the correct polymer dosage before any material is pumped to the Geotube®.

Once well blended, sludge will be pumped from the storage tank through a polymer injection system, which will inject a predetermined, made down polymer solution into the sludge in order flocculate the waste stream.

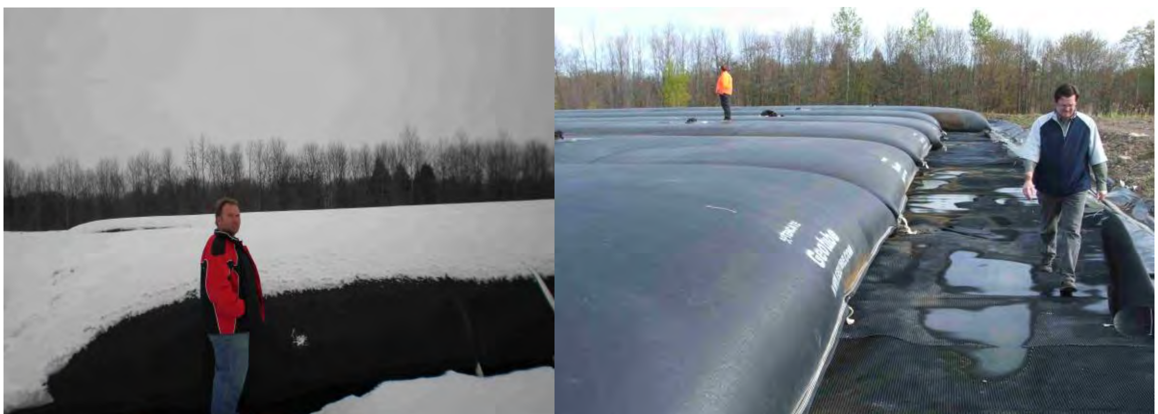
Samples of the flocculated material will be obtained from a sample port located on the polymer mixing chamber prior to dewatering to ensure optimal flocculation. After verifying the floc the sludge will be transferred to the Geotube® to be dewatered.

Filtrate draining from the 45' circumference Geotube® units will be collected in a trough located at the end of the dewatering cell. It can be directed via gravity to a subsurface holding tank and pumped back to the Headwork's of the WWTP at the discretion of the Plant Operators.

Retained solids will be removed once the Geotube® units are full or at the discretion of the Plant Operators. Dewatered solids can be land applied, land filled. Suitable methods of disposal will be determined based on analysis of the dewatered materials.

Freeze/Thaw Performance

It is advantageous for the Geotube® units to freeze over the winter months, as the eventual thawing of the bags will cause further dewatering, and reduction in bag height. While it is beneficial for the units to freeze, it is not required. Greenhouse structures are typically utilized over the Geotube® units required for the winter months to create a safe work environment for plant Operators by keeping the filtrate from freezing on the dewatering pad.



(The picture on the left shows a Geotube® unit which was filled in the fall of 2009, during the winter of 2010, the picture on the right shows the same Geotube® on April 26, 2010. Due to the freeze/thaw cycle, the units have reduced in height from 5'6" to 3'.)

Budgetary Costing: Capital Costs

Description	Quantity	Cost	Comments
*****Polymer Injection and Mixing System	1	$32,500	Will depend on client chosen parameters.
Impermeable Geo-Membrane	Approx. 6,750 sq. ft.	$2,800	Will cover the lay down area, berms and trenches of dewatering cells.
Non-Woven Geo-Synthetic	1 Rolls	$800	Will be deployed over the membrane to protect it from damage.
Geotube® Filtration Fabric	2 rolls	$1,250	Will be deployed over the non-woven material to promote drainage from the bottom of the Geotube® units.

Process Control Building 24' x 14'	1	$25,000	An existing heated building may be utilized for this purpose
10,000 Gallon Concrete Holding Tank	1	$12,000	May not be required if onsite storage exists.
Myers pump and Mixing system	1	$27,500	Used to pump septage from the subsurface holding tank.
3Hp Submersible Pump	1	$2,900	Will be used for transfer of filtrate
Freestanding Greenhouse Unit 27' x 60'	1	$25,000	Does Not Include: • Installation • Stamped Engineered Drawings • Electrical Services (Power Supply) • Site permits
Design work sub to engineering company	1	$7,500	This is a fixed fee for BWT to work with R.J. Burnside to ensure design and operations
• Mechanical • Electrical • Construction: The costs associated with site preparation, mechanical and electrical work are dependent upon the input of selected engineering company. This work will be contracted out to local companies selected by the client.			

Polymer Injection Systems can range from 10,000-100,000 in cost. Cost is dependent upon level of automation required.

Budgetary Costing: Operational and Maintenance Costs for 240 days of Operation

Description	Quantity	Cost	Comments
Geotube® Unit 45' in circumference x 57' long	3	$10,500	Bench Testing and RDT testing will better determine anticipated % dewatered solids and allow us to provide a more accurate quantity of Geotube®.
Commissioning and training	5 days	$1,250 per day	This does not include reasonable travel expenses
Polymer	4/45 Gallon Drums	$5,000	Quantity of polymer required may change based on bench testing. Budgetary costs have been calculated assuming dosage rates of 10kg per BDMT

Above costing does not include applicable taxes or shipping and handling. Costs are subject to change based on final design parameters.

Budgetary Costing is valid for 30 days from date of issuance.

Bench Testing

All budgetary costing provided and product specifications in this document are based on information which has been provided to Bishop Water Technologies. Therefore, Bishop Water Technologies cannot definitely determine the % solids of the sludge to be dewatered, the optimum polymer required to flocculate sludge, the best polymer conditioning system for this specific project the or the anticipated dewatered % solids of the sludge.

Bishop Water Technologies recommends a representative sample of the material be bench tested to definitively determine polymer and polymer dosage requirements for the waste streams.

Cost of Bench Testing: $520.00 per + applicable taxes

Permits

The client will be responsible for seeking any amendments to the current Certificate of Approval for the proposed Geotube® facility.

If you have any questions, please contact either myself or Kevin Bossy.

Sincerely,

Shane Dennison
Bishop Water Technologies, Inc.

APPENDIX E
DETAILED CONCEPTUAL LEVEL COSTING

Inflation Rate	**3.00%**
Interest Rate	**5.00%**

Conceptual Level Capital Cost Estimates

Liquod Treatment	**Option 1A**	**Option 1B**	**Option 2A**	**Option 2B**	**Option 3A**	**Option 3C**	**Option 4A**	**Option 4B**
General/Misc	$ 820,000	$ 820,000	$ 880,000	$ 880,000	$ 870,000	$ 870,000	$ 1,200,000	$ 1,200,000
Headworks	$ 3,020,000	$ 3,020,000	$ 3,020,000	$ 3,020,000	$ 3,020,000	$ 3,020,000	$ 3,177,000	$ 3,177,000
Storage Lagoon Conveyance Upgrades	$ 1,825,000	$ 1,825,000	$ 1,825,000	$ 1,825,000	$ 1,825,000	$ 1,825,000	$ 1,825,000	$ 1,825,000
Blowers, Standby Power, and Other Common Upgrades	$ 651,000	$ 651,000	$ 681,000	$ 681,000	$ 651,000	$ 651,000	$ 651,000	$ 651,000
Secondary Treatment	$ 1,589,000	$ 1,589,000	$ 2,427,000	$ 2,427,000	$ 2,337,000	$ 2,337,000	$ 6,447,000	$ 6,447,000
Sub Total	$ 7,905,000	$ 7,905,000	$ 8,833,000	$ 8,833,000	$ 8,703,000	$ 8,703,000	$ 13,300,000	$ 13,300,000
Contingency (30%)	$ 2,371,500	$ 2,371,500	$ 2,649,900	$ 2,649,900	$ 2,610,900	$ 2,610,900	$ 3,990,000	$ 3,990,000
Engineering (12%)	$ 948,600	$ 948,600	$ 1,059,960	$ 1,059,960	$ 1,044,360	$ 1,044,360	$ 1,596,000	$ 1,596,000
Liquid Treatment Total	***$ 11,200,000***	***$ 11,200,000***	***$ 12,500,000***	***$ 12,500,000***	***$ 12,400,000***	***$ 12,400,000***	***$ 18,900,000***	***$ 18,900,000***
Sludge Management	**Option 1A**	**Option 1B**	**Option 2A**	**Option 2B**	**Option 3A**	**Option 3C**	**Option 4A**	**Option 4B**
Digester Allowance	$ 900,000	$ 900,000	$ 900,000	$ 900,000	$ 900,000	$ 900,000	$ 900,000	$ 900,000
Biosolids Storage	$ 4,200,000	$ 1,400,000	$ 4,200,000	$ 1,400,000	$ 4,200,000	$ 1,400,000	$ 3,400,000	$ 1,400,000
Sludge Management Total	**$ 5,100,000**	**$ 2,300,000**	**$ 5,100,000**	**$ 2,300,000**	**$ 5,100,000**	**$ 2,300,000**	**$ 4,300,000**	**$ 2,300,000**
Option Total Capital	**$ 16,300,000**	**$ 13,500,000**	**$ 17,600,000**	**$ 14,800,000**	**$ 17,500,000**	**$ 14,700,000**	**$ 23,200,000**	**$ 21,200,000**

Conceptual Level O&M Cost Estimates

	Option 1A	**Option 1B**	**Option 2A**	**Option 2B**	**Option 3A**	**Option 3C**	**Option 4A**	**Option 4B**
Chemicals	$ 99,912	$ 99,912	$ 99,912	$ 99,912	$ 99,912	$ 99,912	$ 105,412	$ 105,412
Hydro	$ 129,830	$ 114,830	$ 129,830	$ 114,830	$ 129,830	$ 114,830	$ 174,830	$ 159,830
Salaries & Benefits	$ 106,000	$ 106,000	$ 106,000	$ 106,000	$ 106,000	$ 106,000	$ 106,000	$ 106,000
Services	$ 44,555	$ 44,555	$ 44,555	$ 44,555	$ 44,555	$ 44,555	$ 44,555	$ 44,555
Sludge Haulage	$ 27,044	$ 9,296	$ 27,044	$ 9,296	$ 27,044	$ 9,296	$ 27,044	$ 9,296
Supplies & Equip	$ 11,662	$ 11,662	$ 11,662	$ 11,662	$ 11,662	$ 11,662	$ 11,662	$ 11,662
Additional Maintenance	$ 3,481	$ 18,981	$ 3,481	$ 18,981	$ 3,481	$ 18,981	$ 3,481	$ 18,981
IFAS media replacement allowance	$ -	$ -	$ -	$ -	$ 5,000	$ 5,000	$ -	$ -
Membrane replacement allowance	$ -	$ -	$ -	$ -	$ -	$ -	$ 77,600	$ 77,600
Total Annual O&M Cost	**$ 422,000**	**$ 405,000**	**$ 422,000**	**$ 405,000**	**$ 427,000**	**$ 410,000**	**$ 551,000**	**$ 533,000**

25-Year Lifecycle Costs	**$26,850,000.00**	**$23,625,000.00**	**$28,150,000.00**	**$24,925,000.00**	**$28,175,000.00**	**$24,950,000.00**	**$36,975,000.00**	**$34,525,000.00**
Net Present Value O&M	**$10,550,000.00**	**$10,125,000.00**	**$10,550,000.00**	**$10,125,000.00**	**$10,675,000.00**	**$10,250,000.00**	**$13,775,000.00**	**$13,325,000.00**

APPENDIX F
UPGRADES FOR INTERIM CAPACITY INCREASE

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.: 3-3167-01-01
February 3, 2016

TECHNICAL MEMORANDUM
EFFLUENT QUALITY AND CAPITAL UPGRADES REQUIRED TO ACHIEVE AN INTERIM CAPACITY INCREASE
ARTHUR WWTP CLASS EA

Prepared for:

TOWNSHIP OF WELLINGTON NORTH
P.O. Box 125, 7490 Sideroad 7 W
Kenilworth, Ontario
N0G 3E0

Attention: Matthew Aston, Director of Public Works

Prepared by:

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

TABLE OF CONTENTS

TABLE

FIGURE

APPENDICES

1. INTRODUCTION

1.1 Background

The Township of Wellington North (Township) is currently undertaking a Schedule C Class Environmental Assessment (EA) to determine the most cost effective, environmentally sound, and sustainable approach to upgrade the Arthur Wastewater Treatment Plant (WWTP) to provide servicing to a design year of 2031. XCG has been retained by the Township to undertake the Arthur WWTP Class EA. A preferred design concept has been selected as part of Phase 3 of the Class EA process. The preferred concept is to twin the existing extended aeration package plant to provide treatment up to 2,300 m^3/d.

Since completion of Phase 3 of the Class EA process, the Arthur WWTP has recorded a significant increase in raw influent flow. As such, the Township wishes to investigate the option of phasing in the plant capacity expansion to address the recent increases in flow. A preliminary evaluation of existing treatment capacity indicated that an interim capacity of 1,860 m^3/d could be achieved by upgrading only some of the unit processes. Therefore, plant upgrades could be completed in two phases, with the rated plant average daily flow (ADF) being 1,860 m^3/d in Phase 1, and 2,300 m^3/d in Phase 2.

1.2 Objective

The overall objectives of this technical memorandum (TM) are to:

1. Define the flow and loading design basis to the Arthur WWTP for both Phases 1 and 2 based on recent flow data;
2. Define the effluent requirements at the proposed Phase 1 ADF capacity; and,
3. Present the plant liquid treatment train upgrades required to achieve the proposed Phase 1 interim ADF capacity.

2. SUMMARY OF DESIGN BASIS

2.1 Influent Flows and Loadings

Table 2.1 presents the plant influent design wastewater flows and loadings at both the Phase 1 (1,860 m^3/d) and Phase 2 (2,300 m^3/d) capacities. Projected flows and loadings include contributions from domestic wastewater and Industrial / Commercial / Institutional (ICI) contributors.

Previous projections of Phase 2 plant flows and loadings were completed using plant operating data from 2007 to 2012 (XCG, 2014). Previous projections of peak instantaneous flows were estimated based on the existing maximum day flow to the plant and a typical peak instantaneous flow factor.

Since completion of those projections, the Township has conducted two detailed flow monitoring studies, specifically:

- An Inflow and Infiltration (I/I) study, conducted between March and May, 2014; and,
- A plant influent monitoring study, which was started in October 2014 and is ongoing.

Flow data from the studies above were collected at 5 minute intervals, which allowed for a more accurate evaluation of existing maximum day and peak instantaneous flow to the Arthur WWTP. Flow projections presented in Table 2.1 have been updated based on detailed flow data collected in the studies above.

For the 2014 I/I study, flow measurements from four flow meters placed in the collection system were used to estimate influent flow to the plant. Three of these meters were placed upstream of the Frederick St. Sewage Pumping Station (SPS) to estimate total flow to the SPS. Previous analyses have shown there to be good agreement between the plant influent flow as calculated by these meters in the collection system and by flow measurements taken at the plant (XCG, 2015c). It is important to note that two small periods of flow data observed in the collection system during a peak flow event on April 13, 2014 were found to be inconsistent with the remaining data set. These data were excluded from analysis of maximum day and peak instantaneous flows. Additional details of the data analysis are given in a separate report which analyzes the operation of the Wells St. SPS and the Frederick St. SPS (XCG, 2015a).

Existing peak instantaneous flows were estimated from data collected during the 2014 I/I study. As such, results are not impacted by recorded bypasses at the Frederick St. SPS.

Existing maximum day flows were estimated from flow data recorded at the plant, and from data collected during the 2014 I/I study. During peak flow events, the total bypassed volume at the Frederick St. SPS was estimated based on recorded flow to the SPS and the estimated capacity of pumps at the SPS. Total maximum day flow was estimated as the influent flow calculated at the plant, plus the estimated volume of the bypass at the Frederick St. SPS.

As a result of using the detailed flow data, Phase 2 maximum day and peak instantaneous flow projections in Table 2.1 are greater than the previous Phase 2 flow projections. It is important to note that the projected additional maximum day and peak instantaneous flows resulting from residential and ICI growth were unchanged from previous projections.

When the WWTP reaches the Phase 1 interim capacity, the average day flow will have increased from the historic average of 1,342 m^3/d to 1,860 m^3/d, or a total of 518 m^3/d. This correlates to an equivalent population increase of 1,126 persons at the design per capita flow of 460 L/cap/d (inclusive of I/I). The Phase 1 maximum day and peak instantaneous flow growth was developed from the equivalent population increase. Additional details regarding the general methodology associated with development of maximum day and peak instantaneous flows from an equivalent service population is located in the Evaluation of Alternative Treatment Design Concepts report (XCG, 2014).

The Phase 1 average day and maximum month loadings were also developed from the equivalent population increase. Projected loads were based on existing loads to the plant, plus additional loads from the equivalent population increase. Additional loads were developed using either typical or historic per capita loading rates, whichever resulted in the most conservative loading estimate for each parameter. Additional details regarding the general methodology associated with development of these projections is located in the Evaluation of Alternative Treatment Design Concepts report (XCG, 2014). Design peak flows and loadings for both Phase 1 and Phase 2 should be confirmed during preliminary design of the Phase 1 upgrades.

Table 2.1 Summary of Arthur WWTP Design Basis

Parameter	Updated Historic Recorded (2007 - 2015)	Previously Estimated Historic (2007-2012)[3]	Phase 1 (Interim)	Updated Phase 2	Previously Defined Phase 2[3]
ADF	1,342 m^3/d	1,342 m^3/d	1,860 m^3/d	2,300 m^3/d	2,300 m^3/d
MDF	6,722 m^3/d	5,875 m^3/d	7,853 m^3/d	8,784 m^3/d	8,000 m^3/d
MDF Factor	5.0	4.4	4.2	3.8	3.5
PIF	9,920 m^3/d	8,460 m^3/d	11,592 m^3/d	12,887 m^3/d	11,500 m^3/d
PIF Factor	7.4	6.3	6.2	5.6	5.0
BOD_5					
Average Loading	207 kg/d	207 kg/d	291 kg/d	363 kg/d	363 kg/d
Maximum Month Loading[2]	- [1]	-	437 kg/d	545 kg/d	-
Average Concentration	154 mg/L	-	157 mg/L	158 mg/L	-
TSS					
Average Loading	190 kg/d	190 kg/d	291 kg/d	377 kg/d	377 kg/d
Maximum Month Loading[2]	- [1]	-	437 kg/d	566 kg/d	-
Average Concentration	142 mg/L	-	157 mg/L	164 mg/L	-
TKN					
Average Loading	43.5 kg/d	43.5 kg/d	60.0 kg/d	74.0 kg/d	74.0 kg/d
Maximum Month Loading[2]	- [1]	-	89.9 kg/d	111 kg/d	-
Average Concentration	32.4 mg/L	-	32.2 mg/L	32.2 mg/L	-
TP					
Average Loading	6.40 kg/d	6.40 kg/d	10.1 kg/d	13.3 kg/d	13.3 kg/d
Maximum Month Loading[2]	- [1]	-	15.2 kg/d	19.9 kg/d	-
Average Concentration	4.77 mg/L	-	5.44 mg/L	5.77 mg/L	-

Notes:

ADF - Average Day Flow

MDF - Maximum Day Flow

PIF - Peak Instantaneous Flow

BOD_5 - 5-day Biochemical Oxygen Demand

TSS - Total Suspended Solids

TKN - Total Kjeldahl Nitrogen

TP - Total Phosphorus

1. Accurate estimation of existing maximum month loading factors is not available from existing data.
2. Estimations of maximum month loading for Phase 1 and Phase 2 developed assuming a typical maximum month factor of 1.5.
3. As reported in Evaluation of Alternative Treatment Designs (XCG, 2014).

2.2 *Effluent Criteria and Discharge Schedule*

The future design effluent objectives and limits for the Arthur WWTP Phase 2 capacity (ADF of 2,300 m^3/d) were previously developed in consultation with the Ministry of the Environment and Climate Change (MOECC) as part of the Class EA process.

Due to the limitations on effluent discharge from the facility based on effluent total ammonia nitrogen (TAN) concentrations (see Section 2.3), TAN concentration limits for Phase 1 are unchanged from established limits for Phase 2. Similarly, the effluent concentration limits established for $cBOD_5$, TSS, and TP are identical for Phase 1 and for Phase 2 flows. In this way, no modifications will be required to the effluent discharge:receiver flow ratios (see Table 2.3) or maximum daily effluent flow values (see Table 2.4) that had previously been developed. The approved effluent objective concentrations for all parameters for Phase 1 were prorated based on the ratio of the design Phase 2 to Phase 1 flows. Effluent *E. coli* and pH requirements previously approved for Phase 2 have been carried forward for the approved Phase 1 effluent requirements.

The established effluent objectives and limits for both the Phase 2 flow of 2,300 m^3/d, and the Phase 1 flow of 1,860 m^3/d, are summarized in Table 2.2.

Table 2.2 Future Design Effluent Objectives and Compliance Limits

Parameter	Phase 1 Capacity (1,860 m^3/d) Approved Values		Phase 2 Capacity (2,300 m^3/d) Approved Values	
	Objective Concentration	Compliance Limit	Objective Concentration	Compliance Limit
$cBOD_5$ (mg/L)	6 mg/L	10 mg/L	5 mg/L	10 mg/L
TSS	6 mg/L	10 mg/L	5 mg/L	10 mg/L
TP	0.21 mg/L	0.25 mg/L	0.17 mg/L	0.25 mg/L
TAN	0.6 mg/L	3.5 mg/L (1) 2.8 mg/L (2)	0.5 mg/L	3.5 mg/L (1) 2.8 mg/L (2)
E. coli (3)	-	100 cfus/100 mL	-	100 cfus/100mL
pH	-	6 - 8	-	6 - 8

Notes:
1. For discharge during January, February, March, April, May, November, and December.
2. For discharge during October.
3. Based on a monthly geometric mean.

2.3 *Seasonal Effluent Discharge Restrictions*

Based on the results of the Assimilative Capacity Study, the Arthur WWTP will only be permitted to discharge to the Conestogo River during the months of October through May. The allowable effluent flow rate will be dependent on the effluent TAN concentration and the flow rate in the Conestogo River. As noted in Section 2.1, the effluent $cBOD_5$, TSS, TP, and TAN concentration limits previously developed for Phase 2 be used for the Phase 1 interim capacity. Therefore, the allowable discharge at the Phase 1 interim capacity remain the same as the discharge schedule previously approved for the Phase 2 capacity of 2,300 m^3/d.

Table 2.3 presents the ratio of river flow to allowable plant effluent flow as a function of effluent TAN for each month from October through May. Table 2.4 presents the maximum allowable daily effluent flow from the Arthur WWTP.

Table 2.3 Allowable River Flow to Effluent Flow Ratio Table

Month	**TAN (mg/L)**					
	≤0.65	**>0.65 - 1.0**	**>1.0 - 1.5**	**>1.5 - 2.0**	**>2.0 - 2.8**	**>2.8 - 3.5**
January	0.9	0.9	1.7	2.7	4.7	5.8
February	0.7	0.7	0.7	0.9	1.8	2.6
March	1.0	1.0	1.8	2.9	4.9	6.0
April	2.3	4.2	7.5	10.7	15	18.8
May	3.5	5.7	11.4	15.3	22.9	45.8
October	1.4	1.7	3.8	4.8	9.5	- (1)
November	1.4	1.4	1.6	2.5	4.1	5.5
December	1.4	2.4	4.3	6.5	10.4	13

Notes:
1. CofA TAN effluent limit for October is 2.8 mg/L.

Table 2.4 Maximum Daily Effluent Flow from the Arthur WWTP

Month	**Allowable Max Daily Flow (m^3/d)**
January	5,000
February	5,000
March	5,500
April	3,200
May	1,300
October	1,400
November	4,600
December	3,800

3. LIQUID TREATMENT TRAIN UPGRADE REQUIREMENTS FOR PHASE 1

The proposed Phase 1 interim ADF capacity (1,860 m^3/d) represents an increase over the existing CofA rated ADF capacity (1,465 m^3/d). The purpose of this section is to conduct a review of all treatment processes to evaluate what upgrades (if any) are required to rerate the plant to the interim capacity. Further, each subsection will discuss the logistics completing future upgrades of each unit process to reach the Phase 2 capacity of 2,300 m^3/d.

3.1 Preliminary Treatment

Preliminary treatment at the Arthur WWTP currently consists of grit removal, comminution, and a manually raked bar screen. All preliminary treatment processes are located in a channel immediately upstream of the liquid treatment train. The CofA rated capacity of preliminary treatment is 5,045 m^3/d. Over the review period (2007 - 2014), plant records indicate raw wastewater flow through preliminary treatment has exceeded the CofA rated capacity on several peak flow occasions. Plant operators have not reported any adverse operating conditions from peak flow events.

To achieve the interim Phase 1 capacity, no changes are proposed to the preliminary treatment processes at the plant. Peak flow through the preliminary treatment processes will be limited to 6,450 m^3/d through operation of an onsite equalization tank. Additional details of the equalization tank are given in Section 3.2.3. Over the review period (2007 - 2014), peak flow through the preliminary treatment processes has exceeded the projected peak flow after equalization of 6,450 m^3/d at the Phase 1 capacity.

As part of the Phase 2 upgrades, a new headworks system will be required. Details can be found in the Evaluation of Alternative Treatment Design Concepts report (XCG, 2014).

3.2 Secondary Treatment

Twinning the existing extended aeration package plant was selected as the preferred alternative to expand the Arthur WWTP to the Phase 2 capacity of 2,300 m^3/d (XCG, 2014). The existing aeration tank has sufficient biological treatment capacity to achieve the required level of treatment at Phase 1 flows (1,860 m^3/d) (see Section 3.2.1), however the existing secondary clarifier does not have sufficient capacity to handle the design Phase 1 peak flows (see Section 3.2.2). Therefore, the required upgrades to achieve the Phase 1 interim capacity increase includes providing flow equalization to limit peak flows through the existing package extended aeration plant (see Section 3.2.3). By providing equalization volume, constructing the second package extended aeration facility is not required to reach the Phase 1 capacity.

The following sub-sections outline the conceptual level design requirements for secondary treatment including biological treatment, secondary clarification, and flow equalization.

3.2.1 Aeration Tanks

The average day biological treatment capacity of the existing aeration tanks was previously estimated to be 3,044 m^3/d (XCG, 2014). As such, additional aeration tank volume is not required to handle ADF flows at the proposed interim Phase 1 capacity (1,860 m^3/d).

Previous investigation of the aeration tank capacity also found that adequate effluent quality was maintained at a solids retention time (SRT) of 14 days. Under the projected loading conditions at the Phase 1 interim ADF capacity (presented in Table 2.1), and assuming a solids yield of 0.6 kg VSS/kg BOD_5, and a VSS:TSS ratio of 0.6, the estimated MLSS concentration required to maintain adequate treatment at the Phase 1 interim ADF capacity is approximately 3,800 mg/L.

3.2.2 Final Clarifier

The capacity of the existing final clarifier can be estimated based on both the peak hour surface overflow rate (SOR) and the maximum day solids loading rate (SLR). Previous investigations of clarifier capacity have recommended a limit of 0.47 $L/m^2/s$ (40.6 $m^3/m^2/d$) and 200 $kg/m^2/d$ for the peak hour SOR and the maximum day SLR, respectively (Hydromantis, 2007). It is important to note, however, that a failure condition of the secondary clarifier (i.e. carryover of the solids blanket) was not observed during the previous investigations. As such, the actual treatment capacity may be in excess of these values.

Significant plant data has been collected since completion of the stress test. Based on the available clarifier surface area (143 m^2), the previous investigation suggested that the existing final clarifier has a peak hour flow capacity of approximately 5,800 m^3/d. Influent flow records suggest peak hour flows approaching 9,000 m^3/d have been historically treated at the plant with no recorded observations of solids washout. Therefore, the actual peak hour capacity of the final clarifier may be much greater than previously estimated.

The Phase 1 peak hour and maximum day flow through the Arthur WWTP will be limited to 6,450 m^3/d through operation of an onsite equalization tank (See Section 3.2.3). Although this projected flow is greater than the previously estimated peak flow capacity of the final clarifier (5,800 m^3/d), as noted above flows approaching 9,000 m^3/d have been treated via the existing secondary clarifier. Therefore, the existing final clarifier likely has sufficient capacity to treat projected equalized Phase 1 peak flows.

In the event that the existing secondary clarifier cannot effectively treat equalized peak flows at the Phase 1 design basis, all effluent flow could be directed to the storage lagoons for the duration of the peak flow event, regardless of the discharge schedule. Previous investigations have evaluated that there is currently excess storage capacity at the effluent storage lagoons in Arthur (XCG, 2014). Therefore, any secondary effluent wastewater with adverse effluent quality will not be discharged to the environment. All wastewater which is returned from the storage lagoons is filtered and disinfected prior to discharge.

3.2.3 Equalization Tank at the Arthur WWTP

At the Phase 1 interim capacity, projected raw wastewater maximum day and peak hour flows shown in Table 2.1 exceed the estimated treatment capacity of the existing headworks and final clarifier. As such, equalization will be required for Phase 1 to limit peak flows to the package extended aeration plant to 6,450 m^3/d.

To provide peak flow attenuation, it is proposed that equalization be provided by constructing the tankage associated with the future required package extended aeration plant (to reach the Phase 2 ADF), and utilizing this tankage as equalization volume during the interim (Phase 1) step. This would provide a total of approximately 1,650 m^3 of equalization volume.

Although the tankage would be constructed with all structural elements required to convert it into aeration and clarifier tanks as part of the Phase 2 expansion, none of the associated mechanical equipment (aeration system, sludge and scum collection mechanisms, return activated sludge (RAS) pumping) would be installed. However, a means to return any wastewater collected in the equalization tank would be provided, as would a flow splitter box and required flow metering to control flow splits. The flow split chamber to the equalization tank would be located upstream of the plant headworks and existing secondary treatment. To achieve the Phase 2 design capacity in the future, the tank would be retrofitted to provide additional biological and secondary clarification capacity.

To assess the impact of the proposed equalization volume on downstream unit processes, a 48-hour peak flow event was simulated using flow data from a recorded peak flow event during the observation period, and the projected Phase 1 maximum day and peak instantaneous flows presented in Table 2.1. The flow projections were based on the historic recorded combined snow-melt / precipitation event that occurred on April 13-14, 2014, plus an allowance for increased flows due to growth. It was also assumed that the Frederick St. SPS would be upgraded and that the volume that was bypassed at the SPS during this historic event would be conveyed to the WWTP in the future. Full details of the peak flow analysis, including a copy of the projected 48-hour peak event curve, are presented in Appendix A.

The effective peak hour and maximum day flow through secondary treatment can be controlled by operation of the proposed equalization tank. Specifically, it is proposed that sustained flows above 6,450 m^3/d (74.7 L/s) be directed to the equalization tank. Table 3.1 summarizes the projected peak hour and maximum day flows at the interim plant capacity with and without equalization. For purposes of this table, it was assumed that equalized flow would be held in the equalization tank for the duration of the peak flow event. Equalized flow would be returned to the plant upstream of the headworks during low flow periods.

Table 3.1 Summary of Equalization Impact at the Arthur WWTP

	Flow Through Secondary Treatment Without Equalization	Flow Through Secondary Treatment With Equalization
Maximum Day Flow	7,853 m^3/d	6,392 m^3/d (1)
Peak Hour Flow	10,433 m^3/d (2)	6,450 m^3/d

Notes:
1. Assumes equalized flow is not returned to the head of the plant during the peak flow event.
2. Assumed to be 90% of the Phase 1 peak instantaneous flow.

As presented in the Table 3.1, the proposed operation of the equalization tank would effectively attenuate both maximum day and peak hour flows to the plant to 6,392 m^3/d and 6,450 m^3/d, respectively. Under the proposed operation, approximately 1,633 m^3 would overflow into the equalization tank during the 48-hour peak flow event.

It is also possible to attenuate future peak flows through construction of an equalization tank at the Frederick St. SPS. This equalization tank may be considered in addition to or in replacement of the tank constructed at the Arthur WWTP. Evaluation and analysis presented in this report has not considered the construction of an equalization tank onsite at the Frederick St. SPS. The feasibility of constructing an equalization tank at the Frederick St. SPS should be further evaluated during the preliminary design.

3.3 Aeration Tank Oxygenation

Oxygen to the aeration tanks is provided by two blowers, one duty and one standby. Each blower is rated to provide 486 L/s against 45 kPa discharge pressure at standard conditions. Each aeration tank is equipped with 84 coarse bubble diffusers, for a total of 168 diffusers. The capacity of the coarse bubble diffusers could not be confirmed through this evaluation, and will need to be assessed during preliminary design.

Table 3.2 summarizes oxygen requirements at the Phase 1 interim capacity and at the Phase 2 capacity given the design basis in Table 2.1.

Table 3.2 Summary of Estimated Aeration Tank Oxygenation Requirements

	Phase 1 Capacity (1,860 m^3/d) Proposed Values	Phase 2 Capacity (2,300 m^3/d) Approved Values
Estimated Oxygen Demand (1)	1,016 kg O_2/d	1,261 kg O_2/d
Estimated Air Requirement	842 L/s	1,045 L/s

Notes:
1. Based on an oxygen demand of 1.5 kg O_2/kg BOD_5 + 4.6 kg O_2/kg TKN (MOE, 2008). Based on average day BOD_5 loading and peak day TKN loading (MOE, 2008). Peak day TKN loading estimated from the historic dry weather flow factor (2.1).

Results in Table 3.2 indicate that an increase to the existing oxygenation capacity (i.e. blower capacity) is required at both the Phase 1 ADF and the Phase 2 ADF to maintain current blower operation (i.e. one blower kept in standby).

During preliminary design, oxygenation requirements based on design loadings should be reviewed, and the recommended upgrades to the oxygenation system adjusted as necessary. For purposes of this report, an allowance to increase aeration blower capacity has been included in capital cost estimations.

3.4 Tertiary Filtration

Based on the conceptual level design basis, the maximum design effluent discharge from the Arthur WWTP is 5,500 m^3/d at the interim Phase 1 capacity. This is limited by the discharge requirements as previously agreed to with the MOECC. The CofA rated capacity of the tertiary filters is 6,500 m^3/d. Therefore, there is sufficient filter capacity to treat the maximum design effluent flow. No upgrades or expansion of tertiary filtration is required as part of the Phase 1 or Phase 2 expansions.

3.5 Chemical Addition

The chemical feed system at the Arthur WWTP consists of a 23 m^3 chemical storage tank, 450 L day tank, and two chemical metering pumps (one duty and one standby), each rated for 250 L/d. The coagulant addition point is immediately upstream of the secondary clarifier, but provisions exist for a second coagulant dose point upstream of the tertiary filters. The Arthur WWTP currently uses alum as the precipitant for chemical phosphorus removal.

The ADF capacity of the existing chemical feed system at the Arthur WWTP has previously been estimated to be 3,034 m^3/d (XCG, 2014). As such, there are no required upgrades to the chemical feed system for either Phase 1 or Phase 2 plant expansion.

As discussed in Table 2.2, the effluent TP objectives and limits are expected to decrease at both the Phase 1 and Phase 2 plant capacities. Full-scale testing of dual point alum addition at the Arthur WWTP demonstrated that effluent TP concentrations can be maintained consistently below Phase 1 and Phase 2 objective effluent TP concentrations. Therefore, implementation of dual point alum addition at the Arthur WWTP will be required for Phase 1 and Phase 2 plant expansion.

Previous analyses have indicated that effluent pH adjustment may be required to achieve non-toxic effluent concentrations of un-ionized ammonia (XCG, 2014). The potential addition of pH adjustment should be re-evaluated during preliminary design. If required, it is not anticipated that this will significantly impact capital and operation and maintenance (O&M) costs.

3.6 Ultra Violet (UV) Disinfection

The Arthur WWTP currently uses UV irradiation to disinfect tertiary treated effluent prior to discharge to the Conestogo River. The UV system is designed to provide a dose of approximately 25.9 watts-sec/cm^3 at 65 percent transmission and a peak flow capacity of 6,500 m^3/d.

The UV system was replaced in 2013 and has adequate capacity to meet future discharge requirements at the proposed effluent flows of the interim plant capacity. Therefore, no upgrades to the UV system are required for either Phase 1 or Phase 2 plant expansion.

3.7 Effluent Storage and Conveyance

During non-discharge periods, treated effluent flow is conveyed to storage lagoons through a forcemain. During the discharge period, the lagoon contents are combined with the plant's secondary clarifier effluent, and this flow is then treated by the tertiary filters and an ultra violet disinfection system prior to discharge to the Conestogo River. According to the CofA, the existing capacity of the storage lagoon is approximately 340,000 m^3. Based on the projected storage requirement at the Phase 2 ADF capacity (approximately 246,000 m^3), there is no additional storage capacity required at either the Phase 1 or Phase 2 plant capacities. The existing forcemain consists of the following configuration:

- 860 m of 200 mm diameter pipe;
- 1,100 m of 250 mm diameter pipe; and,
- 600 m of 300 mm diameter pipe.

Flow is currently conveyed to the storage lagoons using horizontal split case pumps. The conveyance system has two pumps installed, each rated for 58.5 L/s at 64 m TDH. The Arthur WWTP operations manual indicates that both pumps are operated as required at peak flow conditions. However, typical MOE design guidelines suggest that a full redundancy of the conveyance pumps should be provided for at the projected peak flows.

Required upgrades at the interim plant capacity have been developed assuming a full redundancy will be provided (i.e. providing firm capacity sufficient to convey peak flows to the storage lagoons).

There are two potential options to convey projected peak flows at the Phase 1 plant capacity. Each option is presented in detail below.

Option 1 – Full Replacement of the 200 mm Diameter Pipe

For this option, the entire 860 m length of 200 mm diameter forcemain would be replaced with 350 mm diameter forcemain. Under this approach, the existing transfer pumps may have sufficient capacity to transfer projected peak flows at the Phase 1 plant capacity, or may be able to be upgraded with only minor modifications (i.e. changing the existing pump impeller). Detailed analysis of the existing pump curves is required to confirm upgrades required to the transfer pumps, and should be completed during the preliminary design. The estimated cost to replace this section of the forcemain is $645,000. It is assumed that any upgrades required to increase pumping capacity (if necessary) are relatively minor.

Option 2 – Partial Replacement of the 200 mm Diameter Pipe

The upgrade of a portion of the 200 mm diameter pipe to 350 mm diameter pipe is required to sufficiently reduce the estimated headloss in the forcemain at projected equalized Phase 1 plant flows of 6,450 m^3/d. For this option, approximately 500 m of the 860 m total length of 200 mm diameter forcemain would be replaced with a 350 m diameter forcemain. Under this approach, two new transfer pumps would be required. The estimated cost to provide and install these pumps is $639,000. The estimated cost to upgrade the forcemain is $375,000. The total estimated cost for Option 2 is $1,014,000.

It is important to note that the conveyance pumps must be replaced to reach Phase 2 capacity regardless of the option selected to achieve Phase 1 pumping capacity. As such, the new conveyance pumps which are required for Option 2 represent temporary installations only. Option 2 is not a cost-effective solution relative to Option 1. For purposes of developing upgrade requirements, it is assumed that Option 1 will be used to achieve Phase 1 conveyance pumping capacity.

As previously discussed, it may be possible to further attenuate peak flows through construction of an equalization tank onsite at the Frederick St. SPS. Implementation of equalization both at the treatment plant and at the pumping station may further reduce or eliminate the need for upgrades to the effluent conveyance system to achieve Phase 1 capacity. The potential for equalization at the Frederick St. SPS is further discussed in a separate technical memorandum (XCG, 2015a). The final selection of equalization volumes and locations, as well as required effluent conveyance system upgrades will be confirmed in the preliminary design.

3.8 Sludge Management

There were several sludge management strategies reviewed for the handling and treatment of sludge generated at the Phase 1 interim capacity, and at the Phase 2 capacity. Detailed analysis and evaluation of all sludge management options, including selection of the preferred sludge management alternative, is presented in a separate technical memorandum (XCG, 2015b)

4. OVERVIEW OF PLANT OPERATION

Using information presented in the preceding section, the purpose of this section is to present an overview of proposed plant configuration and operation at the Phase 1 and Phase 2 plant capacities.

At the Phase 1 interim plant capacity, all sustained influent flow greater than 6,450 m^3/d will be directed to an equalization tank upstream of the existing headworks. Equalized flow will be returned via pump to the liquid treatment train upstream of the headworks during low flow periods. Dual point alum addition will be used in the liquid treatment train for phosphorus control. Alum will be dosed upstream of the final clarifier and upstream of the tertiary filters. Operation of the liquid treatment train is otherwise unchanged from current operation. Figure 4.1 shows a process flow diagram (PFD) of the Arthur WWTP at the proposed Phase 1 operation. Figure 4.3 presents a site layout at the Phase 1 operation.

For purposes of this technical memorandum, Figure 4.1 shows no changes to the existing solids treatment train at the Arthur WWTP. Several sludge management strategies have been reviewed for treatment of solids at the Phase 1 and Phase 2 plant capacity. Possible solutions include expansion of the existing aerobic digestion process, and disposal of waste biological solids at the Regional Lystek facility in Dundalk, Ontario. Details of this review and selection of a preferred solids treatment alternative is presented in a separate technical memorandum (XCG, 2015b). In Figure 4.1, a general sludge handling / treatment process is shown.

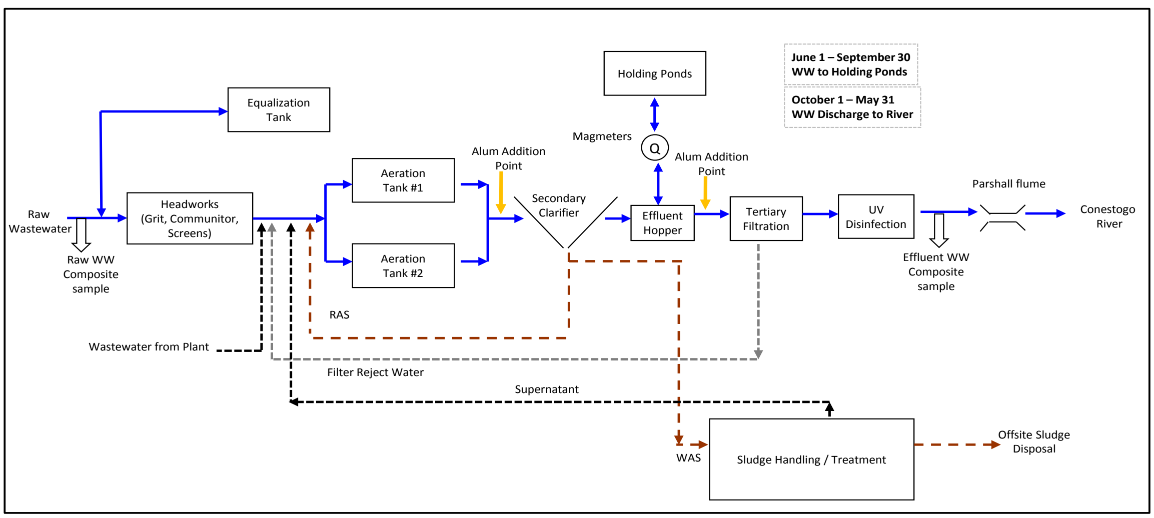


Figure 4.1 Arthur WWTP Phase 1 Process Flow Diagram

Figure 4.2 shows a PFD of the plant under proposed Phase 2 operation. To achieve Phase 2 capacity, the existing headworks channel will be decommissioned and a new headworks building will be constructed to treat all influent flow to the plant. The existing equalization tank will be converted into an extended aeration package plant. Additional upgrades will be required to the secondary effluent pumping system.

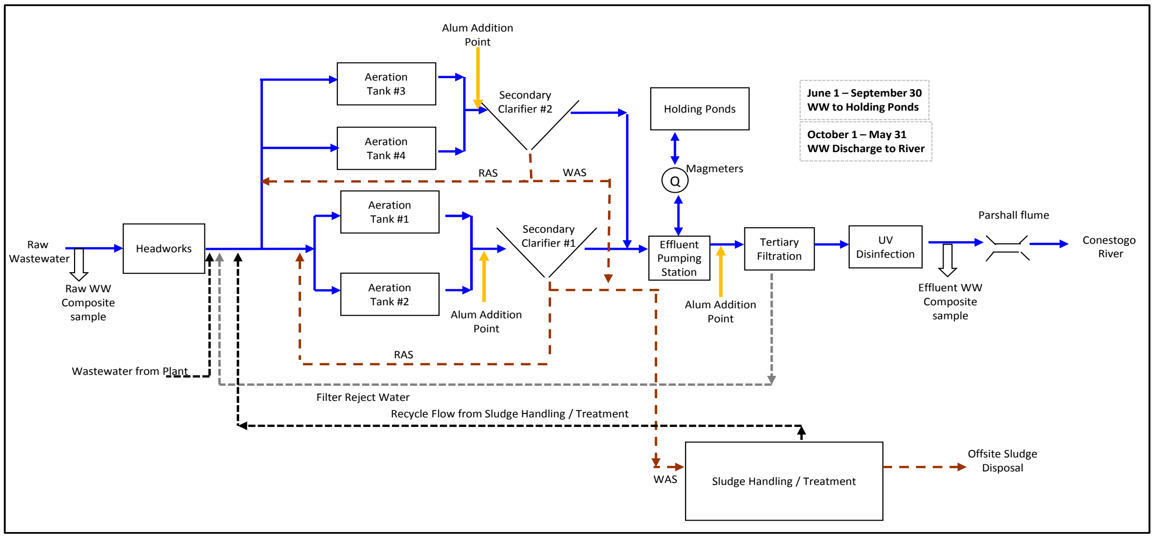


Figure 4.2 Arthur WWTP Phase 2 Process Flow Diagram

Figure 4.3 shows the required plant expansion to achieve Phase 1 and Phase 2 capacities. The preferred method of sludge management at Phase 1 and Phase 2 flows is discussed in a separate technical memorandum. As such, required improvements to the solids treatment train have not been included in Figure 4.3. Further, several details, such as design peak flows and flow equalization, will be finalized during the preliminary design process. Plant expansion details presented in Figure 4.3 are subject to change upon confirmation of these design details.

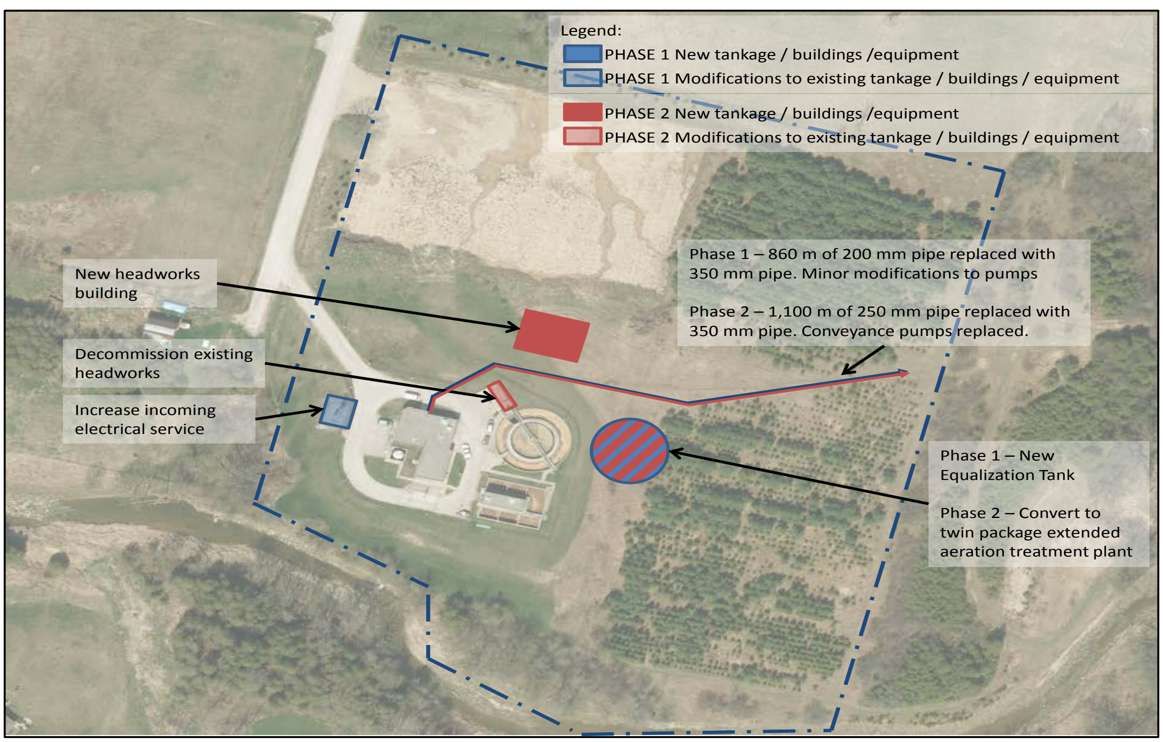


Figure 4.3 Arthur WWTP Phase 1 and Phase 2 Expansion Requirements

5. CONCEPTUAL LEVEL COST

5.1 Capital Costs

Conceptual level capital cost analyses were conducted for expansion of the Arthur WWTP liquid treatment train to the proposed Phase 1 and Phase 2 capacity. Estimated capital costs to expand the solids treatment train are presented in a separate report (XCG, 2015b). Phase 1 capital costs include the following items:

- Construction of tankage for an twin extended aeration treatment plant, to be used for equalization at during Phase 1 operation;
- Upgraded blower capacity and all appurtenances;
- Additional standby power and increased electrical service; and,
- Required upgrades to effluent pumping and conveyance.

Phase 2 capital costs include the following items:

- Installation of all required appurtenances to convert the equalization tank into a twin extended aeration package plant; and,
- Construction of new preliminary treatment consisting of flow metering, mechanically cleaned bar screens, vortex grit separators, and headworks building complete with odour control and all appurtenances.

For purposes of this analysis, it is assumed additional blower capacity provided as part of Phase 1 is sufficient to treat Phase 2 flows. A summary of proposed capital costs for Phase 1 and Phase 2 plant expansion is given in Table 5.1.

Conceptual level cost estimates are generally considered to be accurate to -25% to +40%. Actual costs will depend on site specific factors such as soil and groundwater conditions, the engineering design applied, construction conditions at the time of tendering, and the extent of additional upgrades to the works that may be included in the final design. Capital costs include a 30 percent allowance for contingency and a 12 percent allowance for engineering, permits, and approvals.

Results in Table 5.1 show that using the proposed phased approach, the Township is able to defer approximately $8 million in capital costs.

Table 5.1 Summary of Conceptual Level Cost Estimates at the Arthur WWTP for Liquid Treatment Train Upgrades

	Phase 1	Phase 2
General/Miscellaneous	$340,000	$569,000
Headworks	$0	$3,020,000
Storage Lagoon Conveyance Upgrades	$695,000	$1,275,000
Blowers, Standby Power, and Other Common Upgrades	$681,000	$0
Equalization Tank	$1,674,000	$0
Secondary Treatment	$0	$809,000
Sub Total	$3,390,000	$5,673,000
Contingency (30%)	$1,017,000	$1,702,900
Engineering (12%)	$407,000	$681,000
Liquid Treatment Train Total	**$4,814,000**	**$8,056,000**

Notes:

All costs are conceptual level opinions of probable costs and are considered to be accurate to within -25 to +40 percent and are exclusive of HST.

1. Assumed increase in blower capacity provided in Phase 1 is adequate for Phase 2 demand.

5.2 Operation and Maintenance Costs

O&M costs for the Arthur WWTP liquid treatment train can be separated into six primary categories: chemicals, hydro, salaries and benefits, services, sludge haulage, and supplies and equipment. Estimated O&M costs to for the solids treatment train are presented in a separate report (XCG, 2015b).

At the Phase 1 interim capacity, the chemical and hydro costs of the liquid treatment train are expected to increase as a result of more stringent effluent phosphorus requirements, and increased flow to the plant. At the Phase 1 ADF capacity, the estimated O&M cost increase is estimated to be $48,000/year as a result of liquid treatment train operation.

Similarly, at the Phase 2 plant capacity, the chemical and hydro costs of the liquid treatment train are expected to increase. As a result, at the Phase 2 ADF capacity, the estimated O&M cost increase is $89,000/year as a result of liquid treatment train operation.

Total O&M costs will depend on the preferred sludge management alternative. A detailed review and selection of a preferred sludge treatment alternative is presented in a separate report (XCG, 2015b).

6. SUMMARY AND CONCLUSIONS

6.1 Summary Design Basis

The proposed Arthur WWTP design basis was updated using the following information:

- Plant Operating Data (2007 - 2014);
- An I/I study, completed March to May, 2014; and,
- A plant influent monitoring study, which was started October 2014 and is ongoing.

A summary of the proposed design basis is given in Table 6.1.

Table 6.1 Summary of Arthur WWTP Design Basis

Parameter	Existing	Phase 1 (Interim)	Phase 2
ADF	1,342 m^3/d	1,860 m^3/d	2,300 m^3/d
MDF	6,722 m^3/d	7,853 m^3/d	8,784 m^3/d
MDF Factor	5.0	4.2	3.8
PIF	9,920 m^3/d	11,592 m^3/d	12,887 m^3/d
PIF Factor	7.4	6.2	5.6
BOD_5			
Average Loading	207 kg/d	291 kg/d	363 kg/d
Maximum Month Loading (2)	- (1)	437 kg/d	545 kg/d
Average Concentration	154 mg/L	157 mg/L	158 mg/L
TSS			
Average Loading	190 kg/d	291 kg/d	377 kg/d
Maximum Month Loading (2)	- (1)	437 kg/d	566 kg/d
Average Concentration	142 mg/L	157 mg/L	164 mg/L
TKN			
Average Loading	43.5 kg/d	60.0 kg/d	74.0 kg/d
Maximum Month Loading (2)	- (1)	89.9 kg/d	111 kg/d
Average Concentration	32.4 mg/L	32.2 mg/L	32.2 mg/L
TP			
Average Loading	6.40 kg/d	10.1 kg/d	13.3 kg/d
Maximum Month Loading (2)	- (1)	15.2 kg/d	19.9 kg/d
Average Concentration	4.77 mg/L	5.44 mg/L	5.77 mg/L

Notes:
1. Accurate estimation of existing maximum month loading factors is not available from existing data.
2. Estimations of maximum month loading for Phase 1 and Phase 2 developed assuming a typical maximum month factor of 1.5.

6.2 Details of Implementation of a Phased Plant Capacity Increase

The following is a summary of details outlining the implementation of a phased increase to the Arthur WWTP:

Preliminary Treatment

- Preliminary treatment consists of grit removal, comminution, and manual screens. At the Phase 1 ADF, there are no recommended changes to preliminary treatment processes (Section 3.1). Peak flow through preliminary treatment would be restricted to 6,450 m^3/d through operation of an equalization tank (Section 3.2.3).
- As part of the Phase 2 upgrades, a new headworks system would be constructed. Details can be found in the Evaluation of Alternative Treatment Design Concepts report (XCG, 2014).

Secondary Treatment

- Secondary treatment consists of aeration and clarification. At the Phase 1 ADF, peak flow through the secondary treatment would be restricted to 6,450 m^3/d through operation of an equalization tank (Section 3.2.3).
- Existing aeration tanks have sufficient capacity to achieve the required level of treatment of Phase 1 flows (Section 3.2.1).
- Although peak flow through secondary treatment (6,450 m^3/d) is slightly greater than the estimated capacity of the final clarifier (5,800 m^3/d), the capacity of the secondary clarifier has been estimated using conservative design parameters. As such, the capacity of the existing secondary clarifier may be greater than estimated. Any adverse quality clarifier effluent will be directed to the storage lagoons.
- The preferred solution to achieve Phase 2 plant capacity is to twin the existing extended aeration package plant (XCG, 2014). Tankage for the twin plant will be constructed in Phase 1 and used as equalization volume. When required, the equalization tank will be converted to an extended aeration plant to achieve Phase 2 capacity.

Tertiary Filtration / Chemical Addition / UV Disinfection

- The capacity of existing tertiary filtration, UV disinfection, and chemical addition processes is sufficient to treat the Phase 2 ADF capacity of 2,300 m^3/d. There are no required modification to these processes to treat projected Phase 1 flow.

Effluent Storage and Conveyance

- The existing conveyance system consists of a 2.56 km forcemain and transfer pumps. Phase 1 peak flows are restricted to approximately 6,450 m^3/d through operation of an equalization tank. There is insufficient capacity in the conveyance system to transfer projected equalized peak flows.
- Additional conveyance capacity can be provided by replacing the entire 860 m length of 200 mm diameter pipe with 350 mm diameter pipe. It is anticipated that the existing transfer pumps may have sufficient capacity required via minor modifications (i.e. new impellers).
- For Phase 2 capacity, additional conveyance capacity would be added by upgrading the remaining 1,100 m of 250 mm diameter pipe, and through the installation of new conveyance pumps.
- The existing capacity of the storage lagoons is approximately 340,000 m^3. Based on the projected storage requirement at the Phase 2 ADF capacity (approximately 246,000 m^3), there is no additional storage capacity required at either the Phase 1 or Phase 2 plant capacities.

- Minor changes to the projected peak flows and/or provision of equalization at the Frederick St. SPS may impact the required onsite equalization and effluent conveyance system upgrades.

Sludge Management

- A detailed review of sludge management options at the Phase 1 interim ADF and at the Phase 2 ADF was completed as a separate analysis (XCG, 2015b).

6.3 Plant Overview and Conceptual Costs

A process flow diagram of the proposed Phase 1 plant operation is given in Figure 6.1. An overview of the site layout, complete with proposed Phase 1 and Phase 2 upgrades is given as Figure 6.2. Both figures are subject to minor changes upon confirmation of design details during the preliminary design.

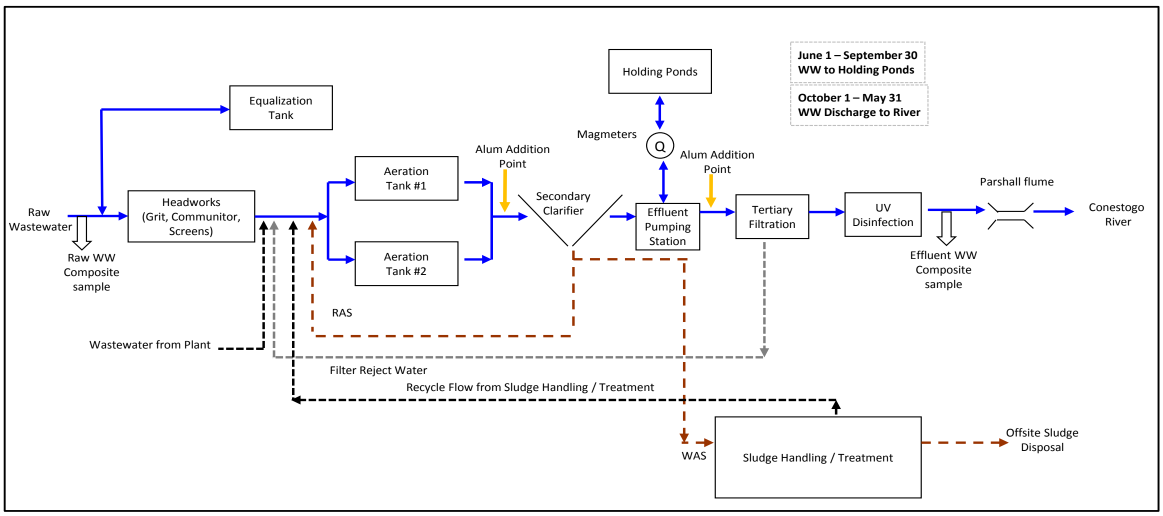


Figure 6.1 Arthur WWTP Phase 1 Process Flow Diagram

The estimate cost of sludge management has been considered as part of a separate report, and therefore is not reported as part of this analysis (XCG, 2015b). Implementation of a phased plant expansion allows for the deferral of approximately $8 million dollars in capital costs associated with the liquid treatment train at the Arthur WWTP. A summary of conceptual level capital costs is given in Table 6.2. The estimated increase to operation and maintenance costs are expected at Phase 1 and Phase 2 capacities are $48,000/year and $89,000/year, respectively. O&M cost increases are primarily due to increased flow and decreased effluent TP requirements.

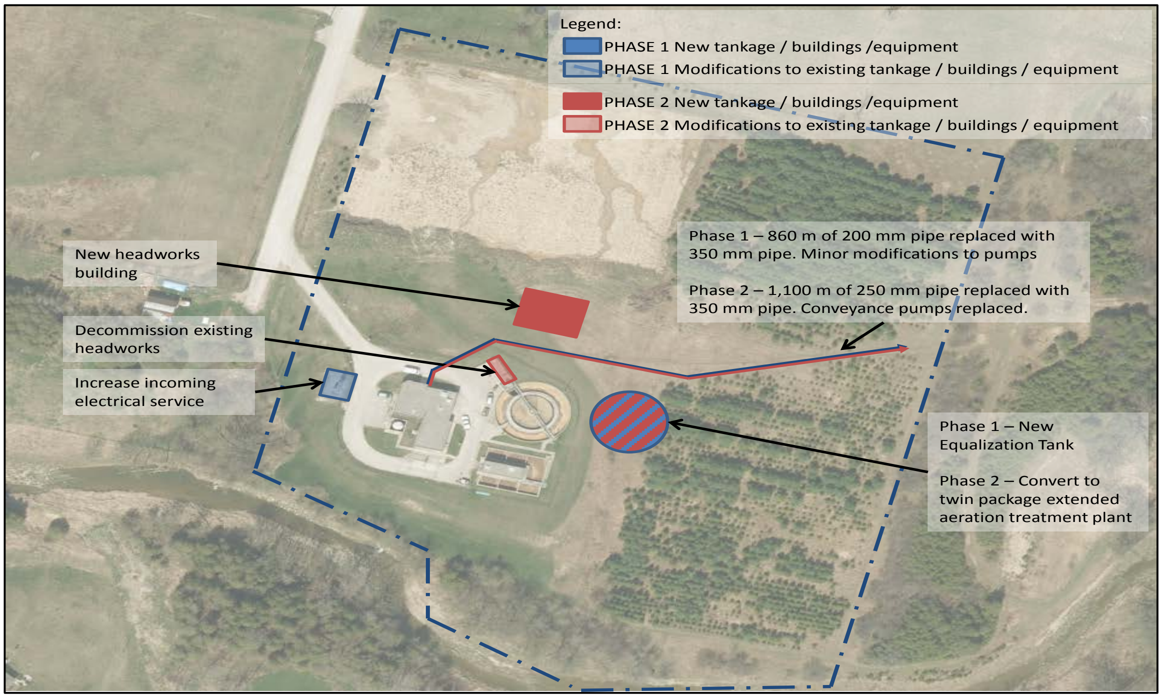


Figure 6.2 Arthur WWTP Phased ADF Increase Site Layout

Table 6.2 Summary of Conceptual Level Cost Estimates at the Arthur WWTP for Liquid Treatment Train Upgrades

Treatment Process	Phase 1	Phase 2
General/Miscellaneous	$340,000	$569,000
Headworks	$0	$3,020,000
Storage Lagoon Conveyance Upgrades	$695,000	$1,275,000
Blowers, Standby Power, and Other Common Upgrades	$681,000	$0
Equalization Tank	$1,674,000	$0
Secondary Treatment	$0	$809,000
Sub Total	$3,390,000	$5,673,000
Contingency (30%)	$1,017,000	$1,702,900
Engineering (12%)	$407,000	$681,000
Liquid Treatment Train Total	**$4,814,000**	**$8,056,000**

Notes:

All costs are conceptual level opinions of probable costs and are considered to be accurate to within -25 to +40 percent and are exclusive of HST.

1. Assumed increase in blower capacity provided in Phase 1 is adequate for Phase 2 demand.

7. REFERENCES

MOECC. (2008). Design Guidelines for Sewage Works.

XCG Consulting Ltd. (2013). Assimilative Capacity Study – Arthur WWTP Class EA.

XCG Consulting Ltd. (2014). Evaluation of Alternative Treatment Design Concepts – Arthur WWTP Class EA.

XCG Consulting Ltd. (2015a). Evaluation of Wells St. and Frederick St. Sewage Pumping Stations.

XCG Consulting Ltd. (2015b). Summary of Arthur WWTP Sludge Management Options.

XCG Consulting Ltd. (2015c). Arthur WWTP Class EA – Review of Recent Flow Data, Construction Phasing, and Associated Class EA Implications.

APPENDIX A
PEAK FLOW ANALYSIS

A future peak flow event at the projected Phase 1 capacity was created using a measured peak flow event recorded from April 13 - 14, 2014. During this 48-hour peak flow period, flow was measured at 5-minute intervals at four different locations in the collection system. The sum of flow from all meters represents total influent flow to the treatment plant. To create the peak flow projection, hourly flows recorded during the peak flow event were adjusted using the projected maximum day flow at the Phase 1 ADF relative to the observed maximum day flow at the plant during the peak flow event.

A copy of the projected 48-hour peak flow curve to the Arthur WWTP is given in Figure A.1.

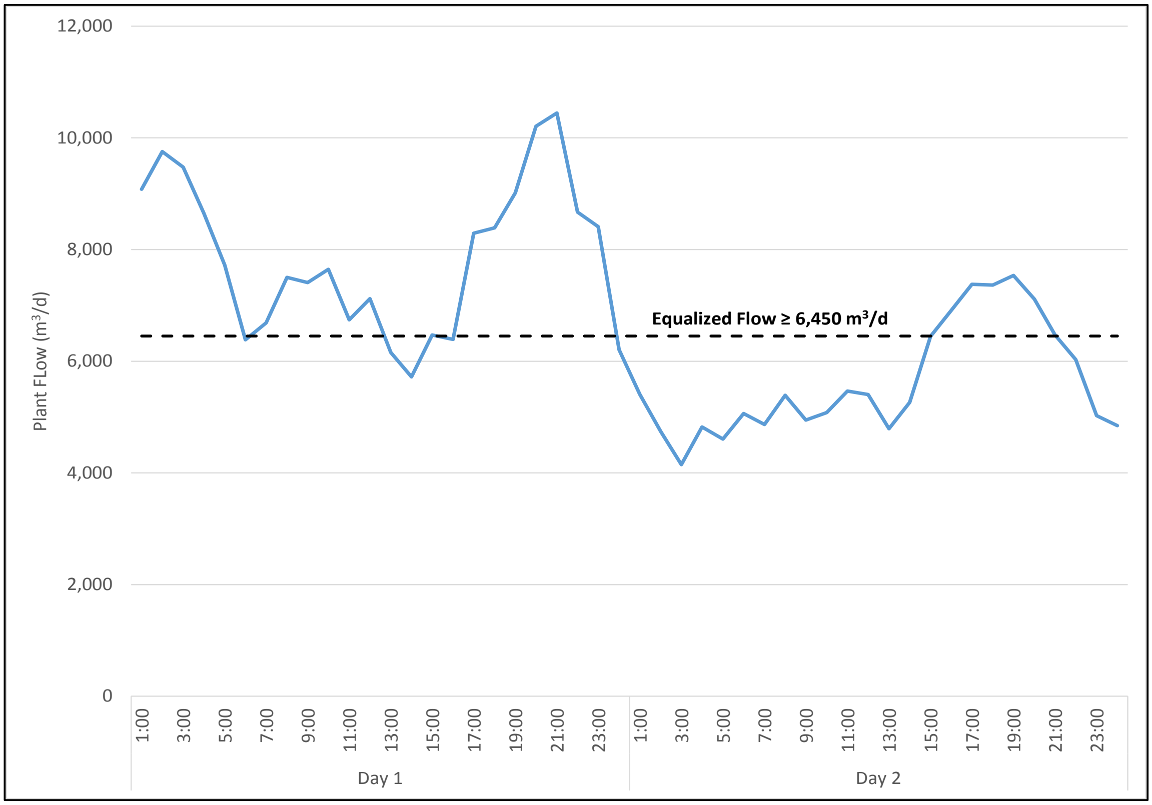


Figure A.1 48-Hour Peak Flow Curve to the Arthur WWTP

Proposed operation of the equalization tank would divert all sustained flow greater than 6,450 m^3/d to the equalization tank. A summary of the equalization tank use during the 48-hour peak flow event is summarized in Table A.1. For purposes of this analysis, it is assumed equalized flow is not returned to the plant headworks until the end of the peak flow event.

Table A.1 Equalization System Flow Analysis

Hour	Design Flow (m^3/d)	Influent Flow to Secondary Treatment (m^3/d)	Flow to Equalization Tank (m^3)
1	9,078	6,450	110
2	9,753	6,450	138
3	9,475	6,450	126
4	8,651	6,450	92
5	7,720	6,450	53
6	6,385	6,385	0
7	6,686	6,450	10
8	7,500	6,450	44
9	7,407	6,450	40
10	7,644	6,450	50
11	6,742	6,450	12
12	7,119	6,450	28
13	6,157	6,157	0
14	5,719	5,719	0
15	6,469	6,450	1
16	6,390	6,390	0
17	8,293	6,450	77
18	8,388	6,450	81
19	9,014	6,450	107
20	10,209	6,450	157
21	10,444	6,450	166
22	8,671	6,450	93
23	8,409	6,450	82
24	6,205	6,205	0
25	5,406	5,406	0
26	4,743	4,743	0
27	4,148	4,148	0
28	4,822	4,822	0
29	4,606	4,606	0
30	5,063	5,063	0
31	4,867	4,867	0
32	5,390	5,390	0
33	4,946	4,946	0

Table A.1 Equalization System Flow Analysis

Hour	Design Flow (m^3/d)	Influent Flow to Secondary Treatment (m^3/d)	Flow to Equalization Tank (m^3)
34	5,081	5,081	0
35	5,465	5,465	0
36	5,404	5,404	0
37	4,791	4,791	0
38	5,264	5,264	0
39	6,446	6,446	0
40	6,910	6,450	19
41	7,378	6,450	39
42	7,363	6,450	38
43	7,535	6,450	45
44	7,112	6,450	28
45	6,470	6,450	1
46	6,028	6,028	0
47	5,024	5,024	0
48	4,847	4,847	0
Average (Day 1)	7,855	6,392	-
Average (Day 2)	5,629	5,460	-
Peak Hour	10,444	6,450	-
Total	-	-	1,633

Notes:
A 48-hour peak flow event was projected based on a peak flow event observed from April 13-14, 2014, and the projected maximum day and peak hour flows at the Phase 1 interim plant capacity.

APPENDIX G
SLUDGE MANAGEMENT OPTIONS FOR INTERIM CAPACITY

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.: 3-3167-01-01
December 7, 2015

TECHNICAL MEMORANDUM
SLUDGE MANAGEMENT OPTIONS AND CAPITAL UPGRADES REQUIRED TO ACHIEVE AN INTERIM PLANT CAPACITY INCREASE
ARTHUR WWTP CLASS EA

Prepared for:

TOWNSHIP OF WELLINGTON NORTH
P.O. Box 125, 7490 Sideroad 7 W
Kenilworth, Ontario
N0G 3E0

Attention: Matthew Aston, Director of Public Works

Prepared by:

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

TABLE OF CONTENTS

TABLE

APPENDICES

1. INTRODUCTION

1.1 Background

The Township of Wellington North (Township) is currently undertaking a Schedule C Class Environmental Assessment (EA) to determine the most cost effective, environmentally sound, and sustainable approach to upgrade the Arthur wastewater treatment plant (WWTP) to provide servicing to a design year of 2031. XCG Consultants Ltd. (XCG) has been retained by the Township to undertake the Arthur WWTP Class EA. A preferred design concept has been selected as part of Phase 3 of the Class EA process. The preferred concept is to twin the existing extended aeration package plant to provide treatment up to 2,300 m^3/d.

Since completion of Phase 3 of the Class EA process, the Arthur WWTP has recorded a significant increase in raw influent flow. As such, the Township wishes to investigate the option of phasing in the plant capacity increase to address the recent increases in flow. A preliminary evaluation of existing treatment capacity indicated that an interim capacity of 1,860 m^3/d could be achieved by upgrading only some of the unit processes. Therefore, plant upgrades could be completed in two phases, with the rated plant average day flow (ADF) being 1,860 m^3/d in Phase 1, and 2,300 m^3/d in Phase 2.

As part of the ongoing Class EA process, two sludge handling options were previously considered (XCG, 2014). Specifically, these options were:

- Option A: Liquid biosolids storage in onsite tanks; and,
- Option B: Geotextile dewatering and cake storage in an onsite facility.

Ultimate selection of the preferred sludge handling option was left open until preliminary design. In addition to the options above, two additional options have been proposed for Phase 1 interim sludge management at the Arthur WWTP:

- Option C: Utilize existing available onsite biosolids storage at the Arthur WWTP and ship excess biosolids for storage at the Mount Forest WWTP; and,
- Option D: Utilize existing available onsite biosolids storage and secure off-site disposal through a contract with a third party (i.e. Lystek).

As a result of the two phase upgrade, the Township now wishes to revisit the evaluation of sludge management options to identify a recommended preferred option for Phase 1.

1.2 Objectives

Overall, the objectives of this technical memorandum (TM) are to:

- Determine the conceptual level design basis for sludge production at the Arthur WWTP at the Phase 1 interim ADF capacity (1,860 m^3/d) and at the Phase 2 ADF capacity (2,300 m^3/d); and,
- Evaluate the implementation of each identified solution at the interim Phase 1 capacity. The evaluation will consider capital and operational costs while also considering the implementation of each option at the Phase 2 capacity.
- Identify a recommended preferred sludge management option for the interim Phase 1.

2. SUMMARY OF DESIGN BASIS

2.1 Influent Flows and Loads

Table 2.1 presents the plant influent design wastewater flows and loads at both the interim Phase 1 and Phase 2 capacities of 1,860 m^3/d and 2,300 m^3/d, respectively. Projected flows and loads include contributions from domestic wastewater and Industrial / Commercial / Institutional (ICI) contributors. Details regarding the development of these flows and loads are presented in a separate report (XCG, 2015).

Table 2.1 Summary of Arthur WWTP Design Basis

Parameter	Existing	Phase 1 (Interim)	Phase 2
ADF	1,342 m^3/d	1,860 m^3/d	2,300 m^3/d
MDF	6,722 m^3/d	7,853 m^3/d	8,784 m^3/d
MDF Factor	5.0	4.2	3.8
PIF	9,920 m^3/d	11,592 m^3/d	12,887 m^3/d
PIF Factor	7.4	6.2	5.6
BOD_5			
Average Loading	207 kg/d	291 kg/d	363 kg/d
Maximum Month Loading (2)	- (1)	437 kg/d	545 kg/d
Average Concentration	154 mg/L	157 mg/L	158 mg/L
TSS			
Average Loading	190 kg/d	291 kg/d	377 kg/d
Maximum Month Loading (2)	- (1)	437 kg/d	566 kg/d
Average Concentration	142 mg/L	157 mg/L	164 mg/L
TKN			
Average Loading	43.5 kg/d	60.0 kg/d	74.0 kg/d
Maximum Month Loading (2)	- (1)	89.9 kg/d	111 kg/d
Average Concentration	32.4 mg/L	32.2 mg/L	32.2 mg/L
TP			
Average Loading	6.40 kg/d	10.1 kg/d	13.3 kg/d
Maximum Month Loading (2)	- (1)	15.2 kg/d	19.9 kg/d
Average Concentration	4.77 mg/L	5.44 mg/L	5.77 mg/L

Notes:
ADF - Average Day Flow
MDF - Maximum Day Flow
PIF - Peak Instantaneous Flow
BOD_5 - 5-day Biochemical Oxygen Demand
TSS - Total Suspended Solids
TKN - Total Kjeldahl Nitrogen
TP - Total Phosphorus

1. Accurate estimation of existing maximum month loading factors is not available from existing data.
2. Estimations of maximum month loading for Phase 1 and Phase 2 developed assuming a typical maximum month factor of 1.5.

2.2 Sludge Generation

Design sludge generation rates were developed based on the projected raw wastewater loads presented in Table 2.1. It is important to note that plant operational data over the review period (2007 – 2014) did not contain data regarding waste activated sludge (WAS) concentrations or WAS generation rates. As such, sludge generation rates were developed assuming a typical observed WAS yield (Y_{obs}) of 0.6 kg VSS/kg BOD_5 and a typical VSS:TSS ratio of 0.6 for activated sludge facilities without primary clarification (Metcalf & Eddy, 2003). A summary of the sludge generation design basis at the Phase 1 and Phase 2 ADF capacities is presented in Table 2.2.

Table 2.2 Summary of Arthur WWTP Sludge Generation Design Basis

Parameter	Phase 1 (Interim)	Phase 2
ADF	1,860 m^3/d	2,300 m^3/d
Raw Influent BOD_5		
Average Loading	291 kg/d	363 kg/d
Maximum Month Loading (1)	437 kg/d	543 kg/d
WAS TSS (2)		
Average Loading	291 kg/d	363 kg/d
Maximum Month Loading (1)	437 kg/d	543 kg/d
WAS VSS (2)		
Average Loading	175 kg/d	218 kg/d
Maximum Month Loading (1)	262 kg/d	327 kg/d
WAS Flow (3)		
Average Loading	14.6 m^3/d	18.2 m^3/d
Maximum Month Loading (1)	21.9 m^3/d	27.2 m^3/d
Biosolids Flow (4) (Aerobic Digester Effluent)		
Average Flow	11.2 m^3/d	13.7 m^3/d
Maximum Month Flow (1)	16.8 m^3/d	20.5 m^3/d

Notes:
1. Estimations of maximum month loading for Phase 1 and Phase 2 developed assuming a typical maximum month factor of 1.5.
2. Calculated assuming a typical WAS yield (0.6 kg VSS/kg BOD_5) and VSS:TSS ratio (0.6).
3. Assumed WAS concentration of 2%.
4. Assumed 38% VS destruction, and thickening of digested solids to 2% in the secondary digester through decanting.

3. SLUDGE MANAGEMENT AT THE ARTHUR WWTP

Currently, all biological sludge produced at the Arthur WWTP is stabilized in a two-stage aerobic digestion process. The existing combined (primary and secondary) digestion volume is approximately 468 m^3. In addition, there exist four biosolids holding tanks which provide an estimated 600 m^3 of storage. Each storage tank has a volume of approximately 150 m^3. Oxygen to the aerobic digesters and storage tanks is provided by two blowers. Each blower is rated to supply 150 L/s against 45 kPa discharge pressure.

There are several options for future management of biological sludge produced at the Arthur WWTP. Two options which were previously considered as part of the ongoing Class EA are as follows:

- Option A: Onsite aerobic digestion, with onsite storage and seasonal land application of liquid biosolids.
- Option B: Onsite aerobic digestion, with onsite storage of biosolids using geotextile tubes. Dewatered cake is land applied seasonally.

With respect to both Option A and Option B, it is important to note existing aerobic digestion facilities require expansion to provide adequate stabilization of projected maximum month sludge flows for both Phase 1 and Phase 2 capacities.

The previous evaluation of alternative treatment design concepts found that, while the estimated capital cost of Option B was lower than Option A, the technology used in Option B is relatively unproven on the scale required at Phase 2 flows. As such, previous evaluations deferred selection of a preferred alternative for sludge management to the preliminary design phase (XCG, 2014).

In addition to the options above, the following options were considered as part of this review:

- Option C: Onsite aerobic digestion, with liquid biosolids storage onsite in available storage tanks and excess biosolids shipped to Mount Forest WWTP for storage. Liquid biosolids are land applied seasonally.
- Option D: Liquid biosolids are shipped to the Lystek regional processing facility located in Dundalk, Ontario. A sub-option would involve periodic dewatering and disposing of the cake at the Lystek facility.

With respect to Option C, it is assumed sludge must be fully stabilized before being stored onsite or at the Mount Forest WWTP. With respect to Option D, biological solids are not required to be stabilized before disposal at the Lystek facility.

The purpose of this section is to evaluate the implementation of each sludge management option above at the projected Phase 1 interim plant capacity. Each evaluation will present the estimated capital and operational costs while also considering the implementation of each option at the Phase 2 capacity.

3.1 Aerobic Digestion

At the Phase 2 capacity, the previous investigation found an additional 300 m^3 of digestion volume is required to provide adequate retention at maximum month flows (XCG, 2014).

This would be accomplished through the conversion of two existing holding tanks into digesters. After conversion, the total available digestion volume would be 768 m^3. In addition, it was noted that additional blower capacity may be required at Phase 2 flows to facilitate complete stabilization (XCG, 2014).

For Options A, B, and C, biosolids are required to be stabilized prior to storage and ultimate disposal. Previous investigation noted that adequate treatment in the liquid treatment train can be achieved at a mixed liquor concentration of 3,800 mg/L and a solids retention time (SRT) of 14 days (XCG, 2015).

Assuming an additional 300 m^3 of digestion volume is provided now, the total digestion volume at the Phase 1 capacity is 768 m^3. At the projected Phase 1 maximum month digester flow (see Table 2.2), the estimated digester SRT is approximately 28 days. Typical design parameters suggest aerobic digestion facilities provide a minimum 45 day SRT, including the SRT of the liquid treatment process (MOE, 2008). Under maximum month digester loading conditions, the estimated combined SRT of the liquid and solids treatment trains is 42 days, slightly below the recommended design guidelines under maximum month conditions.

As previously defined in the Alternative Design Concepts Review (XCG, 2014), upgrades required to meet aerobic digestion requirements at Phase 2 flows involved converting two biosolids storage tanks to aerobic digestion volume. Therefore, no further increases to the aerobic digester volume would be needed to meet Phase 2 requirements.

As noted in previous investigations, upgrades to the digester aeration system may be required as flows to the aerobic digesters increase (i.e. at Phase 1 capacity flow). During preliminary design, oxygenation requirements based on design loadings should be reviewed. An allowance to increase digester blower capacity has been included in the capital cost estimates. The estimated capital costs for upgrading/expanding the aerobic digestion process is $900,000.

For Option D, solids are disposed of at the Lystek regional processing facility in Dundalk, Ontario. This facility can accept both digested and undigested biosolids. As such, biosolids processed under Option D are not required to be stabilized prior to disposal (i.e. do not require a 45 day retention time in the treatment process) and there are no upgrades required to achieve the Phase 1 capacity.

Table 3.1 summarizes the Phase 1 modifications required to the existing digestion process for each option. Specifically, the table quantifies the number of holding tanks to be converted, and if blower capacity expansion is required.

Table 3.1 Summary of Digestion Upgrades for Phase 1

	Option A	Option B	Option C	Option D
Conversion of sludge holding tanks for additional digester capacity	Yes (2 tanks)	Yes (2 tanks)	Yes (2 tanks)	Not Required
Allowance for blower capacity expansion	Yes	Yes	Yes	Not Required

3.2 Biosolids Storage

3.2.1 Option A – Onsite Liquid Biosolids Storage

MOECC design guidelines recommend onsite biosolids storage facilities provide for a minimum of 240 days or 8 months of storage volume. Using the projected biosolids production in Table 2.2, a summary of the required biosolids storage for the Arthur WWTP is given in Table 3.2.

Table 3.2 Summary of Option A Storage Requirements

Parameter	Phase 1 (Interim)	Phase 2
ADF	1,860 m^3/d	2,300 m^3/d
Average Biosolids Production (1)	11.2 m^3/d	13.7 m^3/d
Total Storage Required	2,688 m^3	3,276 m^3
Total Existing Storage (2)	300 m^3	300 m^3
Total Additional Storage Required	2,388 m^3	2,976 m^3

Notes:
1. Assumed 38% VS destruction, and thickening of digested solids to 2% in the secondary digester.
2. After conversion of two cells to aerobic digesters

The proposed solution as part of the Evaluation of Alternative Treatment Design Concepts for the Arthur WWTP (XCG, 2014) involved the construction of two biosolids storage tanks, each with a volume of 1,650 m^3. Based on results presented in Table 3.2, both storage tanks would be required at the Phase 1 interim capacity. As such, there exists no opportunity to defer upgrade costs with this option. The estimated capital costs for construction of two biosolids storage tanks is approximately $4.2 million.

3.2.2 Option B – Onsite Geotextile Dewatering and Storage

Requirements for geotextile dewatering and storage at the Phase 2 plant capacity have previously been detailed in the Evaluation of Alternative Treatment Design Concepts for the Arthur WWTP (XCG, 2014). A summary of the proposed geotextile dewatering has been reproduced from this document, and is shown as Table 3.3.

Based on the design biosolids generation rate for Phase 1, all three Geotube units would be required. As such, it is not feasible to phase in implementation of the geotextile dewatering solution. The complete dewatering volume proposed for the Phase 2 plant capacity would be installed at the Phase 1 interim plant capacity. The estimated capital cost for installation of onsite geotextile dewatering units is $1.4 million.

Table 3.3 Geotextile Dewatering and Cake Storage Requirements for Phase 2

Parameter	Average Day
Average Biosolids Generation	280 kg/d (1)
Design Dewatered Sludge Concentration	18 % TS (2)
Estimated Volumetric Dewatered Sludge Volume Requiring Storage (3)	420 m^3
Recommended Number of Geotube® Units (2)	3
Size of Each Geotube® Unit (2)	13.7 m circumference x 17.4 m length (45 ft circumference x 57 ft length)

Notes:
1. Based on the average WAS generation rate of 363 kg/d and assuming 38% VSS destruction in the digestion process
2. Based on quote supplied by Bishop Water Technologies Inc.
3. Based on 240 days of storage.

3.2.3 Option C – Offsite Liquid Biosolids Storage (Mount Forest WWTP)

The Mount Forest WWTP is located approximately 25 km north of the Arthur WWTP. The Mount Forest WWTP is equipped with the following digestion/storage equipment:

- Two aerated digestion/storage tanks (each 320 m^3);
- Two aerated digestion/storage tanks (each 662 m^3); and,
- One aerated digestion/storage tank (1,987 m^3).

Therefore, the total digestion/storage volume available at the Mount Forest WWTP is approximately 3,951 m^3.

Using results presented in the Mount Forest WWTP annual reports (2012 to 2014), an estimated 254 m^3 of digester volume is required to stabilize current sludge flows. Assuming future plant loading and sludge flows increase proportionally to plant influent flow, an estimated minimum 554 m^3 is required to stabilize sludge generated at the Mount Forest WWTP when it reaches its rated capacity. Therefore, digestion at current and future flows at the Mount Forest WWTP can be provided by one 320 m^3 tank operating as a primary digester and one 320 m^3 tank operating as a secondary digester. This will provide a total volume of 640 m^3 for digestion.

Digested solids produced at the Mount Forest WWTP are stored onsite. Sufficient volume to store 240 days of biosolids produced at the Mount Forest WWTP will be reserved in the storage tanks. Remaining storage volume beyond what is required by the Mount Forest WWTP can be used for excess biosolids produced at the Arthur WWTP. A summary of biosolids storage requirements for the Mount Forest plant is given in Table 3.4.

Table 3.4 Summary of Estimated Biosolids Storage Requirements for the Mount Forest WWTP

Parameter	Mount Forest WWTP Current Operation	Mount Forest WWTP Certificate of Approval (CofA) Capacity Operation
Estimated Average Day Mount Forest WWTP Digester Effluent Flow (1)	8.1 m^3/d	10.7 m^3/d
Required Storage Volume for biosolids produced at the Mount Forest WWTP (2)	1,944 m^3	2,568 m^3
Total Available Storage at the Mount Forest WWTP	3,311 m^3	3,311 m^3
Total Excess Storage Capacity available for Arthur WWTP biosolids	1,367 m^3	743 m^3

Notes:
1. Assumed 38% VS destruction, and thickening of digested solids to 2% in the secondary digester.
2. For biosolids produced at the Mount Forest WWTP. Assumed 240 day onsite storage requirement.

Results in Table 3.4 suggest there is additional biosolids storage capacity available at the Mount Forest WWTP. Specifically, there is an estimated 1,367 m^3 storage volume available under current operation, and 743 m^3 available at the CofA rated capacity.

From Table 3.2, the required storage for Arthur WWTP biosolids at both the Phase 1 interim capacity and the Phase 2 capacity exceeds available storage capacity at the Mount Forest WWTP. As such, Option C is not feasible for implementation as a stand-alone solution. However, use of excess storage capacity at the Mount Forest WWTP may allow for the deferred construction of one of the two onsite storage tanks proposed in Section 3.2.1 for the Phase 1 interim capacity.

Under this solution, approximately 738 m^3 of digested biosolids would be transported to the Mount Forest WWTP per year at the Phase 1 capacity at an estimated hauling cost of \$7.50/m^3. This solution allows for the deferral of approximately \$1.55 million in capital costs associated with building the second biosolids storage tank at the Arthur WWTP.

3.2.4 Option D – Offsite Liquid or Cake Biosolids Disposal (Lystek)

The Lystek Regional Organic Materials Recovery Centre (OMRC) is located in Dundalk Ontario, approximately 50 km north of the Arthur WWTP. This facility accepts a wide variety of organic-based waste solids, and produces a fertilizer product using their patented Lystek process. Biosolids are not required to be stabilized prior to trucking to the OMRC.

Under Option D, existing digestion facilities would not be expanded. Biosolids produced in the liquid treatment train would be stored in the existing aerobic digester and storage tanks, and hauled to the OMRC as required. Option D does not achieve complete stabilization of waste biological solids onsite at the Arthur WWTP prior to hauling to the OMRC. In spite of this, some VS destruction is anticipated in the aerated holding tanks.

A summary of the estimated waste solids produced for Option D is given in Table 3.5. Estimations of waste sludge flow have been generated assuming a 15% reduction in volatile solids (i.e. partial digestion due to higher throughput), and the thickening of waste sludge to 2% TS in the holding tanks prior to disposal.

Table 3.5 Summary of Arthur WWTP Sludge Generation Design Basis - Option D

Parameter	Phase 1 Interim Capacity	Phase 2 Capacity
ADF	1,860 m^3/d	2,300 m^3/d
Biosolids TSS (2) (Holding Tank Effluent)		
Average Flow	265 kg/d	330 kg/d
Maximum Month Flow (1)	397 kg/d	494 kg/d
Biosolids Flow (3) (Holding Tank Effluent)		
Average Flow	13.2 m^3/d	16.5 m^3/d
Maximum Month Flow (1)	19.8 m^3/d	24.7 m^3/d

Notes:
1. Estimations of maximum month loading for Phase 1 and Phase 2 developed assuming a typical maximum month factor of 1.5.
2. Calculated assuming a typical WAS yield (0.6 kg VSS/kg BOD5) and VSS:TSS ratio (0.6). Assumed 15% VS destruction in the holding tanks.
3. Assumed thickening of digested solids to 2% in the secondary digester.

There is approximately 600 m^3 of aerated sludge storage available at the Arthur WWTP. Given the estimated production of waste sludge volumes in Phase 1 and Phase 2 in Table 3.5, haulage would be needed approximately once per month.

For Option D, Lystek has provided a cost estimate for the hauling and disposal of waste sludge at the OMRC. The quoted disposal cost is related to the solids concentration of the waste stream. Disposal cost estimations for Option D have been conservatively developed assuming a solids concentration of 2%. The estimated cost of disposal is $24/$m^3$ based on a quote provided by Lystek on November 9, 2015. A copy of this quote is included as Appendix B. It is assumed this cost will remain unchanged over the duration of the disposal period. Further, it is assumed Lystek has the capacity to receive all waste solids produced at the Arthur WWTP.

It is possible to further reduce hauling and disposal costs by dewatering the waste sludge to a solids concentration of 15% - 20% prior to disposal at the OMRC. However, the Arthur WWTP does not have an onsite dewatering process. As such, a mobile dewatering unit would be required to achieve the target solids concentrations. At a waste solids concentration of 2%, the estimated cost to operate a mobile dewatering service is $25/$m^3$ and the estimated disposal cost of the thickened sludge is $100/wet tonne. As such, the expected cost to dewater and dispose of the waste sludge exceeds the price quoted by Lystek to dispose of the 2% liquid waste sludge directly ($24/$m^3$).

For Option D, it is assumed that existing sludge loading mechanisms and infrastructure at the Arthur WWTP are sufficient for purposes of hauling solids to the OMRC. Further, since there are no required upgrades to the existing digesters and holding tanks, there are no capital costs associated with this option.

4. SUMMARY OF SLUDGE MANAGEMENT OPTIONS

4.1 Overview of Upgrades Required for Each Sludge Management Option

Using results presented in the preceding sections, Table 4.1 provides an overview of the required upgrades to achieve the Phase 1 and Phase 2 capacity in the solids treatment train at the Arthur WWTP.

Table 4.1 Summary of Upgrades Required to Increase Arthur WWTP Solids Treatment Train Capacity

Phase	Upgrade	Option A	Option B	Option C	Option D
Phase 1	Digester Allowance	• Conversion of two existing sludge holding tanks to aerobic digesters. • Upgrades include increased blower capacity and increased sludge transfer pump size.	• Conversion of two existing sludge holding tanks to aerobic digesters. • Upgrades include increased blower capacity and increased sludge transfer pump size.	• Conversion of two existing sludge holding tanks to aerobic digesters. • Upgrades include increased blower capacity and increased sludge transfer pump size.	• No upgrades required
	Biosolids Storage	• Construction of two new sludge holding tanks, each with a volume of 1,650 m^3.	• Construction of a Geotube dewatering facility.	• Construction of one new sludge holding tank with a volume of 1,650 m^3.	• No upgrades required
Phase 2	Digester Allowance	• No upgrades required	• No upgrades required	• No upgrades required	• No upgrades required
	Biosolids Storage	• No upgrades required	• No upgrades required	• Construction of one new sludge holding tank with a volume of 1,650 m^3.	• No upgrades required

4.2 Conceptual Level Cost

4.2.1 Capital Costs

Conceptual level capital cost analyses were completed for all four sludge management options presented above. Conceptual level cost estimates are generally considered to be accurate to -25% to +40%. Actual costs will depend on site specific factors such as soil and groundwater conditions, the engineering design applied, construction conditions at the time of tendering, and the extent of additional upgrades to the works that may be included in the final design. Capital costs include a 30 percent allowance for contingency and a 12 percent allowance for engineering, permits, and approvals.

A summary of the capital cost analysis is presented in Table 4.2.

Table 4.2 Summary of Conceptual Level Capital Cost Estimates [(1)]

Phase	Upgrade	Option A	Option B	Option C	Option D
Phase 1	Digester Allowance [(2) (3)]	$900,000	$900,000	$900,000	$0
	Biosolids Storage [(3)]	$4,200,000	$1,400,000	$2,646,000	$0
	Total Estimated Capital - Phase 1	**$5,100,000**	**$2,300,000**	**$3,546,000**	**$0**
Phase 2	Digester Allowance [(2) (3)]	$0	$0	$0	$0
	Biosolids Storage [(3)]	$0	$0	$2,646,000	$0
	Total Estimated Capital - Phase 2	**$0**	**$0**	**$2,646,000**	**$0**
Total Estimated Capital Costs (Both Phase 1 & 2)		**$5,100,000**	**$2,300,000**	**$6,192,000**	**$0**

Notes:
1. All costs are conceptual level opinions of probable costs and are considered to be accurate to within -25 to +40 percent exclusive of HST.
2. Includes modification of diffusers and piping, increase of blower capacity, increase of sludge transfer pumps, and other process piping.
3. Includes 12% engineering fee and 30% contingency.

The following conclusions can be made regarding the capital cost estimates:

- It has been assumed that existing infrastructure and sludge loading mechanisms at the Arthur WWTP are sufficient for future hauling needs. As such, Option D (disposal at the Lystek regional facility) has no associated capital costs. Option B (Geotubes) has the next lowest capital cost, estimated to be $2.3 million.
- Of all considered options, only Option C requires additional capital investment at Phase 2 flows.

4.2.2 Operation and Maintenance Cost Estimates

Estimated operation and maintenance (O&M) costs for sludge management at the Arthur WWTP include the following:

- A hydro allowance for additional sludge storage;
- An O&M allowance for additional Geotube equipment, if required;
- Additional sludge haulage to the Mount Forest WWTP, if required; and,
- Hauling and disposal of sludge.

For Options A, B, and C, digested sludge is seasonally land applied. Costs for the hauling and disposal of sludge were estimated from historical costs at the Arthur WWTP. For Option D, the estimated hauling and disposal cost was provided by Lystek on November 9, 2015. A copy of the Lystek cost proposal is included as Appendix B. For Option D, it was assumed cost estimates were unchanged over the planning period, and that Lystek has sufficient capacity to receive all sludge flows. The Township should consider confirming these assumptions with Lystek.

A summary of the estimated yearly O&M costs at current sludge flows and at the Phase 1 capacity is given in Table 4.3. Complete details of O&M cost estimations are given in Appendix A. For these estimations, a biosolids concentration of 2.0% was assumed for all options. Current digested sludge flows were estimated from plant annual records.

Table 4.3 Summary of Conceptual Level O&M Cost Estimates (1)

	Option A	Option B	Option C	Option D
Estimated Yearly O&M Costs - Current Flow	$36,000	$17,000	$30,000	$73,000
Estimated Yearly O&M Costs - Phase 1 Capacity Flow	$49,000	$25,000	$49,000	$116,000

Notes:
1. All costs are conceptual level opinions of probable costs and are considered to be accurate to within -25 to +40 percent exclusive of HST.

Results from Table 4.3 show that Option D has the greatest expected annual O&M costs of all sludge management options considered. Relative to Option B, O&M costs of Option D may represent an additional $56,000/year at current flows, and approximately $91,000/year at the Phase 1 capacity.

4.2.3 Conceptual Cost Summary

Table 4.4 summarizes the estimated net present value (NPV) of capital and operating costs for each option over a 5-Year period. A 5-Year period has been used as this is the estimated timeframe for the interim Phase 1 period. To generate NPV estimations, assumptions of the inflation rate (3%) and interest rate (5%) were required. Further it was assumed that total biosolids production would increase from current flows (as estimated by plant records) to Phase 1 capacity flows at the end of the 5 year period. This correlates to a biosolids production growth rate of approximately 12%.

Table 4.4 Summary of Conceptual Level Cost Estimates (1)

Phase	Option A	Option B	Option C	Option D
Capital Cost	$5,100,000	$2,300,000	$3,546,000	$0
5-Year NPV O&M Cost (2) (3)	$203,000	$109,000	$184,000	$448,000
5-Year Total NPV	**$5,303,000**	**$2,409,000**	**$3,730,000**	**$448,000**

Notes:
1. All costs are conceptual level opinions of probable costs and are considered to be accurate to within -25 to +40 percent exclusive of HST.
2. Calculated assuming the projected Phase 1 flows will be achieved at the end of the 5-year period (estimated biosolids production growth rate of 12%).
3. Assumes an inflation rate (3%) and interest rate (5%).

Despite having the greatest yearly O&M costs, Option D represents the most economical option over a 5-Year operational period given the listed assumptions.

5. SUMMARY AND CONCLUSIONS

As part of the ongoing Class EA process, four sludge handling options were considered as part of this review:

- Option A: Liquid biosolids storage in onsite tanks;
- Option B: Geotextile dewatering and cake storage in an onsite facility;
- Option C: Utilize existing available onsite biosolids storage at the Arthur WWTP and ship excess biosolids for storage at the Mount Forest WWTP; and,
- Option D: Utilize existing available onsite biosolids storage and secure off-site disposal through a contract with a third party, that is Lystek's Dundalk facility

At the Phase 1 plant capacity, the recommended preferred sludge management strategy is Option D. Under this option, all biosolids produced at the Arthur WWTP would be hauled to the Lystek regional processing facility located in Dundalk, Ontario. Although this option was found to have the greatest estimated yearly O&M costs, there are no required capital costs for its implementation. As such, it was found to be the most economically favourable solution over a short time period (i.e. 5 years). Further, implementation of Option D in the short term does not restrict possible sludge management strategies in the future.

At the Phase 2 plant capacity, Option A, B, and D all represent viable sludge management alternatives. As such, the final evaluation and selection of a biosolids management strategy should be completed at part of the preliminary design of the Phase 2 plant upgrade.

6. REFERENCES

XCG. (2014). Evaluation of Alternative Treatment Design Concepts – Arthur WWTP Class EA.

XCG. (2015). Effluent Quality and Capital Upgrades Required to Achieve an Interim Capacity Increase - Arthur WWTP Class EA.

Ontario Ministry of the Environment and Climate Change. (2008). Design Guidelines for Sewage Works.

Metcalf & Eddy. (2003). Wastewater Engineering Treatment and Reuse. 4th Edition.

APPENDIX A
O&M COST DETAILS

Table A.1 Summary of Conceptual Level O&M Cost Estimates - Current Biosolids Production (1)

Phase	Option A	Option B	Option C	Option D
Sludge Storage Hydro Allowance	$15,000	$0	$9,000	$0
Geotube O&M Allowance	$0	$10,000	$0	$0
Sludge Hauling to Mount Forest WWTP	$0	$0	$0 (2)	$0
Sludge Hauling and Disposal	$21,000	$7,000	$21,000	$73,000
Estimated Yearly O&M Cost	**$36,000**	**$17,000**	**$30,000**	**$73,000**

Notes:
1. All costs are conceptual level opinions of probable costs and are considered to be accurate to within -25 to +40 percent exclusive of HST.
2. At current estimated sludge production, sufficient storage capacity exists at the Arthur WWTP and no additional storage is required.

Table A.2 Summary of Conceptual Level O&M Cost Estimates - Phase 1 Capacity Biosolids Production (1)

Phase	Option A	Option B	Option C	Option D
Sludge Storage Hydro Allowance	$15,000	$0	$9,000	$0
Geotube O&M Allowance	$0	$13,000	$0	$0
Sludge Hauling to Mount Forest WWTP	$0	$0	$6,000	$0
Sludge Hauling and Disposal	$34,000	$12,000	$34,000	$116,000
Estimated Yearly O&M Cost	**$49,000**	**$25,000**	**$49,000**	**$116,000**

Notes:
1. All costs are conceptual level opinions of probable costs and are considered to be accurate to within -25 to +40 percent exclusive of HST.

APPENDIX B
COPY OF LYSTEK COST PROPOSAL

1425 Bishop St. N., Unit 16, Cambridge, ON N1R 6J9
T. 226.444.0186 TF. 888.501.6508 E. info@lystek.com

November 9, 2015

Township of Wellington North
7490 Side road 7 West
PO Box 125 Kenilworth, Ontario
N0G 2E0

Attention: Mr. Matt Aston – Director of Public Works

Re: Letter Proposal for Biosolids Processing, Storage & Marketing

As discussed with you recently, Lystek International Inc. (Lystek) is pleased to extend an offer to manage the biosolids produced at Township of Wellington North (the Township) Arthur Waste Water Treatment Plant (WWTP). Lystek proposes to accept and process liquid biosolids from the Township Arthur WWTP for a three year term starting in 2016, provided the terms specified in this proposal letter are agreed upon. Based on the information provided, we understand that the annual quantity is approximately 2,000 cubic metres of material at an average solids concentration of less than 4%.

The proposed terms and conditions for the acceptance and processing of this material at Lystek's Organic Materials Recovery Centre (OMRC) located at 191 Eco Parkway in the Township of Southgate, Ontario are:

1. This offer is inclusive of trucking/delivery of the materials to the Southgate OMRC. NOTE: If it is the preference of the Township to provide trucking of the materials to the Southgate OMRC, Lystek can provide a separate offer, at the request of the Township.
2. For the duration of this contract Lystek will hold 200 cubic meters of capacity per month for liquid biosolids from the Township Arthur WWTP. Volumes greater than 200 cubic meters can be accepted, but must be approved by Lystek prior to delivery.
3. Prior to receiving material, Lystek requires an analysis of the liquid biosolids material as well as additional analysis as (and if) it is obtained by the Township during the period that material is delivered to the OMRC. As part of Lystek's ongoing quality control measures, samples of the biosolids will be collected periodically; the results of these sampling events will be provided to the Township, if desired.
4. A base price of $24.00/cubic meter of liquid biosolids will be charged upon delivery to the OMRC that are 3% solids (or lower). A surcharge of $2 will be charged for each additional percentage of solids up to 7%, for example:
    - $24.00/cubic meter at a solids content of 3% or lower
    - $26.00/cubic meter at a solids content of 3 – 4%
    - $28.00/cubic meter at a solids content of 4 – 5%
    - $30.00/cubic meter at a solids content of 5 – 6%
    - $32.00/cubic meter at a solids content of 6 – 7%
    - Solids concentrations greater than 7% will be subject to prior approval from Lystek and will be subject to confirmation of the final average solids concentration and a revised price would be negotiated and agreed upon prior to shipping the material.

5. The liquid biosolids material will be received on a regular delivery schedule that is mutually agreed upon at least 48 hours in advance of delivery. The OMRC is open Monday - Friday (6:00am - 6:00pm) and Saturday (7:00am - 4:00pm).
6. Payments (as described in point 4 above) will be based on weigh scale records as collected at the Southgate OMRC (it is assumed that 1 tonne = 1 m3) as well as percent solids analysis performed by Lystek and confirmed by the Township (if preferred).
7. Invoices for materials received shall be issued on a monthly basis with a term of net 15 days for all receivables.

Should you have any questions please feel free to contact me any time.

Sincerely,

Mike Dougherty, P.Ag
Manager, Fertilizer Production and Distribution
Lystek International Inc.
Phone: 519.923.3539
Email: mdougherty@lystek.com

cc: *Rick Mosher – Lystek International Inc.*
Kevin Litwiller – Lystek International Inc.

APPENDIX H
EVALUATION OF WELLS ST. AND FREDERICK ST. SEWAGE PUMPING STATIONS

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.: 3-3167-01-01
February 3, 2016

TECHNICAL MEMORANDUM EVALUATION OF WELLS ST. AND FREDERICK ST. SEWAGE PUMPING STATIONS ARTHUR WWTP CLASS EA

Prepared for:

TOWNSHIP OF WELLINGTON NORTH
P.O. Box 125, 7490 Sideroad 7 W
Kenilworth, Ontario
N0G 3E0

Attention: Matthew Aston, Director of Public Works

Prepared by:

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

TABLE OF CONTENTS

TABLE

FIGURE

APPENDICES

1. INTRODUCTION

1.1 Background

The Township of Wellington North (Township) is currently undertaking a Schedule C Class Environmental Assessment (EA) to determine the most cost effective, environmentally sound, and sustainable approach to upgrade the Arthur Wastewater Treatment Plant to provide servicing to a design year of 2031. XCG Consultants Ltd. (XCG) has been retained by the Township to undertake the Arthur WWTP Class EA. A preferred design concept has been selected as part of Phase 3 of the Class EA process. The preferred concept is to twin the existing extended aeration package plant to provide treatment up to 2,300 m^3/d.

The Arthur wastewater collection system consists of a gravity sewer network with two sewage pumping stations (SPSs): the Wells St. SPS and the Frederick St. SPS. Each pumping station has a forcemain which discharges near the treatment plant. Over the review period (2007 – 2015), bypasses of the Frederick St. SPS have occurred during peak flow periods. As such, the Township wishes to evaluate the existing capacity of both pumping stations and determine if any upgrades and/or expansions are required to the study's design year of 2031.

1.2 Objectives

The overall objectives of this memorandum are to:

1. Define the existing flows to both the Wells St. SPS and the Frederick St. SPS based on available flow monitoring data; and,
2. Identify the upgrades and/or expansions required to each pumping station to adequately convey flow in their catchment areas to the study's design year of 2031.

1.3 Data Sources

The following sources were used to complete this analysis:

- The 2014 Inflow and Infiltration study (I/I), completed by Triton Engineering Services Ltd.;
- The 2012 Class EA Master Plan Study, completed by Triton Engineering Services Ltd.;
- Plant data and annual reports (2007 – 2015); and,
- Plant influent flow meter data from the ongoing flow study, beginning October 2014.

2. WELLS ST. SEWAGE PUMPING STATION

2.1 Description

The Wells St. SPS is located on Wells St., approximately 675 m south of Highway 6. The pumping station is equipped with the following:

- Two submersible pumps (one duty, one standby), each with a rated capacity of 16 L/s (1,382 m^3/d);
- One wet well with a total volume of approximately 120 m^3; and,
- One standby diesel generator.

Wastewater from the Wells St. SPS is pumped through a 150 mm diameter forcemain that is 1 km in length. It is discharged into the Preston St. trunk sewer at the intersection of Preston St. and Highway 6. Details of the forcemain location are shown in Appendix A, reproduced from the 2012 Master Plan.

The Wells St. SPS service area includes Wells St. E. and Smith St. between Wells and Preston St. It receives predominately industrial flows from industry located in the west part of Arthur. There have been no recorded bypass flows at the Wells St. SPS over the review period (2007 to 2014).

2.2 Existing Flows

Existing flow to the Wells St. SPS was estimated using data from the recently completed 2014 I/I study. During that study, flow meters were placed at several points in the collection system. These monitoring locations are detailed in Appendix B. 'Monitoring Location A' represents the flow meter placed in the Preston St. trunk sewer, downstream of the Wells St. SPS forcemain discharge point, but upstream of the Frederick St. SPS forcemain discharge point. The meter measured flow from both the Preston St. gravity sewer and the Wells St. SPS.

When pumps at the Wells St. SPS were active, there was a measurable impact on flows in the Preston St. sewer at 'Monitoring Location A'. As such, the time of pump operation and pumped volume from the Wells St. SPS could be approximated from detailed analysis of the measured flow data.

Estimated Average Day

The average day raw wastewater flow measured at the Arthur WWTP in 2014 was 1,733 m^3/d. However, during the 2014 I/I study period (March to May), the average raw wastewater flow measured at the treatment plant was approximately 2,254 m^3/d.

Four days from the I/I study period were selected for average day flow analysis from the Wells St. SPS. Days were selected where the total measured flow to the Arthur WWTP was comparable to the 2014 average day wastewater flow. Specifically, the following days were selected for analysis (the measured flow to the Arthur WWTP is presented in parentheses):

- March 14 (1,723 m^3/d);
- March 19 (1,858 m^3/d);
- May 8 (1,892 m^3/d) ; and,
- May 28 (1,737 m^3/d).

Flow profiles from each of the selected days were analyzed to estimate the total flow pumped from the Wells St. SPS, and the total pumping time. Flow measured at the Preston St. trunk sewer is shown as Figure 2.1, Figure 2.2, Figure 2.3, and Figure 2.4 for March 14, March 19, May 8, and May 28, respectively.

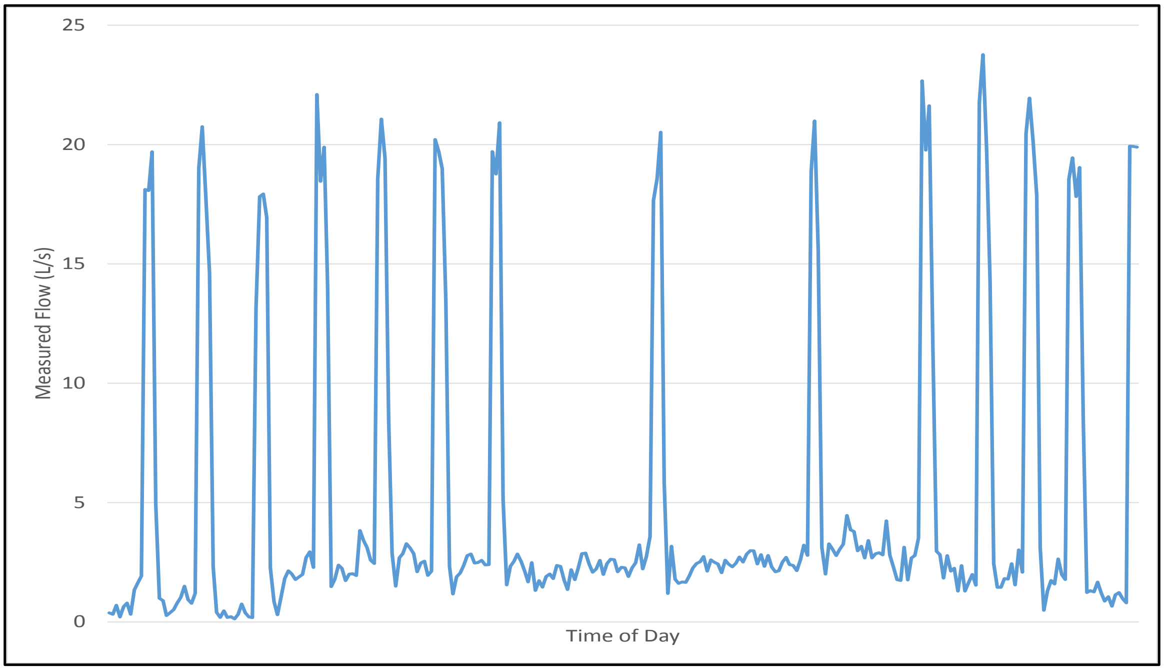


Figure 2.1 Flow Profile at Monitoring Location A – March 14, 2014

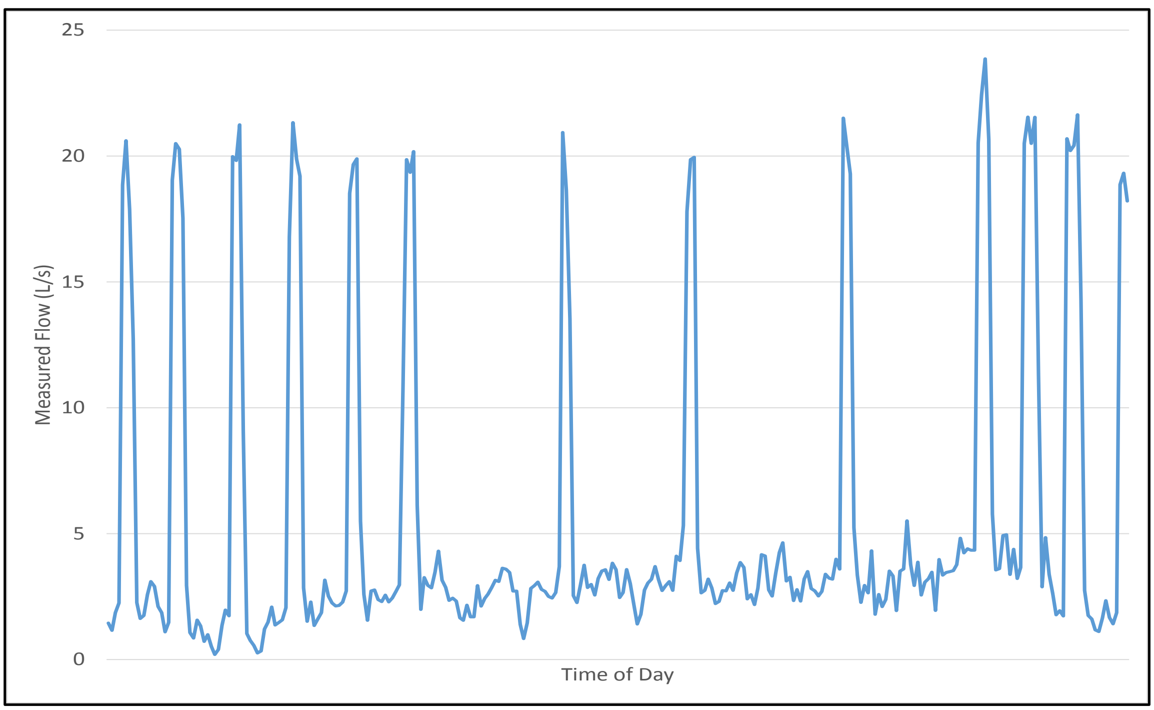


Figure 2.2 Flow Profile at Monitoring Location A – March 19, 2014

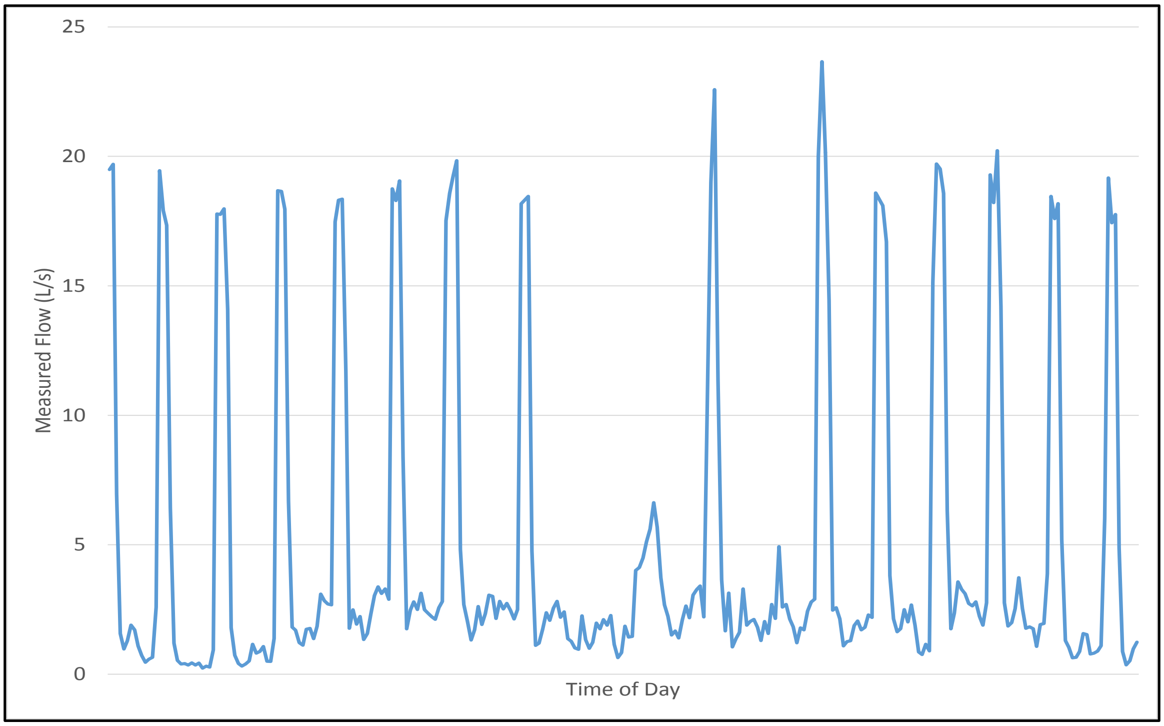


Figure 2.3 Flow Profile at Monitoring Location A – May 8, 2014

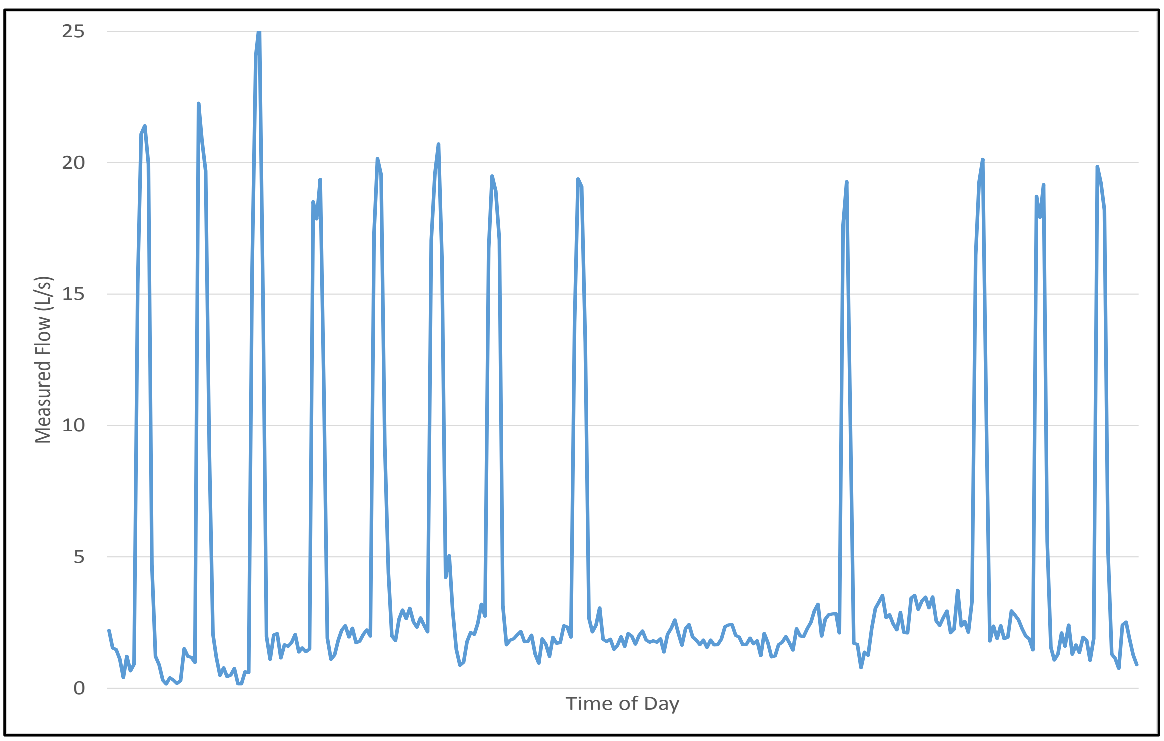


Figure 2.4 Flow Profile at Monitoring Location A – May 28, 2014

As discussed, each observed spike on the figures above correlate to a pumping period from the Wells St. SPS. From these figures, the total pumped volume and pumping time was estimated. This information is summarized in Table 2.1.

Table 2.1 Wells St. SPS Estimated Average Day Flow

	Total Pumped Volume (m^3)	Total Pumped Time (minutes)
March 14	240	250
March 19	235	245
May 8	254	265
May 28	202	210
Overall Average	233	243

Results presented in Table 2.1 show that, under average day conditions the Wells St. SPS was in operation approximately 17% of the day (243 minutes), and contributed approximately 233 m^3/d of wastewater flow treated at the Arthur WWTP.

Maximum Day

To evaluate operation of the Wells St. SPS under peak flows, two additional days from the I/I study period were selected for analysis: April 8 (measured flow to the Arthur WWTP of 5,274 m^3/d) and April 13 (measured flow to the Arthur WWTP of 7,070 m^3/d). Flow measured at the Preston St. trunk sewer ('Monitoring Location A') is shown as Figure 2.5 and Figure 2.6 for April 8 and April 13, respectively.

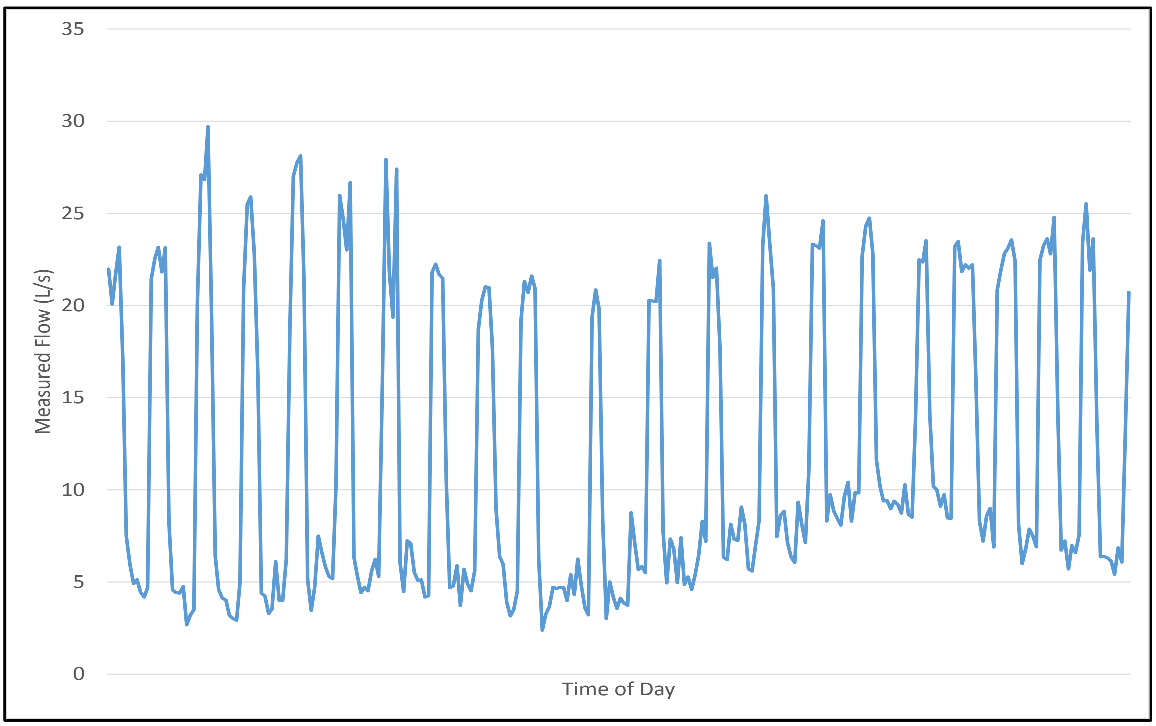


Figure 2.5 Flow Profile at Monitoring Location A – April 8, 2014

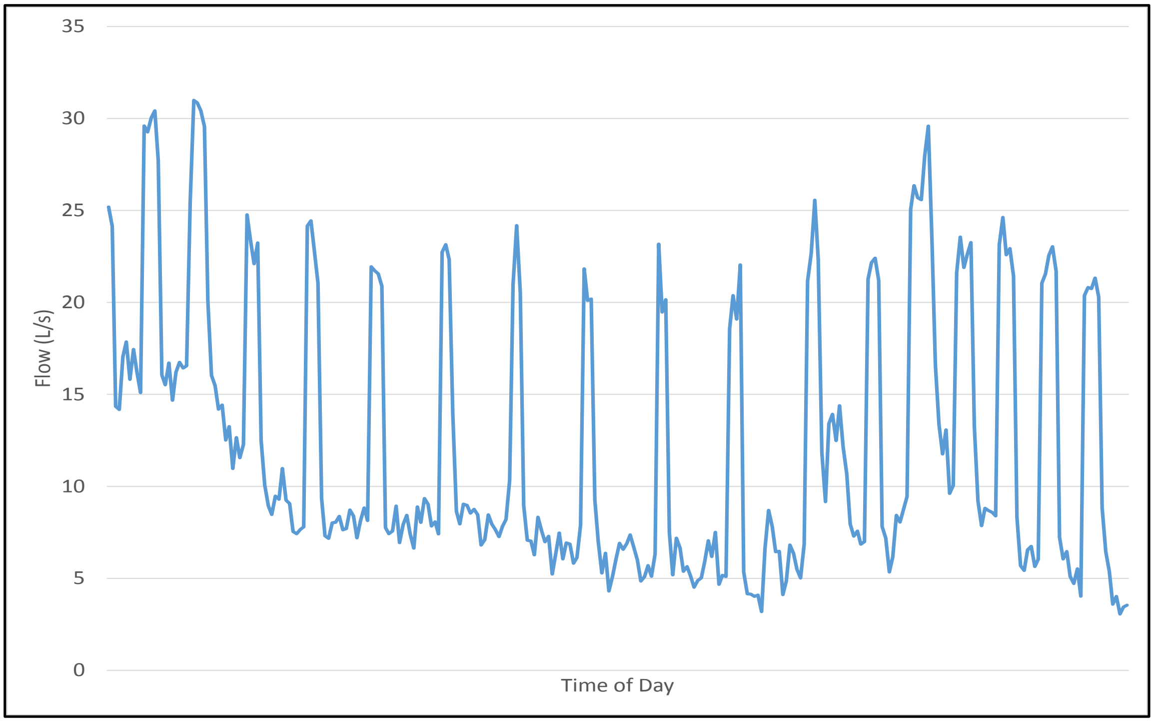


Figure 2.6 Flow Profile at Monitoring Location A – April 13, 2014

As discussed, each observed spike on the figures above correlate to a pumping period from the Wells St. SPS. From these figures, the total pumped volume and pumping time was estimated. This information is summarized in Table 2.2.

Table 2.2 Wells St. SPS Estimated Peak Day Flow

	Total Pumped Volume (m^3)	Total Pumped Time (minutes)
April 8, 2014	461	480
April 13, 2014	365	380

Results presented in Table 2.2 show that, under peak day conditions, the Wells St. SPS is in operation up to 33% of the day (480 minutes), and can contribute up to approximately 461 m^3/d to wastewater flow treated at the Arthur WWTP. Based on this evaluation, the maximum day factor was approximately 2.0 over the review period.

Peak Instantaneous

By typical design standards, the pumping capacity of a sewage pumping station is able to convey the expected peak instantaneous flow to the pumping station (MOE, 2008). As previously discussed, the majority of flow to the Wells St. SPS is from the surrounding industrial area. An estimate of the total contributing area was generated using maps provided in the 2014 I/I study and the 2012 Master Plan. Based on this contributing area, the expected peak factor was estimated to be 3.75 from literature sources documenting typical peak factors from industrial flow sources (MOE, 1985). This estimated peak instantaneous flow factor is also consistent with the observed maximum day factor at the Wells St. SPS. At the existing average day flow (233 m^3/d), the peak instantaneous flow to the Wells St. SPS is estimated to be approximately 874 m^3/d (10.1 L/s). The existing rated pumping capacity of the Wells St. SPS is 1,382 m^3/d (16.0 L/s).

2.3 Projected Flows

Based on projected growth in the Village of Arthur presented in the 2012 Master Plan, there are no additional industrial or residential flows expected to the Wells St. SPS service area from new development over the planning period. This assumes that any industrial development in lot V217 in the north of Arthur is directed to the Preston St. trunk sewer. As such, additional flows to the Wells St. SPS over the planning period are only expected from increases to existing industrial services.

Projections of future average day wastewater flows to the Arthur WWTP accounted for a 10 m^3/d increase in flow from Golden Valley Farms Inc., which discharges flow to the Wells St. SPS. This represents the only expected increase in flow to the Wells St. SPS over the planning period.

Including additional flow from Golden Valley Farms Inc., the future average day flow to the Wells St. SPS is estimated to be 243 m^3/d. Additional flow to the Wells St. SPS is expected to have a minimal impact on its operation on an average day basis.

Using a maximum day factor of 2.0, future maximum day flow to the Wells St. SPS is estimated to be 486 m^3/d. This represents a minor (25 m^3/d) increase from existing maximum day flow. As such, future flow is expected to have a minimal impact on maximum day operation of the Wells St. SPS.

Using a peak flow factor of 3.75, the estimated future peak instantaneous flow to the Wells St. SPS is 911 m^3/d (10.5 L/s). Future estimated peak flows are less than the existing rated pumping capacity of the Wells St. SPS of 16.0 L/s.

2.4 Summary Evaluation of the Wells St. SPS

Based on flow projections, the Wells St. SPS has sufficient capacity to transfer future average day, maximum day, and peak flows from its serviced area. As such, the Wells St. SPS does not require expansion.

3. FREDERICK ST. SEWAGE PUMPING STATION

3.1 Description

The Frederick St. SPS is located near the intersection of Frederick and Francis streets. The pumping station is equipped with the following:

- Two submersible pumps (one duty, one standby), each with a rated capacity of 58.4 L/s (approximately 5,045 m^3/d);
- One reinforced wet well, measuring approximately 5.3 m x 5.3 m x 6.2 m (deep); and,
- One 60 kW standby diesel generator with 450 L fuel tank.

The Frederick St. SPS receives the majority of wastewater flow from the village of Arthur, including the central, southern, and eastern portions of the system. Flows are predominately a mix of residential and commercial wastewater. The operating depth of the Frederick St. SPS wet well is approximately 0.7 m, and the operating volume is approximately 17.5 m^3. From the Frederick St. SPS, raw wastewater is pumped directly to the treatment plant via a 250 mm diameter forcemain. Details of the forcemain are shown in Appendix A, reproduced directly from the 2012 Master Plan.

Over the review period (2007 to 2014), there have been several recorded bypass events at the Frederick St. SPS. Bypasses occur during periods of high flow, primarily caused by heavy rainfall and/or snow melt. The bypass of the Frederick St. SPS is located in MH-175, on Frederick St. immediately in front of the pumping station. During a bypass event, periods of high flow cause the raw wastewater level to rise in the wet well and in the collection system immediately upstream of the wet well, including at MH-175. When the bypass level is reached, raw wastewater automatically flows over the bypass weir located in MH-175, which trips an alarm and begins a timer. Bypass flow is discharged to the Conestogo River. Bypass flows are not metered, but bypass volumes are estimated based on the bypass time recorded.

Previous bypasses at the Frederick St. SPS have illustrated the need to increase pumping capacity. Based on typical design guidelines, the capacity of the pumping station will be sized to handle future projected peak flows to the pumping station (MOE, 2008). Projected peak flows to the Frederick St. SPS were estimated based on existing base flows plus an allowance for growth to 2031.

3.2 Existing Flows

Existing flows to the Frederick St. SPS were estimated using data collected during the recently completed 2014 I/I study. During that study, flow meters were placed at several points in the collection system, as detailed in Appendix B. Cumulatively, flow measured at ‘Monitoring Location B’, ‘Monitoring Location C’, and ‘Monitoring Location D’ represent the total influent flow to the Frederick St. SPS.

Using data collected during the 2014 I/I study, Frederick St. SPS flow represents approximately 80% of total flow measured in the collection system on an average daily basis. Based on the established average day flow (ADF) for the Arthur WWTP (1,342 m^3/d), the estimated Frederick St. SPS ADF is approximately 80% of the influent WWTP flow, or 1,074 m^3/d.

It is important to note that measured flow at 'Monitoring Location B' showed unexplained peak flows of significant magnitude on April 13, 2014. These peak flows were measured during a bypass period at the Frederick St. SPS. Figure 3.1 details the measured depth, measured velocity, and calculated flow at 'Monitoring Location B' on April 13, 2014. Recorded SPS bypass periods are shown on this figure.

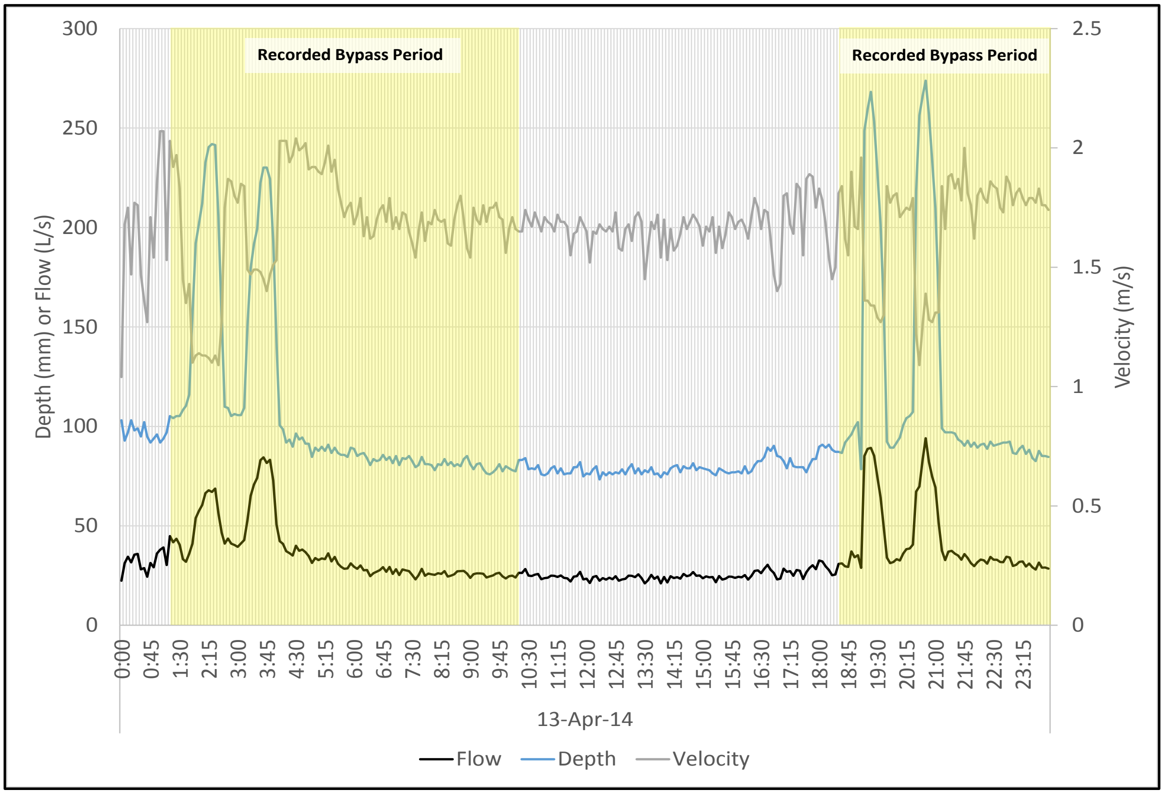


Figure 3.1 Detailed Flow Monitoring Information from Monitoring Location B on April 13, 2014

Plant records indicate bypass at the Frederick St. SPS was also observed on April 8 and April 10-11, 2014. Detailed flow monitoring information (i.e. depth, velocity, flow) for these days from 'Monitoring Location B' is shown as Figure 3.2 and Figure 3.3, respectively. Similar to above, the recorded bypass period is highlighted on each figure.

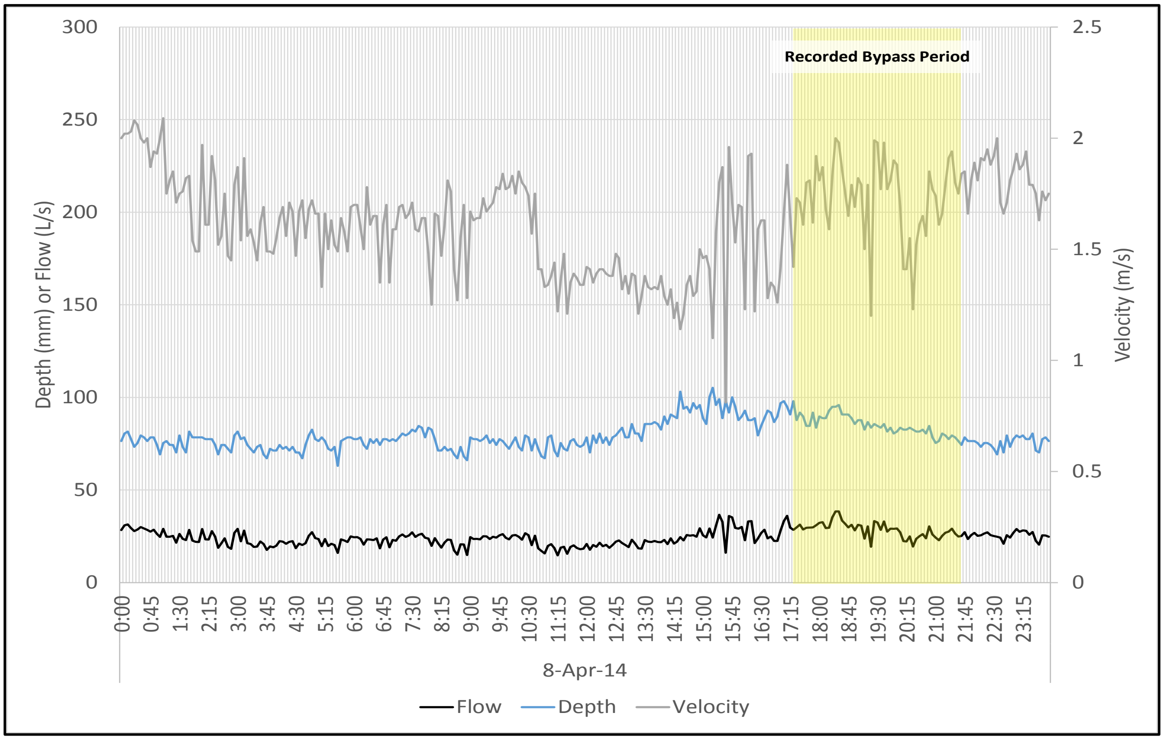


Figure 3.2 Detailed Flow Monitoring Information from Monitoring Location B on April 8, 2014

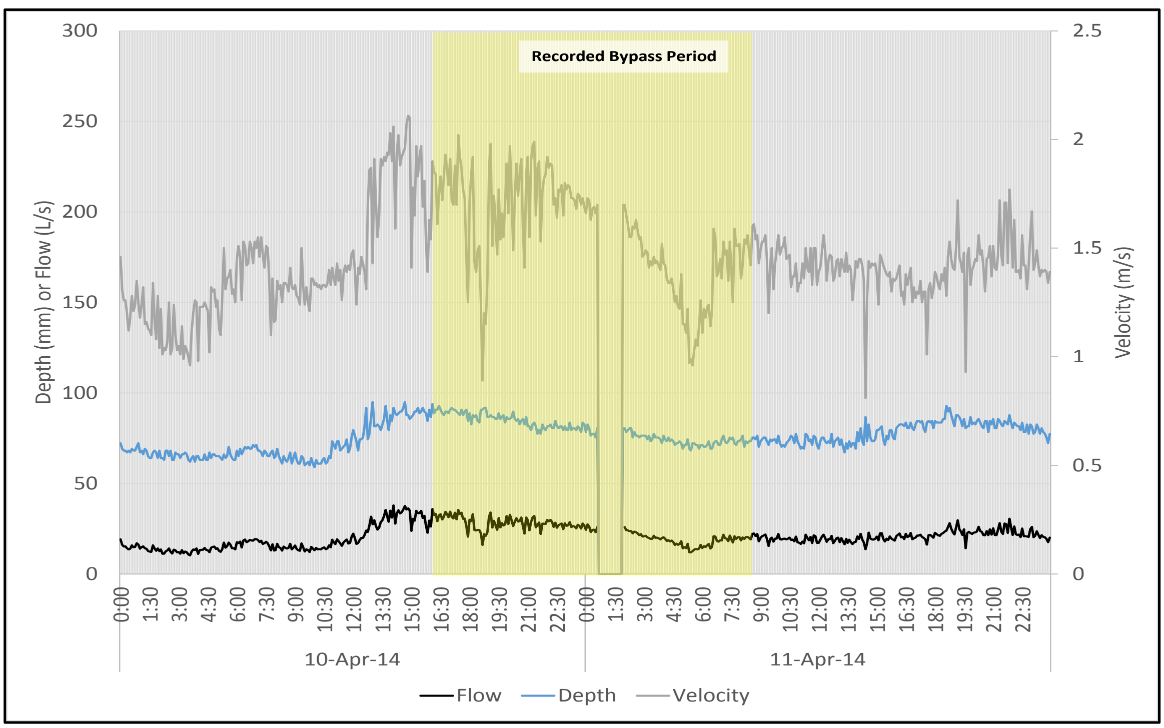


Figure 3.3 Detailed Flow Monitoring Information from Monitoring Location B on April 10 and April 11, 2014

Results in Figure 3.2 and Figure 3.3 indicate that peak flows similar to those measured on April 13 at 'Monitoring Location B' were not observed at the same monitoring location during other periods of high flows and bypasses at the Frederick St. SPS.

As such, recorded flows during the four highest peak periods from 'Monitoring Location B' on April 13, 2014 were not considered representative of actual flow data, and were excluded from further consideration.

In order to conduct flow analysis for the Frederick St. SPS, measured flow at 'Monitoring Location B' on April 13, 2014 was adjusted to exclude the identified peak periods. Figure 3.4 plots the recorded flow and an adjusted flow at 'Monitoring Location B', shown in red, on April 13, 2014. Periods of recorded SPS bypass have been highlighted.

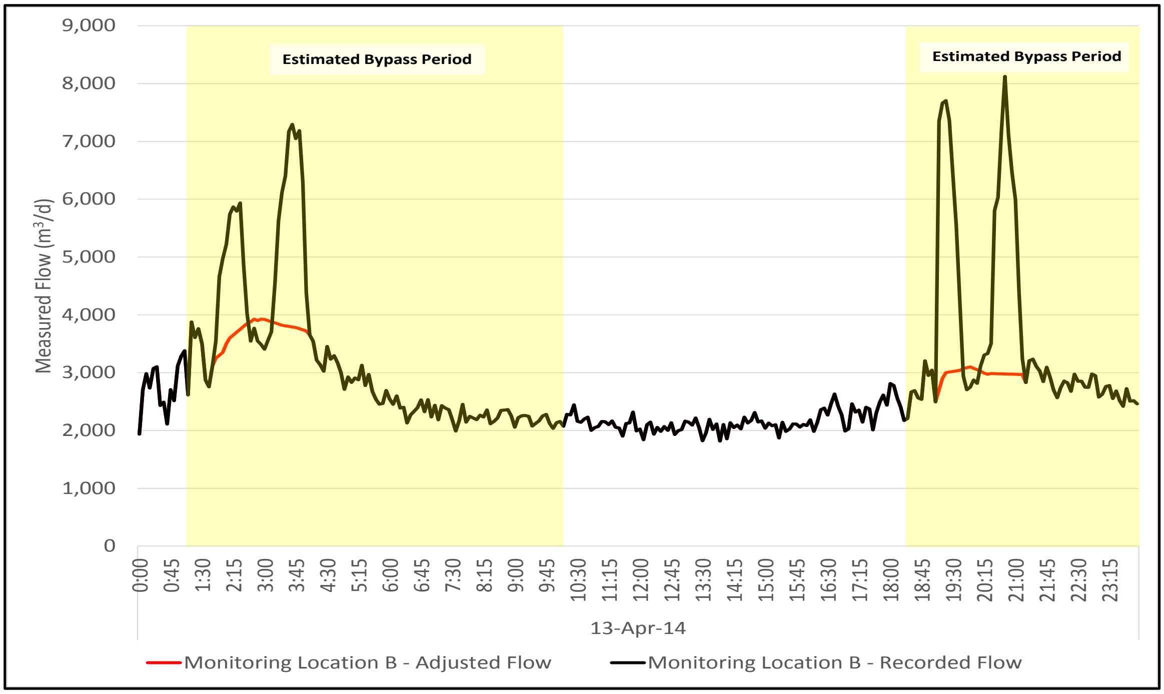


Figure 3.4 Measured Flow at Monitoring Location B on April 13, 2014

Table 3.1 contains a summary of existing average day, maximum day, and peak instantaneous flows.

Table 3.1 Summary of Estimated Flows to the Frederick St. SPS during the 2014 I/I Study (March to May)

	Flow	Factor
Average Day Flow	1,074 m^3/d (1)	-
Maximum Day Flow	6,019 m^3/d (2)	5.6
Peak Instantaneous Flow	7,776 m^3/d (2)	7.2

Notes:

1. Average flow estimated from the average fraction of total flow to the Frederick St. SPS (0.8), and the established Arthur WWTP ADF (1,342 m^3/d).
2. Maximum day and peak instantaneous flow estimated using adjusted flow measurements from 'Monitoring Location B' plus measured flow from 'Monitoring Location C' and 'Monitoring Location D' to calculate total influent flow to the Frederick St. SPS.

3.3 Projected Flows

Average Day Flow

Growth flows to the Frederick St. SPS were estimated based on planned residential and commercial development in the Frederick St. SPS catchment area, as detailed in the 2012 Master Plan. These planned developments were used as the basis to estimate future required capacity at the Arthur WWTP.

Table 3.2 presents details of the planned development in the Frederick St. SPS service area from the 2012 Master Plan. There are two important notes regarding the development of this table:

- In the 2012 Master Plan, residential development WN-52 was reclassified as a long term development based on discussions with municipal staff.
- During the development of the proposed 2,300 m^3/d average day flow to the Arthur WWTP, additional development at the Eastridge Landing subdivision was included (XCG, 2013).

In order to develop a conservative estimate of future flow to the Frederick St. SPS, both developments listed above have been considered as part of this analysis.

Table 3.2 Summary of Planned Development in the Frederick St. SPS Service Area to 2031

Development	Units / Hectares (1)	Equivalent Service Population (2)
Residential		
WN-52 (3)	91	251
WN-55	55	152
WN-37	2	6
WN-48	12	33
WN-54	57	157
WN-62	35	97
WN-79	10	28
Eastridge Expansion (4)	-	284
Commercial		
1192	1.7	63
1194	1.8	67
Total Growth Equivalent Service Population		**1,138**

Notes:
1. Developable units (residential) or hectares (commercial) as defined in 2012 Master Plan.
2. Equivalent service population estimated based on 2.76 persons per unit (residential), or assuming a developed commercial flow of 17 m^3/ha and an equivalent population per capita flow of 460 L/cap/d.
3. Designated as 'long-term' development, included here to establish a conservative design basis.
4. Previous flow projections have accommodated for additional expansion in the Eastridge subdivision, beyond that reported in the 2012 Master Plan. Included here to establish a conservative design basis.

From Table 3.2, the total growth equivalent service population is estimated to be 1,138 persons. The average day flow growth was estimated based on a design dry weather per capita flow of 370 L/cap/d and an average I/I allowance of 90 L/cap/d, consistent with previous projections developed as part of this study.

The total average day flow growth is estimated to be 523 m^3/d. Future projected 2031 average day flow to the Frederick St. SPS is estimated to be 1,597 m^3/d.

Maximum Day Flow

Future maximum day flow was calculated based on the existing maximum day flow (see Table 3.1), plus an allowance for new growth. This was done by applying the historic dry weather flow (DWF) factor (2.1) to the non-I/I portion of the per capita flow rate (370 L/cap/d), and applying a typical maximum per capita generation rate of 227 L/cap/d for I/I flows (MOE, 2008).

Using this method, the estimated maximum day flow growth is 1,143 m^3/d. Total estimated future maximum day flow to the Frederick St. SPS is 7,162 m^3/d.

Peak Instantaneous Flow

Future PIF values were calculated based on the observed base PIF (see Table 3.1), plus a peak flow allowance for new growth. To calculate the PIF allowance for new growth, a PIF peaking factor for the new growth flows was determined using the Harmon peaking factor. The Harmon peaking factor was applied to the design non-I/I portion of the per capita flow value (370 L/cap/d). A typical peak I/I rate (227 L/cap/d) was also considered in estimation of peak flows (MOE, 2008). The Harmon peaking factor was calculated to be 3.2 based on the ultimate design equivalent population of 5,055 persons at an ADF of 2,300 m^3/d.

Using this method, the peak flow growth was estimated to be 1,605 m^3/d. Total estimated future peak instantaneous flow to the Frederick St. SPS is 9,381 m^3/d (or approximately 110 L/s).

Overall Projected Flow to the Frederick St. SPS

Total future average day and peak flows to the Frederick St. SPS is summarized in Table 3.3.

Table 3.3 Growth Avera.ge and Peak Flow to the Frederick St. SPS

	Frederick St. SPS Flow (m^3/d)
Design ADF	
Existing	1,074 m^3/d
Growth	523 m^3/d
Overall	**1,597 m^3/d**
MDF Factor	
Existing	5.6
Growth	2.2
Overall	**4.5**
Design MDF	
Existing	6,019 m^3/d
Growth	1,143 m^3/d
Overall	**7,162 m^3/d**
PIF Factor	
Existing	7.2
Growth	3.1
Overall	**5.9**
Design PIF	
Existing	7,776 m^3/d
Growth	1,605 m^3/d
Overall	**9,381 m^3/d**

Future capacity of the Frederick St. SPS should be designed to handle the estimated future peak instantaneous flow to the pumping station. Results in Table 3.3 indicate that the future capacity of the Frederick St. SPS is required to be at least 9,381 m^3/d (approximately 110 L/s).

3.4 Equalization

Under the proposed phased expansion of the Arthur WWTP, equalization would be provided at the WWTP to attenuate peak flows at the Phase 1 rated capacity (1,860 m^3/d). At the Phase 2 capacity (2,300 m^3/d), the equalization tank would be converted to an extended aeration plant to increase the biological treatment capacity of the liquid treatment train. Additional details regarding phased expansion of the Arthur WWTP are available in the Effluent Quality and Capital Upgrades Required to Achieve an Interim Capacity Increase Technical Memorandum (XCG, 2015).

Conceptual level upgrade requirements for the Frederick St. SPS have been developed assuming that an equalization tank will be constructed at the Arthur WWTP and that the conveyance system between the treatment plant and storage lagoons will be upgraded as required during Phase 1 of the WWTP expansion. With these upgrades at the WWTP, additional equalization at the Frederick St. SPS would not be required. In spite of this, this evaluation should be updated during preliminary design of the Phase 1 upgrades, once design flows have been refined, to determine if providing equalization at the Frederick St. SPS can offset capital costs associated with upgrades to the secondary effluent pumping system and/or provision of equalization volume at the Arthur WWTP.

At Phase 2, it is possible that the addition of equalization volume at the Frederick St. SPS may reduce capital upgrades required at the treatment plant. This should be further evaluated during preliminary design of the Phase 2 plant expansion using an updated and finalized flow design basis.

Equalization at the Frederick St. SPS may be provided through construction of an above-grade bolted steel tank, which is expected to be the most cost-effective solution. Equalization may also be provided by constructing a below-grade concrete tank.

3.5 Conceptual Level Upgrade and Expansion Requirements and Capital Costs

3.5.1 Upgrade and Expansion Requirements

To achieve capacity to a design year of 2031, it is assumed additional land adjacent to the existing Frederick St. SPS will be acquired by the Township. At a conceptual level, expansion of the Frederick St. SPS will be facilitated through the construction of two new wet wells, each measuring 3.0 m x 3.0 m x 8.0 m, and equipped with a new pump and VFD controller. The operating depth within the wet well would be approximately 1.5 m, providing an operating volume of approximately 27 m^3. Operating volume within the wet well has been conceptually sized to accommodate future projected peak flows (110 L/s) given typical design guidelines for pumping stations (MOE, 2008). The existing wet well and pumps would be retained to provide emergency overflow volume. New VFD controllers will be contained within the existing generator building. Required wet well dimensions and operating volumes should be confirmed during preliminary design.

A new, larger generator will be installed in a self-contained outdoor unit onsite. A channel monster (i.e. grinder) will be installed in a precast concrete chamber upstream of the new wet wells. A bypass overflow of the channel monster will be provided.

An overview of the required expansion to the Frederick St. SPS is located in Figure 3.5. As previously discussed, construction of an equalization tank at the Frederick St. SPS was not considered as part of this analysis and has not been shown in the figure. The need for equalization at the Frederick St. SPS will be evaluated during preliminary design of the Phase 1 and Phase 2 plant expansion. Figure 3.5 shows there is space available onsite if equalization at the Frederick St. SPS is required in the future.

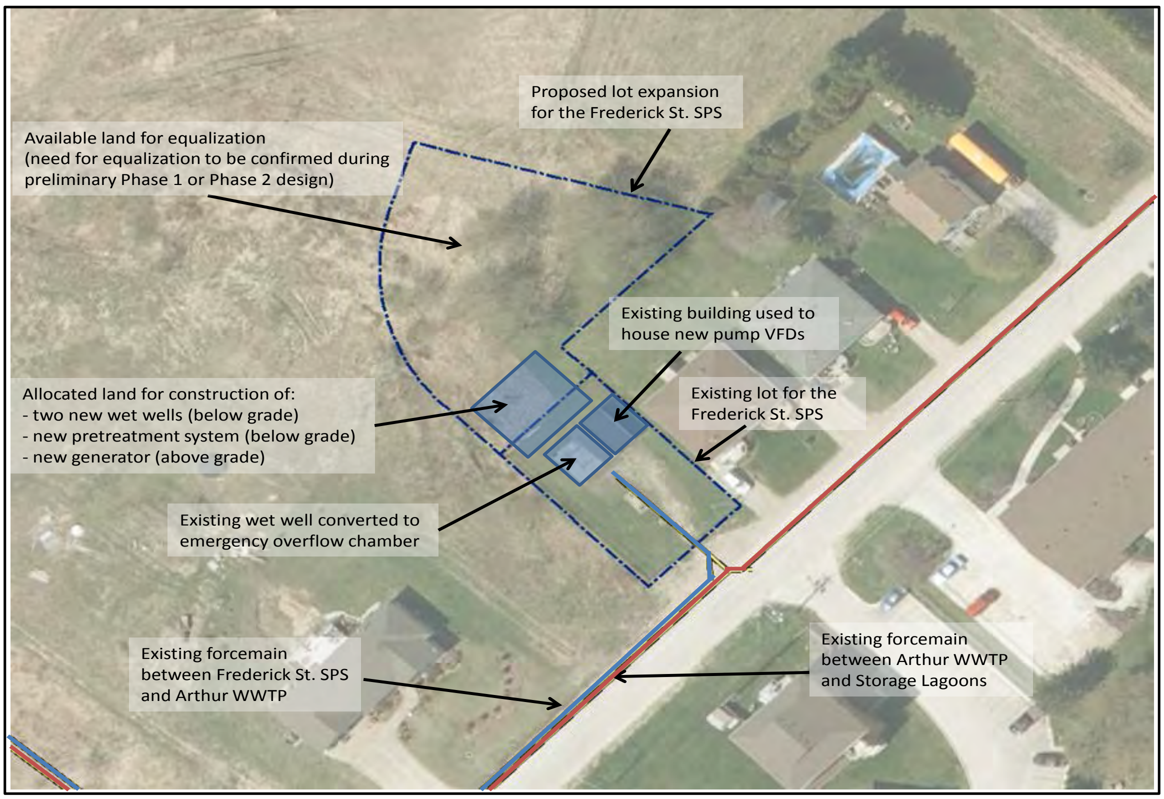


Figure 3.5 Frederick St. SPS Site Layout

3.5.2 Capital Costs

Conceptual level capital cost analyses were conducted for expansion of the Frederick St. SPS to handle projected 2031 flows. Conceptual level capital costs include allowances for the purchase of additional land, construction of new wet wells, new pumps, and provision of a larger backup generator. No upgrades are required to the forcemain to convey flows to the WWTP.

Previous analysis has shown that existing and projected peak flow factors to the Frederick St. SPS and the Arthur WWTP are high (XCG, 2015). It may be possible to attenuate future peak flows through construction of an equalization tank at the Arthur WWTP, or at the Frederick St. SPS. Conceptual cost estimates presented in this report have not considered the construction of an equalization tank onsite at the Frederick St. SPS. As previously discussed, the feasibility of constructing an equalization tank at the Frederick St. SPS at Phase 1 and/or Phase 2 should be further evaluated during preliminary design of the upgrades to the Arthur WWTP.

Conceptual level cost estimates are generally considered to be accurate to -25% to +40%. Actual costs will depend on site specific factors such as soil and groundwater conditions, the engineering design applied, construction conditions at the time of tendering, and the extent of additional upgrades to the works that may be included in the final design. Capital costs include a 30 percent allowance for contingency and a 12 percent allowance for engineering and approvals.

A summary of conceptual level capital costs is given in Table 3.4. The total estimated capital cost to expand capacity of the Frederick St. SPS is approximately $2.9 million.

Table 3.4 Summary of Conceptual Level Cost Estimates for Expansion of the Frederick St. SPS (1)

	Estimated Cost
General/Miscellaneous	$140,000
Site Works	$610,000
Sewage Pumping Station	$1,196,000
Allowance for Land Purchase	$75,000
Subtotal	$2,021,000
Contingency (30%)	$606,300
Engineering (12%)	$242,520
Estimated Total Capital Costs (2)	**$2,900,000**

Notes:
1. All costs are conceptual level opinions of probably costs and are considered to be accurate to within -25 to +40 percent exclusive of HST.
2. Estimated total capital costs are rounded up to the nearest hundred thousand.

4. *SUMMARY AND CONCLUSIONS*

The purpose of this report was to evaluate the capacity of the Wells St. SPS and the Frederick St. SPS to determine if any upgrades and/or expansions are required to the study's design year of 2031.

There have been no recorded bypasses at the Wells St. SPS over the review period (2007 - 2014). Further, there is limited expected growth in the Wells St. SPS catchment area, and the capacity of the existing pump is sufficient to handle future projected peak flows. As such, there are no required upgrades to the Wells St. SPS.

Based on an evaluation of current and future flows, the Frederick St. SPS requires expansion to provide a firm pumping capacity of 110 L/s. Upgrades would consist of the construction of new wet wells, installation of new pumps, a new generator, retaining the existing building to house new VFDs, and retaining the existing wet well and pumps for emergency overflow storage. The conceptual level capital cost associated with these upgrades is approximately $2.9 million. The need for an equalization tank at the Frederick St. SPS should be confirmed during preliminary design of the Phase 1 and Phase 2 upgrades at the Arthur WWTP. Providing equalization at the Frederick St. SPS may reduce upgrade requirements at the Arthur WWTP.

5. REFERENCES

Ontario Ministry of the Environment. (1985). Design Guidelines for Water Treatment and Sewage Treatment Plants.

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

Triton Engineering Services Limited. (2012). Class Environmental Assessment Master Plan Study for Water Supply and Sanitary Sewage Systems.

Triton Engineering Services Limited. (2014). Community of Arthur Infiltration and Inflow Investigation.

XCG Consultants Ltd. (2013). Proposed Design Flows – Arthur WWTP Class EA.

XCG Consultants Ltd. (2015). Effluent Quality and Capital Upgrades Required to Achieve an Interim Capacity Increase – Arthur WWTP Class EA.

APPENDIX A
DETAILS OF THE ARTHUR COLLECTION SYSTEM

TOWNSHIP OF WELLINGTON NORTH

ARTHUR WATER AND SANITARY SERVICING MASTER PLAN

SEWER SIZING:

- 200mm
- 250mm
- 300mm
- 375mm
- 450mm
- FORCEMAINS
- LAGOON OVERFLOW

FIGURE 4.1

SANITARY SYSTEM SEWER SIZE

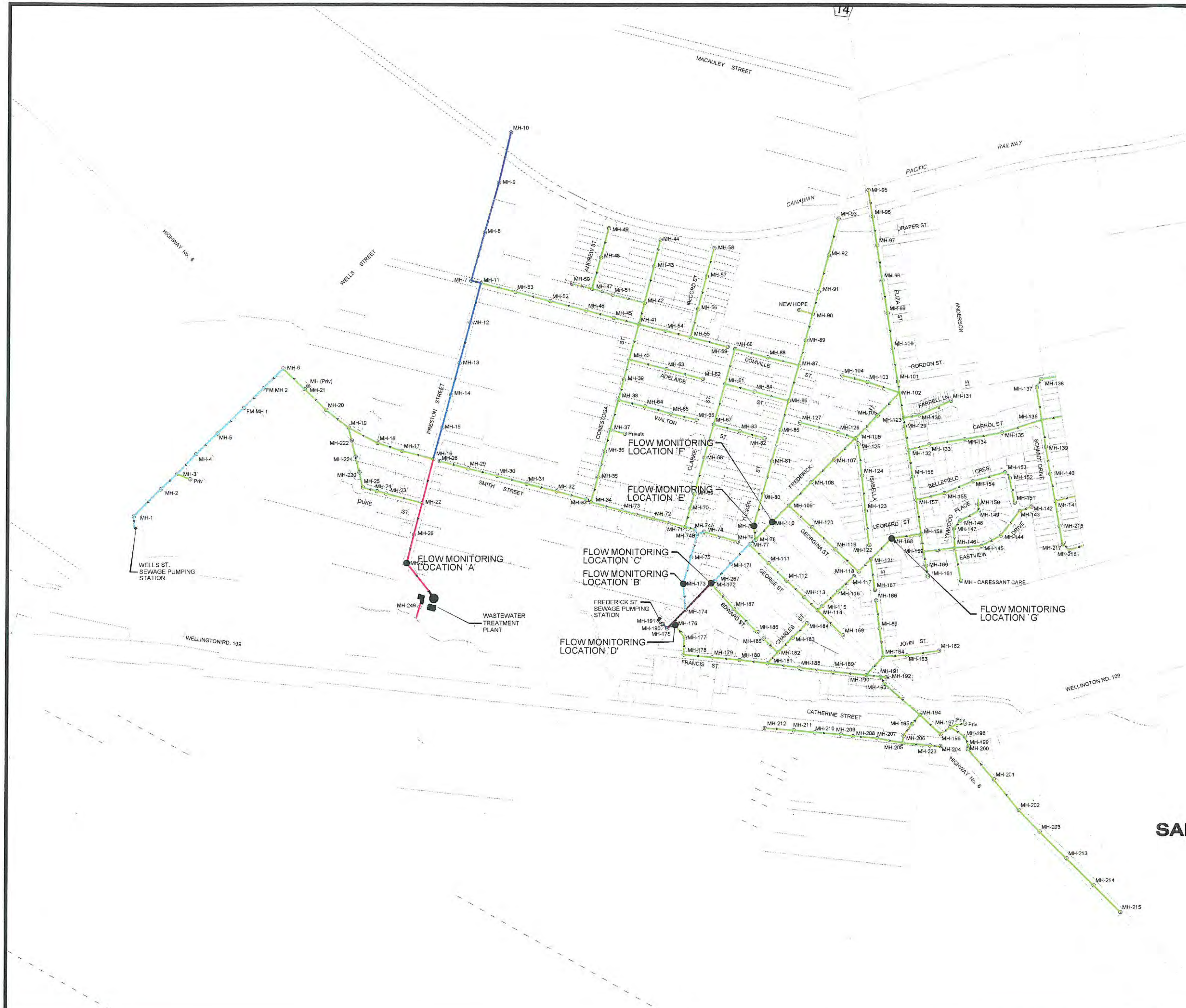
SCALE 1:10,000
A5514

TRITON ENGINEERING SERVICES LIMITED
Consulting Engineers
Fergus, Ontario

APPENDIX B
2014 I/I STUDY FLOW MONITORING LOCATION DETAILS

TOWNSHIP OF WELLINGTON NORTH

ARTHUR SANITARY SERVICING INFILTRATION/INFLOW INVESTIGATION



SEWER SIZING:

- 200mm
- 250mm
- 300mm
- 375mm
- 450mm
- FLOW MONITORING LOCATION

FIGURE 2a

MAHOLE LOCATIONS & SANITARY SEWER DIAMETERS

SCALE 1:10,000
A5510 (14) - R41

TRITON ENGINEERING SERVICES LIMITED
Consulting Engineers
Fergus, Ontario

APPENDIX I
PUBLIC, AGENCY, STAKEHOLDER AND ABORIGINAL CONSULTATION

APPENDIX I

PUBLIC, AGENCY, STAKEHOLDER AND ABORIGINAL CONSULTATION

I-1

PROJECT MAILING LIST

Township of Wellington North
Arthur Wastewater Treatment Plant Class Environmental Assessment
Agency and Stakeholder Contact List

Agency/Organization	Contact	Contact Information	Phone/Fax/E-Mail
Provincial			
Ministry of Aboriginal Affairs	Ms. Polly Dondy-Kaplan Senior Policy Advisor Consultation Unit	160 Bloor St. E., 9th Floor Toronto, ON M7A 2E6	Phone: 416-325-1057 E-mail: polly.dondy-kaplan@ontario.ca
Ministry of Aboriginal Affairs	Ms. Pam Wheaton Director, Aboriginal and Ministry Relationships Branch	160 Bloor St. E., 9th Floor Toronto, ON M7A 2E6	Phone: 416-326-4053 Fax: 416-325-1066 E-mail: Pam.Wheaton@ontario.ca
Ministry of the Environment and Climate Change 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 and Climate Change 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 the Environment and Climate Change Guelph District Office	Ms. Amy Shaw District Supervisor	4th Floor 1 Stone Road West Guelph, ON N1G 4Y2	Phone: 519-826-3126 E-mail: amy.shaw@ontario.ca
Ministry of the Environment and Climate Change Guelph District Office	Mr. Cameron Hall Senior Environmental Officer	4th Floor 1 Stone Road West Guelph, ON N1G 4Y2	Phone: 519-826-4261 E-mail: cameron.hall@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, Culture and Sport	Mr. Joseph Muller Heritage Planner Culture Services Unit Programs and Services Branch	401 Bay Street, Suite 1700 Toronto, ON M7A 0A7	Phone: 416-314-7145 Fax: 416-314-7175 E-mail: joseph.muller@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
	Municipal Services Office - Western		
Ministry of Natural Resources and Forestry	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 and Forestry	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
Grand River Conservation Authority	Ms. Beth Brown Supervisor of Resource Planning	400 Clyde Road P.O. Box 729 Cambridge, ON N1R 5W6	Phone: 519-621-2763, ext. 2229 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: 519-621-2761 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
Municipal			
The Township of Wellington North	Mayor Andy Lennox	7490 Sideroad 7 West P.O. Box 125 Kenilworth, ON N0G 2E0	Phone: 519-831-9612 E-mail: alennox@wellington-north.ca
The Township of Wellington North	Mr. Dan Yake Councillor, Ward 1	7490 Sideroad 7 West P.O. Box 125 Kenilworth, ON N0G 2E0	Phone: 519-323-2334 E-mail: dyake@wellington-north.ca
The Township of Wellington North	Ms. Sherry Burke Councillor, Ward 2 Chair, Water/Sewer Committee	7490 Sideroad 7 West P.O. Box 125 Kenilworth, ON N0G 2E0	Phone: 519-323-2604 E-mail: sburke@wellington-north.ca
The Township of Wellington North	Mr. Lisa Hern Councillor, Ward 3	7490 Sideroad 7 West P.O. Box 125 Kenilworth, ON N0G 2E0	Phone: 519-321-1598 E-mail: lhern@wellington-north.ca
The Township of Wellington North	Mr. Steve McCabe Councillor, Ward 4	7490 Sideroad 7 West P.O. Box 125 Kenilworth, ON N0G 2E0	Phone: 519-321-9352 E-mail: smccabe@wellington-north.ca
The Township of Wellington North	Mr. Dale Clark Roads Superintendent	7490 Sideroad 7 West P.O. Box 125 Kenilworth, ON N0G 2E0	Phone: 519-848-3620, ext. 31 E-mail: dclark@ wellington-north.ca

Agency/Organization	Contact	Contact Information	Phone/Fax/E-Mail
The Township of Wellington North	Mr. Michael Givens Chief Administrative Officer	7490 Sideroad 7 West P.O. Box 125 Kenilworth, ON N0G 2E0	Phone: 519-848-3620, ext. 27 E-mail: mgivens@wellington-north.com
The Township of Wellington North	Ms. Karen Wallace Clerk	7490 Sideroad 7 West P.O. Box 125 Kenilworth, ON N0G 2E0	Phone: 519-848-3620, ext. 27 E-mail: kwallace@wellington-north.com
The Township of Wellington North	Mr. Dale Small Business and Economic Manager	7490 Sideroad 7 West P.O. Box 125 Kenilworth, ON N0G 2E0	Phone: 519-848-3620, ext. 34 E-mail: dsmall@wellington-north.com
The Township of Wellington North	Mr. Barry Lavers Director of Recreation, Parks and Facilities	7490 Sideroad 7 West P.O. Box 125 Kenilworth, ON N0G 2E0	Phone: 519-848-3620, ext. 23 E-mail: blavers@wellington-north.com
The Township of Wellington North	Mr. Darren Jones Chief Building Official	7490 Sideroad 7 West P.O. Box 125 Kenilworth, ON N0G 2E0	Phone: 519-848-3620, ext. 62 E-mail: djones@wellington-north.com
County of Wellington	Mr. Mark Van Patter Senior Planner	74 Woolwich Street Guelph, ON N1H 3T9	Phone: 519-837-2600, ext. 208 E-mail: markv@county.wellington.on.ca
Arthur and District Chamber of Commerce	Mr. Corey Bilton President	P.O. Box 519 146 George Street Arthur, ON N0G 1A0	Phone: 519-848-5603 E-mail: achamber@wightman.ca
Utilities			
Hydro One Networks Inc.	Ms. Jane Zhang Transmission Lines Sustainment System Investment Asset Management	483 Bay Street, 5th Floor Toronto, ON M5G 2P5	Phone: 416-345-4251 E-mail: Jane.Zhang@HydroOne.com
Wellington North Power Inc.	Ms. Judy Rosebrugh President and CEO	290 Queen Street West P.O. Box 359 Mount Forest, ON N0G 2L0	Phone: 519-323-1710 E-mail: jrosebrugh@wellingtonnorthpower.com
Wellington North Power Inc.	Mr. Matthew Aston Manager of Operations	290 Queen Street West P.O. Box 359 Mount Forest, ON N0G 2L0	Phone: 519-323-1710 E-mail: maston@ wellingtonnorthpower.com
Rogers Cable	Mr. Ted Hancocks	85 Grand Crest Place P.O. Box 488 Kitchener, ON N2G 4A8	
Bell Canada	Ms. Gayle Widmeyer Manager	575 Riverbend Drive, 2nd Floor Kitchener, ON N2K 3S3	

Agency/Organization	Contact	Contact Information	Phone/Fax/E-Mail
	Access Network Department		
Canadian Pacific Railway	Mr. Matt Foot Service Area Manager Engineering Operations	2025 McCowan Road Scarborough, ON M1S 5K3	Phone: 416-297-3006
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. Paul Rietdyk Director of Operations	50 Keil Drive North Chatham, ON N7M 5M1	Phone: 519-352-3100
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	
First Nations			
Mississaugas of the New Credit First Nation	Ms. 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	Mr. 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
Stakeholders			
Golden Valley Farms	Mr. Keith Hehn	50 Wells Street P.O. Box 670 Arthur, ON N0G 1A0	Phone: 519-848-3110
Abate Rabbit Packers	c/o Mr. J. Abate	7597 Jones Baseline Arthur, ON N0G 1A0	Phone: 519-848-2107
Ontario Clean Water Agency	Mr. Scott Craggs	West Highland Hub	Phone: 519-941-1938

Agency/Organization	Contact	Contact Information	Phone/Fax/E-Mail
	Operations Manager	78 Centennial Rd., Unit 6 Orangeville, ON L9W 1P9	Fax: 519-941-1794 E-mail: scraggs@ocwa.com
All Treat Farms Limited	Mr. George White President	7963 Wellington Rd. 109 R.R. # 4 Arthur, ON N0G 1A0	Phone: 519-848-3145 E-mail: georgew@alltreat.com
Conestogo Lake Cottager's Association		133 Weber Street North Suite # 3-323 Waterloo, ON N2J 3G9	
Triton Engineering Services Limited	Ms. Christine Furlong	105 Queen Street West, Unit 14 Fergus, ON N1M 1S6	Phone: 519-843-3920 Fax: 519-843-1943 E-mail: cfurlong@tritoneng.on.ca
K.J. Behm and Associates Inc.	Mr. Kenneth J. Behm	55 Erb Street East, Suite 320 Waterloo, ON N2J 4K8	Phone: 519-742-3510 E-mail: kjbehm@bellnet.ca
S. Burnett & Associates Limited	Mr. Steve Burnett	210 Broadway, Unit #203 Orangeville, ON L9W 5G4	Phone: 519-941-2949 E-mail: stephen.burnett@sbaengineering.com
Eramosa Engineering Inc.	Mr. Brady Cowan	90 Woodlawn Road West Guelph, ON N1H 1B2	Phone: 519-763-7774 E-mail: brady.cowan@eramosa.com

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

I-2

NOTICE OF COMMENCEMENT

– ***NEWSPAPER AD***

– ***EXAMPLE LETTERS***

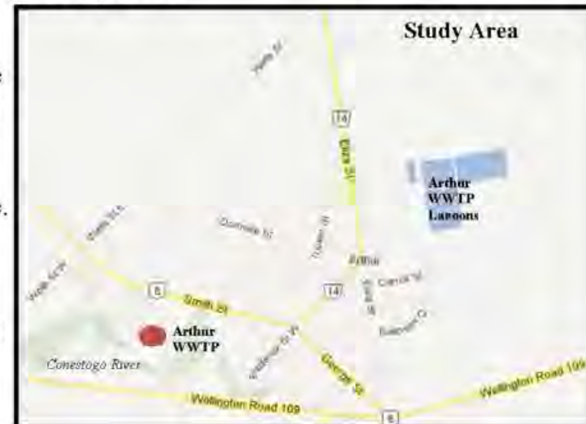
NOTICE OF COMMENCEMENT

CLASS ENVIRONMENTAL ASSESSMENT
ARTHUR WASTEWATER TREATMENT PLANT

The Arthur Wastewater Treatment Plant (WWTP) is owned and operated by the Township of Wellington North (the Township). The Township has initiated a Class Environmental Assessment (EA) to examine options for increasing the capacity of the WWTP.

The Arthur WWTP consists of an extended aeration facility complete with effluent filtration and aerobic digestion and conventional lagoons for seasonal effluent storage. The rated capacity of the facility is 1,465 m^3/day expressed as an annual average flow.

Current flows, combined with development commitments, have resulted in a situation where there is limited capacity for future growth. The goal of the study is to examine alternatives for increasing the treatment capacity at the Arthur WWTP, and to determine a preferred alternative.



Map courtesy of Google Maps

The study is being undertaken as a Schedule C project in accordance with the requirements of the Municipal Class Environmental Assessment (EA) (Municipal Engineers Association, June 2000, as amended in 2007 and 2011).

Consultation with the public, stakeholders and government review agencies is an important component of the Class EA process. Two Public Information Centres (PICs) will be scheduled during the course of the study to present and receive comments on the project, alternative solutions and the preferred solution for increasing the capacity of the WWTP. A notice will be published in advance of each PIC.

Information on the Arthur WWTP Class EA study will be posted on the Township's web site at: http://www.wellington-north.com.

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:

Mr. Barry Trood
Water and Sewer Superintendent
The Township of Wellington North
7490 Sideroad 7 West
P.O. Box 125
Kenilworth, ON N0G 2E0
Phone: 519-848-5327
Fax: 519-848-5291
E-mail: btrood@wellington-north.com

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

This notice was first issued on November 14, 2012.

Township of Wellington North

P.O. Box 125 • 7490 Sideroad 7 W • Kenilworth • ON • N0G 2E0

November 16, 2012

County of Wellington
Mr. Mark Van Patter
Senior Planner
74 Woolwich Street
Guelph, ON N1H 3T9

RE: Municipal Class Environmental Assessment
Arthur Wastewater Treatment Plant
Notice of Commencement

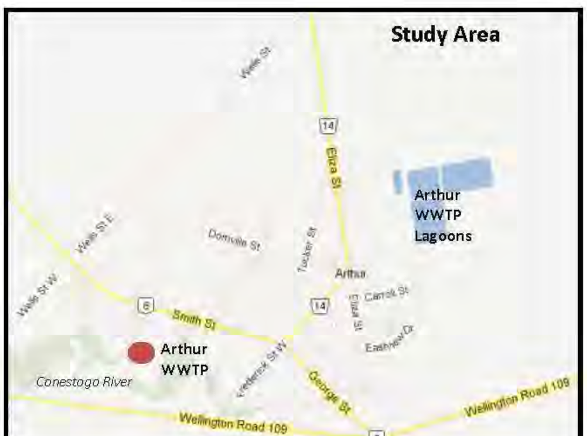
Dear Mr. Mark Van Patter,

The Arthur Wastewater Treatment Plant (WWTP) is owned and operated by the Township of Wellington North (the Township). The Township has initiated a Class Environmental Assessment (EA) to examine options for increasing the capacity of the WWTP.

The Arthur WWTP consists of an extended aeration facility complete with effluent filtration and aerobic digestion and conventional lagoons for seasonal effluent storage. The rated capacity of the facility is 1,465 m^3/day expressed as an annual average flow.

Current flows, combined with development commitments, have resulted in a situation where there is limited capacity for future growth. The goal of the study is to examine alternatives for increasing the treatment capacity at the Arthur WWTP, and to determine a preferred alternative.

The map below shows the approximate limits of the study.



Map courtesy of Google Maps

Tel 519-848-3620   Toll Free 1-866-848-3620   Fax 519-848-3228
www.wellington-north.com   township@wellington-north.com

The study is being undertaken as a Schedule C project in accordance with the requirements of the Municipal Class Environmental Assessment (EA) (Municipal Engineers Association, June 2000, as amended in 2007 and 2011).

The purpose of this letter is to advise you of the commencement of this study. The Township of Wellington North has retained XCG Consultants Ltd. and R.J. Burnside & Associates Ltd. to undertake the study. Please see attached for a Notice of Commencement that will be published in the local newspaper to advise the general public of the project.

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 not want to receive further notifications regarding the study. If this is the case, we would appreciate you advising us in writing. We would appreciate written responses no later than **December16, 2012**.

Two Public Information Centres (PICs) will be scheduled during the study to provide background information, to present the evaluation of alternative solutions and the recommended preferred alternative solution, and to present the recommended preferred design concept. Details of the PICs will be published at a future date.

Information on the Arthur WWTP Class EA study will be posted on the Township's web site at: http://www.wellington-north.com.

If you have any questions or would like further information about the study, please contact the undersigned by phone at 519-848-5327 or by e-mail at btrood@wellington-north.com. Thank you very much for your interest in the study.

Sincerely,

B Trood

Mr. Barry Trood
Water and Sewer Superintendent

Cc: Mr. Stephen Nutt, XCG Consultants Ltd.

Township of Wellington North

P.O. Box 125 • 7490 Sideroad 7 W • Kenilworth • ON • N0G 2E0

November 16, 2012

Conestogo Lake Cottager's Association
133 Weber Street North
Suite # 3-323
Waterloo, ON N2J 3G9

RE: Municipal Class Environmental Assessment
Arthur Wastewater Treatment Plant
Notice of Commencement

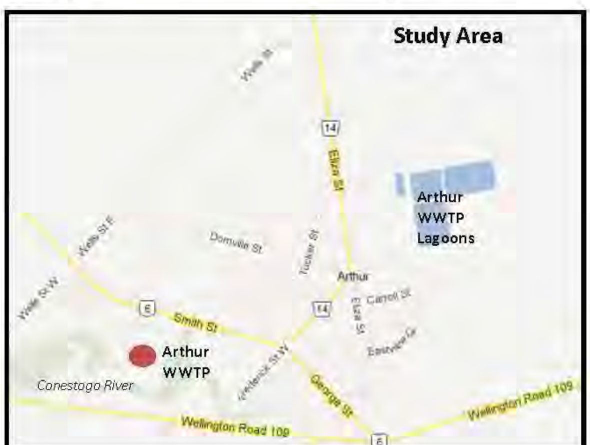
Dear Sir or Madam,

The Arthur Wastewater Treatment Plant (WWTP) is owned and operated by the Township of Wellington North (the Township). The Township has initiated a Class Environmental Assessment (EA) to examine options for increasing the capacity of the WWTP.

The Arthur WWTP consists of an extended aeration facility complete with effluent filtration and aerobic digestion and conventional lagoons for seasonal effluent storage. The rated capacity of the facility is 1,465 m^3/day expressed as an annual average flow.

Current flows, combined with development commitments, have resulted in a situation where there is limited capacity for future growth. The goal of the study is to examine alternatives for increasing the treatment capacity at the Arthur WWTP, and to determine a preferred alternative.

The map below shows the approximate limits of the study.



Map courtesy of Google Maps

The study is being undertaken as a Schedule C project in accordance with the requirements of the Municipal Class Environmental Assessment (EA) (Municipal Engineers Association, June 2000, as amended in 2007 and 2011).

Tel 519-848-3620 Toll Free 1-866-848-3620 Fax 519-848-3228
www.wellington-north.com township@wellington-north.com

The purpose of this letter is to advise you of the commencement of this study. The Township of Wellington North has retained XCG Consultants Ltd. and R.J. Burnside & Associates Ltd. to undertake the study. Please see attached for a Notice of Commencement that will be published in the local newspaper to advise the general public of the project.

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 not want to receive further notifications regarding the study. If this is the case, we would appreciate you advising us in writing. We would appreciate written responses no later than **December16, 2012**.

Two Public Information Centres (PICs) will be scheduled during the study to provide background information, to present the evaluation of alternative solutions and the recommended preferred alternative solution, and to present the recommended preferred design concept. Details of the PICs will be published at a future date.

Information on the Arthur WWTP Class EA study will be posted on the Township's web site at: http://www.wellington-north.com.

If you have any questions or would like further information about the study, please contact the undersigned by phone at 519-848-5327 or by e-mail at btrood@wellington-north.com. Thank you very much for your interest in the study.

Sincerely,

Mr. Barry Trood
Water and Sewer Superintendent

Cc: Mr. Stephen Nutt, XCG Consultants Ltd.

Township of Wellington North
P.O. Box 125 • 7490 Sideroad 7 W • Kenilworth • ON • N0G 2E0

November 16, 2012

RE: Municipal Class Environmental Assessment
Arthur Wastewater Treatment Plant
Notice of Commencement

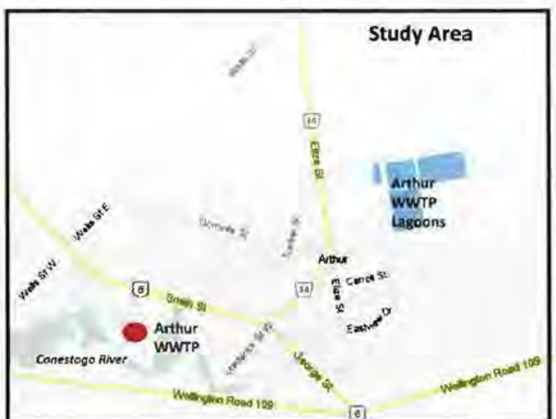
Dear Resident/Property Owner:

The Arthur Wastewater Treatment Plant (WWTP) is owned and operated by the Township of Wellington North (the Township). The Township has initiated a Class Environmental Assessment (EA) to examine options for increasing the capacity of the WWTP.

The Arthur WWTP consists of an extended aeration facility complete with effluent filtration and aerobic digestion and conventional lagoons for seasonal effluent storage. The rated capacity of the facility is 1,465 m^3/day expressed as an annual average flow.

Current flows, combined with development commitments, have resulted in a situation where there is limited capacity for future growth. The goal of the study is to examine alternatives for increasing the treatment capacity at the Arthur WWTP, and to determine a preferred alternative.

The map below shows the approximate limits of the study.



Map courtesy of Google Maps

The study is being undertaken as a Schedule C project in accordance with the requirements of the Municipal Class Environmental Assessment (EA) (Municipal Engineers Association, June 2000, as amended in 2007 and 2011).

The purpose of this letter is to advise you of the commencement of this study. The Township of Wellington North has retained XCG Consultants Ltd. and R.J. Burnside & Associates Ltd. to undertake the study. Please see attached for a Notice of Commencement that will be published in the local newspaper to advise the general public of the project.

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 not want to receive further notifications regarding the study. If this is the case, we would appreciate you advising us in writing. We would appreciate written responses no later than **December16, 2012**.

Two Public Information Centres (PICs) will be scheduled during the study to provide background information, to present the evaluation of alternative solutions and the recommended preferred alternative solution, and to present the recommended preferred design concept. Details of the PICs will be published at a future date.

Information on the Arthur WWTP Class EA study will be posted on the Township's web site at: http://www.wellington-north.com.

If you have any questions or would like further information about the study, please contact the undersigned by phone at 519-848-5327 or by e-mail at btrood@wellington-north.com. Thank you very much for your interest in the study.

Sincerely,

Mr. Barry Trood
Water and Sewer Superintendent

Cc: Mr. Stephen Nutt, XCG Consultants Ltd.

I-3

PUBLIC INFORMATION CENTRE # 1

– *NEWSPAPER AD*

– *EXAMPLE LETTERS*

– *ATTENDANCE RECORD*

– *COMMENT SHEET*

– *DISPLAY BOARDS*

– *HANDOUT*

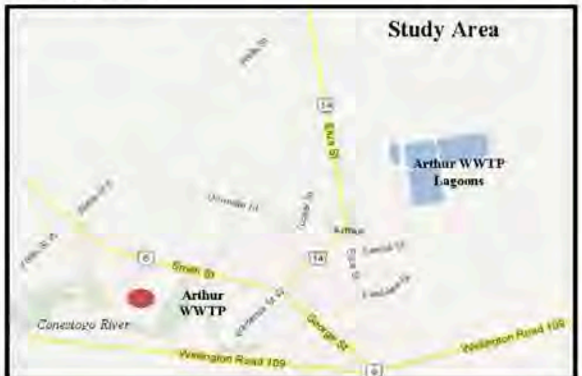
– *COMMENTS RECEIVED*

NOTICE OF PUBLIC INFORMATION CENTRE # 1

CLASS ENVIRONMENTAL ASSESSMENT
ARTHUR WASTEWATER TREATMENT PLANT

The Arthur Wastewater Treatment Plant (WWTP) is owned and operated by the Township of Wellington North (the Township). The Township has initiated a Class Environmental Assessment (EA) to examine options for increasing the capacity of the WWTP.

The Arthur WWTP consists of an extended aeration facility complete with effluent filtration and aerobic digestion and conventional lagoons for seasonal effluent storage. The rated capacity of the facility is 1,465 m^3/day expressed as an annual average flow.



Map courtesy of Google Maps

Current flows, combined with development commitments, have resulted in a situation where there is limited capacity for future growth. The goal of the study is to examine alternatives for increasing the treatment capacity at the Arthur WWTP, and to determine a preferred alternative.

The study is being undertaken as a Schedule C project in accordance with the requirements of the Municipal Class Environmental Assessment (EA) (Municipal Engineers Association, June 2000, as amended in 2007 and 2011).

A Public Information Centre (PIC) has been scheduled to present and receive comments on the project, alternative solutions and the recommended preferred solution for increasing the capacity of the WWTP. The PIC will be held as follows:

Tuesday, March 19, 2013
5:00 PM to 7:00 PM
Arthur Community Centre, 158 Domville Street
Arthur, Ontario

Information on the Arthur WWTP Class EA study will be posted on the Township's web site at: http://www.wellington-north.com. The information presented at this PIC will be available on this web site after March 19, 2013.

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:

Mr. Barry Trood
Water and Sewer Superintendent
The Township of Wellington North
7490 Sideroad 7 West
P.O. Box 125
Kenilworth, ON N0G 2E0
Phone: 519-848-5327
Fax: 519-848-5291
E-mail: btrood@wellington-north.com

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

This notice was first issued on March 6, 2013.

Township of Wellington North

P.O. Box 125 • 7490 Sideroad 7 W • Kenilworth • ON • N0G 2E0

March 6, 2013

Grand River Conservation Authority
Mr. Mark Anderson
Water Quality Engineer
400 Clyde Road
P.O. Box 729
Cambridge, ON N1R 5W6

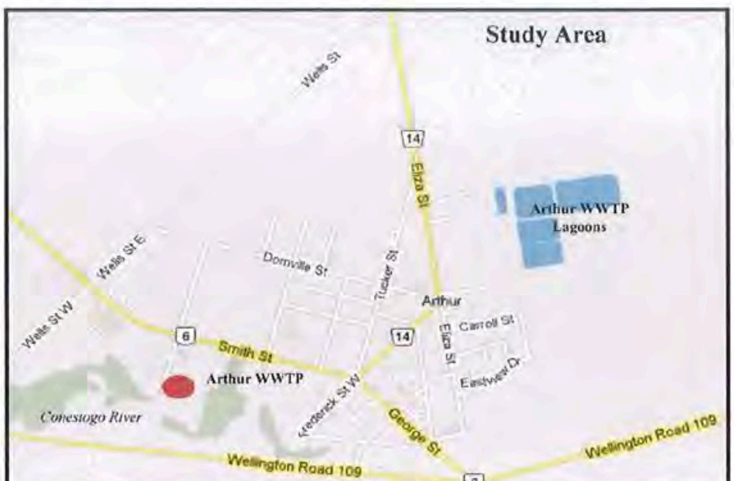
RE: Municipal Class Environmental Assessment
Arthur Wastewater Treatment Plant
Notice of Public Information Centre # 1

Dear Mr. Mark Anderson,

The Arthur Wastewater Treatment Plant (WWTP) is owned and operated by the Township of Wellington North (the Township). The Township has initiated a Class Environmental Assessment (EA) to examine options for increasing the capacity of the WWTP.

The Arthur WWTP consists of an extended aeration facility complete with effluent filtration and aerobic digestion and conventional lagoons for seasonal effluent storage. The rated capacity of the facility is 1,465 m^3/day expressed as an annual average flow.

The map below illustrates the location of the Arthur WWTP.



Map courtesy of Google Maps

Current flows, combined with development commitments, have resulted in a situation where there is limited capacity for future growth. The goal of the study is to examine alternatives for increasing the treatment capacity at the Arthur WWTP, and to determine a preferred alternative.

The study is being undertaken as a Schedule C project in accordance with the requirements of the Municipal Class Environmental Assessment (EA) (Municipal Engineers Association, June 2000, as amended in 2007 and 2011).

A Public Information Centre (PIC) has been scheduled to present and receive comments on the project, alternative solutions and the recommended preferred solution for increasing the capacity of the WWTP. The PIC will be held as follows:

Tuesday, March 19, 2013
5:00 PM to 7:00 PM
Arthur Community Centre, 158 Domville Street
Arthur, Ontario

Information on the Arthur WWTP Class EA study will be posted on the Township's web site at: http://www.wellington-north.com. The information presented at this PIC will be available on this web site after March 19, 2013.

If you have any questions or would like further information about the study, please contact the undersigned by phone at 519-848-5327 (Toll Free: 1-866-848-3620) or by e-mail at btrood@wellington-north.com. Thank you very much for your interest in the study.

Sincerely,

BTrood

Mr. Barry Trood
Water and Sewer Superintendent

Cc. Mr. Stephen Nutt, XCG Consultants Ltd.

Township of Wellington North

P.O. Box 125 • 7490 Sideroad 7 W • Kenilworth • ON • N0G 2E0

March 6, 2013

Ministry of Natural Resources
Mr. Ken Cornelisse
Water Resources Coordinator
Guelph District Office
1 Stone Road West
Guelph, ON N1G 4Y2

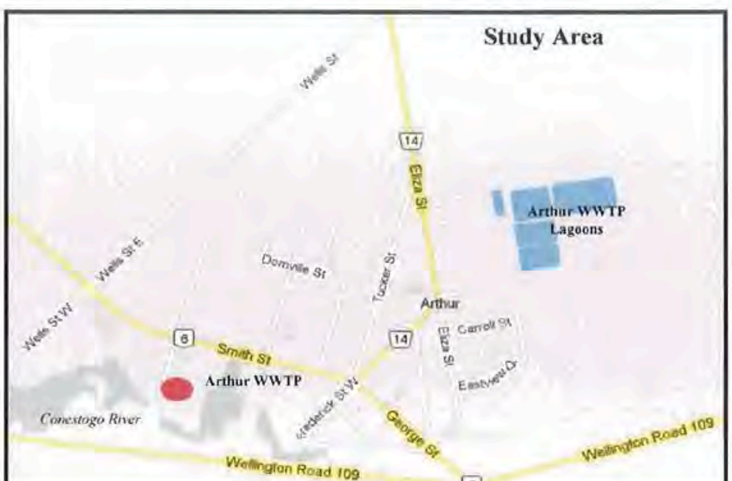
RE: Municipal Class Environmental Assessment
Arthur Wastewater Treatment Plant
Notice of Public Information Centre # 1

Dear Mr. Ken Cornelisse,

The Arthur Wastewater Treatment Plant (WWTP) is owned and operated by the Township of Wellington North (the Township). The Township has initiated a Class Environmental Assessment (EA) to examine options for increasing the capacity of the WWTP.

The Arthur WWTP consists of an extended aeration facility complete with effluent filtration and aerobic digestion and conventional lagoons for seasonal effluent storage. The rated capacity of the facility is 1,465 m^3/day expressed as an annual average flow.

The map below illustrates the location of the Arthur WWTP.



Map courtesy of Google Maps

Current flows, combined with development commitments, have resulted in a situation where there is limited capacity for future growth. The goal of the study is to examine alternatives for increasing the treatment capacity at the Arthur WWTP, and to determine a preferred alternative.

The study is being undertaken as a Schedule C project in accordance with the requirements of the Municipal Class Environmental Assessment (EA) (Municipal Engineers Association, June 2000, as amended in 2007 and 2011).

A Public Information Centre (PIC) has been scheduled to present and receive comments on the project, alternative solutions and the recommended preferred solution for increasing the capacity of the WWTP. The PIC will be held as follows:

Tuesday, March 19, 2013
5:00 PM to 7:00 PM
Arthur Community Centre, 158 Domville Street
Arthur, Ontario

Information on the Arthur WWTP Class EA study will be posted on the Township's web site at: http://www.wellington-north.com. The information presented at this PIC will be available on this web site after March 19, 2013.

If you have any questions or would like further information about the study, please contact the undersigned by phone at 519-848-5327 (Toll Free: 1-866-848-3620) or by e-mail at btrood@wellington-north.com. Thank you very much for your interest in the study.

Sincerely,

B Trood

Mr. Barry Trood
Water and Sewer Superintendent

Cc. Mr. Stephen Nutt, XCG Consultants Ltd.

Township of Wellington North

P.O. Box 125 • 7490 Sideroad 7 W • Kenilworth • ON • N0G 2E0

March 6, 2013

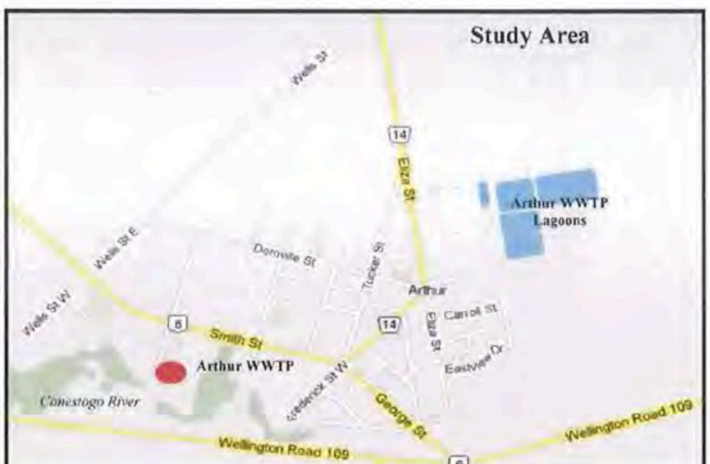
RE: Municipal Class Environmental Assessment
Arthur Wastewater Treatment Plant
Notice of Public Information Centre # 1

Dear Property Owner:

The Arthur Wastewater Treatment Plant (WWTP) is owned and operated by the Township of Wellington North (the Township). The Township has initiated a Class Environmental Assessment (EA) to examine options for increasing the capacity of the WWTP.

The Arthur WWTP consists of an extended aeration facility complete with effluent filtration and aerobic digestion and conventional lagoons for seasonal effluent storage. The rated capacity of the facility is 1,465 m^3/day expressed as an annual average flow.

The map below illustrates the location of the Arthur WWTP.



Map courtesy of Google Maps

Current flows, combined with development commitments, have resulted in a situation where there is limited capacity for future growth. The goal of the study is to examine alternatives for increasing the treatment capacity at the Arthur WWTP, and to determine a preferred alternative.

The study is being undertaken as a Schedule C project in accordance with the requirements of the Municipal Class Environmental Assessment (EA) (Municipal Engineers Association, June 2000, as amended in 2007 and 2011).

A Public Information Centre (PIC) has been scheduled to present and receive comments on the project, alternative solutions and the recommended preferred solution for increasing the capacity of the WWTP. The PIC will be held as follows:

Tuesday, March 19, 2013
5:00 PM to 7:00 PM
Arthur Community Centre, 158 Domville Street
Arthur, Ontario

Information on the Arthur WWTP Class EA study will be posted on the Township's web site at: http://www.wellington-north.com. The information presented at this PIC will be available on this web site after March 19, 2013.

If you have any questions or would like further information about the study, please contact the undersigned by phone at 519-848-5327 (Toll Free: 1-866-848-3620) or by e-mail at btrood@wellington-north.com. Thank you very much for your interest in the study.

Sincerely,

Mr. Barry Trood
Water and Sewer Superintendent

Cc. Mr. Stephen Nutt, XCG Consultants Ltd.

ARTHUR WASTEWATER TREATMENT PLANT
CLASS ENVIRONMENTAL ASSESSMENT

PUBLIC INFORMATION CENTRE # 1
March 19, 2013 – Arthur Community Centre, Arthur
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
Andy Lennox			
Ian Turner			
Dave Stack			
Alan Yake			
GARY WILLIAMSON			
George White			
Mark Goetz			
Mark Anderson			
Jim Coffey			
Paul Smith			

The collection of personal information on this form is necessary for the proper administration of a lawfully authorized activity under the *Environmental Assessment Act* and will be used for the purposes of proving compliance with the consultation and public notice requirements under the *Act*. For more information about this collection, please contact Barry Trood, Water and Sewer Superintendent, The Township of Wellington North, P.O. Box 125, 7490 Sideroad 7 W, Kenilworth, ON, Tel: 519-848-5327, Fax: 519-848-5291 or E-mail: btrood@wellington-north.com.

COMMENT SHEET

Arthur Wastewater Treatment Plant (WWTP)
Schedule C Class Environmental Assessment
Public Information Centre # 1
Tuesday, March 19, 2013

Thank you for your interest in the **Arthur Wastewater Treatment Plant Class Environmental Assessment.** You are encouraged to provide your comments. Please print legibly.

Name: ______________________________

Address: ______________________ Street ______________________ Apt. No.

______________ City ______________ Province ______________ Postal Code

Phone: ______________________________

I would like to be placed on a mailing list to receive future notifications regarding this project.

Please indicate Yes or No. ☐ Yes ☐ No

Comment sheets can be left with a project team member or in the Comment Box, or can be sent by mail, fax or e-mail to one of the following team members. Please submit Comment Sheets before Tuesday, April 2, 2013.

Mr. Barry Trood
The Township of Wellington North
Water and Sewer Superintendent
7490 Sideroad 7 West, P.O. Box 125
Kenilworth, ON, N0G 2E0
Phone: 519-848-5327
Fax: 519-848-5291
E-mail: btrood@wellington-north.com

or

Mr. Stephen Nutt, M. Eng., P. Eng.
Consultant Project Manager
XCG Consultants Ltd.
820 Trillium Drive
Kitchener, ON, N2R 1K4
Phone: 519-741-5774
Fax: 519-741-5627
E-mail: stephen@xcg.com

1. Please provide your comments on the alternatives for providing additional capacity at the Arthur WWTP.

____

____

____

____

____

2. **Please provide your comments on the evaluation of the alternatives for providing additional capacity at the Arthur WWTP.**

3. **Please provide your comments on the recommended preferred alternative for providing additional capacity at the Arthur WWTP.**

4. **Please provide any additional comments.**

The collection of personal information on this form is necessary for the proper administration of a lawfully authorized activity under the *Environmental Assessment Act* and will be used for the purposes of proving compliance with the consultation and public notice requirements under the *Act*. For more information about this collection, please contact Barry Trood, Water and Sewer Superintendent, The Township of Wellington North, P.O. Box 125, 7490 Sideroad 7 W, Kenilworth, ON, Tel: 519-848-5327, Fax: 519-848-5291 or E-mail: btrood@wellington-north.com

Arthur WWTP
Class Environmental Assessment Study

Public Information Centre

Arthur Community Centre
March 19, 2013
5:00 p.m. – 7:00 p.m.

Project team members are here to answer your questions and receive your comments about the study.

XCG Environmental Engineers & Scientists
BURNSIDE

Purpose of the Study

The Township of Wellington North is undertaking a Class Environmental Assessment (Class EA) to determine the most cost-effective, environmentally sound, and sustainable approach to provide wastewater treatment to accommodate future growth in the former Village of Arthur until 2031.

The objectives of the Class EA are:

- To examine the future wastewater treatment needs in the former Village of Arthur until 2031;
- To evaluate the alternative solutions available for wastewater treatment in the former Village of Arthur; and
- To identify the preferred solution to meet the future treatment needs of the former Village of Arthur.

XCG
BURNSIDE

Why Are We Here?

The objectives of this Public Information Centre are:

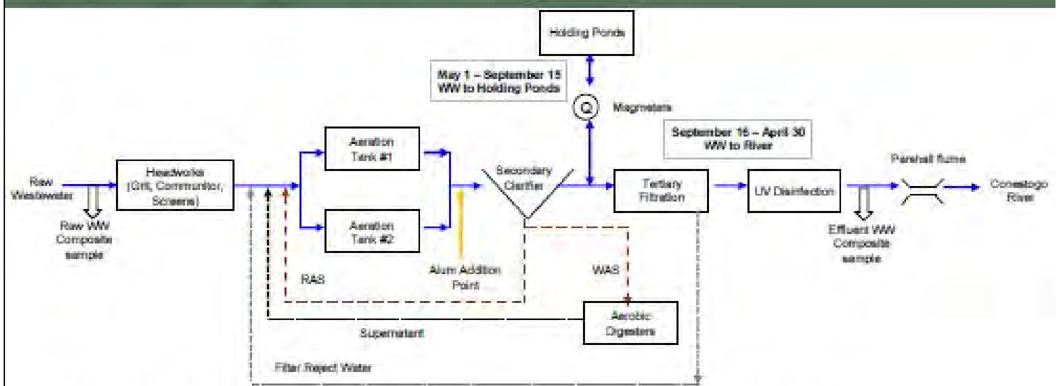
- To present an overview of the project;
- To provide an overview of the Class Environmental Assessment process that is being followed;
- To present the wastewater treatment alternatives that have been evaluated; and
- To present the preferred alternative for wastewater treatment.

Public participation is an integral part of the study process. We encourage you to provide us with any comments that you might have.

Class EA Study Process

Arthur Wastewater Treatment Plant Class EA completes Phases 1 to 4 of the Municipal Class EA process

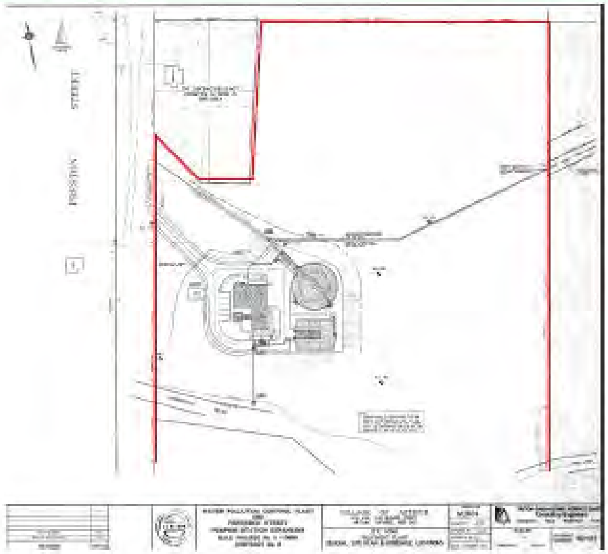
General Plant Overview



- May 1st to September 15 -> Flow to holding ponds for storage / No discharge to Conestogo River
- September 16 to April 30 -> Effluent from plant (and Holding ponds) able to be discharged to Conestogo River, dependent on river flow

XCG BURNSIDE

Existing Site Layout



Property Line

Average Day Flow (ADF) Projections to WWTP

Parameter	Value
Historical Domestic Average Day Flow (ADF)	1,171 m^3/d *
2012 Service Population	2,596 people
2031 Service Population	3,594 people
Design Per Capita Flow	370 L/cap·d + 90 L/cap·d = 460 L/cap·d
2031 Residential Flow	**1,630 m^3/d**
Commercial/Industrial Land Projected Flows	28.7 ha * 17 $m^3/ha{\cdot}d$ = 488 m^3/d
Industrial – Allocated Flows	181 m^3/d
Total ICI Flow Projections	**669 m^3/d**

* Historical Domestic ADF excludes ADF from major industrial contributors.

TOTAL 2031 FLOW PROJECTION = 2,300 m^3/d

Opportunity Statement

The projected 2031 average wastewater flow from the former Village of Arthur is expected to exceed the existing rated capacity of the Arthur Wastewater Treatment Plant. As a result, additional wastewater treatment capacity must be provided to accommodate planned growth in the community.

XCG

Burnside

Wastewater Treatment Alternatives

1. "Do Nothing";
2. Limit Community Growth;
3. Optimize Operational Practices at the Existing Treatment System;
4. Reduce Wastewater Flows through Water Efficiency and Sewer Rehabilitation;
5. Decommission the existing plant and build a new plant to service the community on the existing site;
6. Decommission the existing plant and build a new plant to service the community at a new location;
7. Maintain the existing plant and build a new plant on a new site to service new growth; and
8. Expand the existing plant to service existing and proposed growth in the community.

XCG

Burnside

Evaluation of Alternatives

Preliminary Evaluation of Alternative Solutions			
Alternative	Will Alternative Satisfy All Project Objectives?		Could Alternative be Part of Solution?
	Yes	No	
1. Do Nothing		X	
2. Limit Community Growth		X	
3. Optimize Existing Treatment Process		X	Yes
4. Reduce Wastewater Flows		X	Yes
5. Decommission Existing Plant & Build New Plant on Existing Site	X		
6. Decommission Existing Plant & Build New Plant on a New Site	X		
7. Maintain the Existing Plant & Build New Plant on a New Site to service New Growth	X		
8. Expand the Existing Plant to service Existing and Proposed Growth	X		

XCG Burnside

Evaluation of Alternatives

Alternative	Capital Costs	Annual O&M Cost	25-Yr Life-cycle Cost
Decommission Existing Plant & Build a New Plant on Existing Site	◐	○	◔
Decommission Existing Plant & Build a New Plant on a New Site	●	◐	◐
Maintain Existing Plant & Build a New Plant on a New Site to service New Growth	◐	●	◕
Expand Existing Plant to service Existing and Proposed Growth on Existing Site	○	○	○

Notes:

○ ◔ ◐ ◕ ●

Least expensive → Most expensive

XCG Burnside

Comparison of Feasible Alternative Solutions

Alternative Solution	Natural Environment		Technical Environment		Social Environment		Economic Environment	
	Advantages	Disadvantages	Advantages	Disadvantages	Advantages	Disadvantages	Advantages	Disadvantages
Decommission Existing Plant & Build a New Plant on Existing Site	Construction limited to existing property.	Construction may be necessary on currently undisturbed areas of the site.	Flexibility with respect to selecting treatment technologies for the New Plant.	Difficult construction staging to maintain treatment of wastewater in Arthur during construction.	Construction can be completed on existing land further away from residential.	Significant construction activity on existing property.	Only one plant for staff to operate and maintain.	No use of existing treatment plant infrastructure, increasing capital costs. Expensive construction staging.
Decommission Existing Plant & Build a New Plant on a New Site	Portion of existing site could be recovered.	Land required for new treatment plant. Construction at multiple sites within the community. New outfall location needed.	Flexibility with respect to selecting treatment technologies for the New Plant.	Additional collection system components requiring maintenance.	Construction can be completed on land further away from residential.	Significant construction activity at multiple sites within the community.	Only one plant for staff to operate and maintain.	No use of existing treatment plant infrastructure, increasing capital costs. Land acquisition costs and increasing capital costs. May have increased pumping and energy costs (O&M) from a new site.
Maintain Existing Plant & Build a New Plant on a New Site to service New Growth	No construction or disturbance at current site.	Land required for new treatment plant. Construction at multiple sites within the community. New outfall location needed	Flexibility with respect to selecting treatment technologies for the New Plant.	Additional collection system components requiring maintenance.	Less construction activity on the existing site due to the utilization of the Existing Plant. Construction can be completed on land further away from residential.	Significant construction activity at multiple sites within the community.	Continued use of Existing Plant infrastructure; minimizing capital costs.	Two plants for staff to operate and maintain. Land acquisition costs and increasing capital costs. May have increased pumping and energy costs (O&M) from a new site.
Expand Existing Plant to service Existing and Proposed Growth on Existing Site	Construction limited to existing property.	Construction may be necessary on currently undisturbed areas of the site.	Some flexibility with respect to selecting treatment technologies for the expansion of the Existing Plant.	Significant upgrades to the Existing Plant needed to meet more stringent effluent limits.	Less construction activity on the existing site due to the utilization of the Existing Plant. Construction can be completed on existing land further away from residential.	Significant amount of construction activity on existing property due to the expansion of the Existing Plant.	Continued use of Existing Plant infrastructure; thereby greatly minimizing capital costs. Only one plant for staff to operate and maintain.	Construction staging may increase capital costs.

XCG

Burnside

Preferred Alternative

- The recommended preferred alternative is:

Alternative 8 – Expand the Existing Plant to service Existing and Proposed Growth on Existing Property.

Advantages to this Alternative:

- Construction limited to the existing property
- No land acquisition required
- Some flexibility with respect to selecting treatment technologies for the expansion of the Existing Plant
- Continued use of existing New Plant infrastructure; minimizing capital costs
- Lowest relative 25-year life-cycle cost

Reducing wastewater flows by water efficiency and I/I reduction, as well as optimization of the existing works, will be part of the preferred solution.

XCG

Burnside

What Will Happen Next?

- Evaluation and Selection of the Preferred Design Approach to complete Phases 3 and 4 of the Class EA.
- A second Public Information Centre will be held to present the Preferred Design Approach.

Public input is an important component of the Class EA process that will greatly assist the Township in developing a solution to provide wastewater treatment to accommodate future growth in the former Village of Arthur. Please deposit your comment form in the boxes provided or forward them to the Township. To obtain additional information, or to be placed on a mailing list, please contact:

Mr. Barry Trood
Water and Sewer Superintendent
The Township of Wellington North
7490 Sideroad 7 West, P.O. Box 125
Kenilworth, Ontario, N0G 2E0
Phone: 519-848-5327
Fax: 519-848-5291
e-mail: btrood@wellington-north.com

or

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
e-mail: stephen@xcg.com

EVALUATION CRITERIA AND RESULTS OF PRELIMINARY EVALUATION

A set of evaluation criteria were developed and used to evaluate Alternatives 5, 6, 7 and 8. The criteria included economic, social, technical and natural environmental factors.

Based on the results of the preliminary evaluation, the recommended preferred solution is Alternative 8 – Expand the Existing Plant to Service Existing and Proposed Growth on Existing Property.

The preferred alternative solution includes the following components:

- Reducing wastewater flows through water efficiency measures and reduction of Inflow/ Infiltration (I/I); and
- Optimizing the existing treatment process.

Advantages

Alternative 8 was selected based on the following advantages:

- Construction limited to the existing property;
- No land acquisition required;
- Some flexibility with respect to selecting treatment technologies for the expansion of the existing plant;
- Continued use of existing plant infrastructure thus minimizing capital costs;
- Lowest relative 25-year life-cycle cost.

WHAT ARE THE NEXT STEPS?

The selection of the recommended solution will be finalized based on public and agency input. Alternative design concepts for the preferred solution will be developed and assessed in the next phase of the Class EA process.

A second PIC will be held to present the preferred design approach that is recommended to expand the Arthur WWTP.

OPPORTUNITIES FOR PUBLIC COMMENT

We are interested in receiving your input. If you wish to comment on the Arthur WWTP Class EA, obtain additional information, or be placed on the mailing list to receive future project notifications, please contact either of the following project team members:

Mr. Barry Trood

Water and Sewer Superintendent
The Township of Wellington North
7490 Sideroad 7 West, P.O. Box 125
Kenilworth, ON, N0G 2E0
Phone: 519-848-5327
Fax: 519-848-5291
E-mail: btrood@wellington-north.com

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
E-mail: stephen@xcg.com

Arthur WWTP Class Environmental Assessment

Public Information Centre No. 1
Arthur Community Centre
158 Domville Street, Arthur, ON
Tuesday, March 19, 2013
5:00 p.m. to 7:00 p.m.

INTRODUCTION

The Township of Wellington North has initiated a Class Environmental Assessment (Class EA) to address the long-term wastewater servicing needs for the former Village of Arthur.

As the former Village of Arthur continues to grow, the population will eventually exceed the capacity of the existing infrastructure. In preparation, the Township of Wellington North has commenced this study to identify the most cost-effective, environmentally sound, and sustainable approach to provide wastewater servicing for future growth in the former Village of Arthur to the year 2031.

This Public Information Centre (PIC) presents an overview of the objectives of the study and the alternative wastewater servicing solutions being evaluated as part of the Class EA process.

This is the first of two PICs that will be held during the Arthur WWTP Class EA.

STUDY APPROACH

This study will include the following components:

- Problem Identification;
- Development and evaluation of alternative solutions and selection of the preferred solution; and
- Development and evaluation of alternative design concepts for the preferred solution, and selection of the preferred design concept.

CLASS ENVIRONMENTAL ASSESSMENT PROCESS

This study will follow the Municipal Class EA process, and includes opportunities for public and agency comment.

This study is being undertaken as a Schedule C project and will complete Phases 1 through 4 of the Municipal Class EA process.

PROBLEM IDENTIFICATION

The Arthur WWTP provides tertiary treatment for wastewater from the former Village of Arthur. The plant has a rated average day capacity of 1,465 m^3/d and consists of an extended aeration facility complete with effluent filtration and aerobic digestion, and holding ponds (lagoons) for seasonal effluent storage.

During the period from May 1 to September 15, flow from the secondary treatment system is pumped from the plant to holding ponds for storage. During the period from September 16 to April 30, effluent from the plant can be discharged to the Conestogo River. During this discharge period, the holding pond contents are combined with the plant's secondary clarifier effluent, and this flow is then treated prior to discharge to the Conestogo River.

The Arthur WWTP treats both domestic and industrial wastewaters.

Based on the County of Wellington's Official Plan, there is planned growth in the former Village of Arthur. The projected 2031 average wastewater flows will exceed the existing rated capacity of the WWTP. As a result, additional wastewater servicing capacity must be provided to accommodate planned growth in the community.

WASTEWATER TREATMENT ALTERNATIVES

The following alternatives for providing wastewater treatment services for the former Village of Arthur were evaluated:

1. Do nothing;
2. Limit community growth;
3. Optimize operational practices at the existing treatment system;
4. Reduce wastewater flows through water efficiency and sewer rehabilitation;
5. Decommission the existing plant and build a new plant to service the community on the existing site;
6. Decommission the existing plant and build a new plant to service the community at a new location;
7. Maintain the existing plant and build a new plant on a new site to service new growth; and
8. Expand the existing plant to service existing and proposed growth in the community.

Feasible alternatives must meet the study objectives by providing:

- Wastewater servicing for future growth;
- Upgrades to the existing Arthur WWTP in order to improve its current rated average day capacity; and
- Effluent quality acceptable to the MOE.

Alternatives 5, 6, 7 and 8 can meet all of the study objectives and will be evaluated in further detail.

Alternatives 3 and 4 can be part of the solution, and will be considered in conjunction with the selected preferred alternative.

COMMENT SHEET

Arthur Wastewater Treatment Plant (WWTP)
Schedule C Class Environmental Assessment
Public Information Centre # 1
Tuesday, March 19, 2013

Thank you for your interest in the **Arthur Wastewater Treatment Plant Class Environmental Assessment.** You are encouraged to provide your comments. Please print legibly.

Name: David Stack

Address: ______________________ Street ______________________ Apt. No.

______________________ City ______________________ Province ______________________ Postal Code

Phone: ______________________

I would like to be placed on a mailing list to receive future notifications regarding this project.

Please indicate Yes or No. [✓] Yes [ ] No

Comment sheets can be left with a project team member or in the Comment Box, or can be sent by mail, fax or e-mail to one of the following team members. Please submit Comment Sheets before Tuesday, April 2, 2013.

Mr. Barry Trood
The Township of Wellington North
Water and Sewer Superintendent
7490 Sideroad 7 West, P.O. Box 125
Kenilworth, ON, N0G 2E0
Phone: 519-848-5327
Fax: 519-848-5291
E-mail: btrood@wellington-north.com

or

Mr. Stephen Nutt, M. Eng., P. Eng.
Consultant Project Manager
XCG Consultants Ltd.
820 Trillium Drive
Kitchener, ON, N2R 1K4
Phone: 519-741-5774
Fax: 519-741-5627
E-mail: stephen@xcg.com

1. **Please provide your comments on the alternatives for providing additional capacity at the Arthur WWTP.**

Reasonable set of alternatives

The collection of personal information on this form is necessary for the proper administration of a lawfully authorized activity under the *Environmental Assessment Act* and will be used for the purposes of proving compliance with the consultation and public notice requirements under the *Act*. For more information about this collection, please contact Barry Trood, Water and Sewer Superintendent, The Township of Wellington North, P.O. Box 125, 7490 Sideroad 7 W, Kenilworth, ON, Tel: 519-848-5327, Fax: 519-848-5291 or E-mail: btrood@wellington-north.com

2. **Please provide your comments on the evaluation of the alternatives for providing additional capacity at the Arthur WWTP.**

logical

3. **Please provide your comments on the recommended preferred alternative for providing additional capacity at the Arthur WWTP.**

Expanding existing treatment plant seems like only feasible alternative

4. **Please provide any additional comments.**

Address reducing flow to plant?
infiltration
low flow toilet/showerheads program?
storm water exaggerating volumes?

Other - who addresses other inputs to river from agriculture?

COMMENT SHEET

Arthur Wastewater Treatment Plant (WWTP)
Schedule C Class Environmental Assessment
Public Information Centre # 1
Tuesday, March 19, 2013

Thank you for your interest in the **Arthur Wastewater Treatment Plant Class Environmental Assessment.** You are encouraged to provide your comments. Please print legibly.

Name: Ian Turner

Address: ______________________ Street ______ Apt. No.

______ City ______ Province ______ Postal Code

Phone: ______

I would like to be placed on a mailing list to receive future notifications regarding this project.

Please indicate Yes or No. [✓] Yes [ ] No

Comment sheets can be left with a project team member or in the Comment Box, or can be sent by mail, fax or e-mail to one of the following team members. Please submit Comment Sheets before Tuesday, April 2, 2013.

Mr. Barry Trood
The Township of Wellington North
Water and Sewer Superintendent
7490 Sideroad 7 West, P.O. Box 125
Kenilworth, ON, N0G 2E0
Phone: 519-848-5327
Fax: 519-848-5291
E-mail: btrood@wellington-north.com

or

Mr. Stephen Nutt, M. Eng., P. Eng.
Consultant Project Manager
XCG Consultants Ltd.
820 Trillium Drive
Kitchener, ON, N2R 1K4
Phone: 519-741-5774
Fax: 519-741-5627
E-mail: stephen@xcg.com

1. Please provide your comments on the alternatives for providing additional capacity at the Arthur WWTP.

- Thought Population Projections for arthur in the 2030's → low

- ability to expand a must.

Ian Turner
Co-Chair
arthur Betterment

The collection of personal information on this form is necessary for the proper administration of a lawfully authorized activity under the *Environmental Assessment Act* and will be used for the purposes of proving compliance with the consultation and public notice requirements under the *Act*. For more information about this collection, please contact Barry Trood, Water and Sewer Superintendent, The Township of Wellington North, P.O. Box 125, 7490 Sideroad 7 W, Kenilworth, ON, Tel: 519-848-5327, Fax: 519-848-5291 or E-mail: btrood@wellington-north.com

2. Please provide your comments on the evaluation of the alternatives for providing additional capacity at the Arthur WWTP.

3. Please provide your comments on the recommended preferred alternative for providing additional capacity at the Arthur WWTP.

4. Please provide any additional comments.

The collection of personal information on this form is necessary for the proper administration of a lawfully authorized activity under the *Environmental Assessment Act* and will be used for the purposes of proving compliance with the consultation and public notice requirements under the *Act*. For more information about this collection, please contact Barry Trood, Water and Sewer Superintendent, The Township of Wellington North, P.O. Box 125, 7490 Sideroad 7 W, Kenilworth, ON, Tel: 519-848-5327, Fax: 519-848-5291 or E-mail: btrood@wellington-north.com

I-4

PUBLIC INFORMATION CENTRE # 2

– ***NEWSPAPER AD***

– ***EXAMPLE LETTERS***

– ***ATTENDANCE RECORD***

– ***COMMENT SHEET***

– ***DISPLAY BOARDS***

– ***HANDOUT***

– ***COMMENTS RECEIVED***

NOTICE OF PUBLIC INFORMATION CENTRE # 2

CLASS ENVIRONMENTAL ASSESSMENT
ARTHUR WASTEWATER TREATMENT PLANT

The Arthur Wastewater Treatment Plant (WWTP) is owned and operated by the Township of Wellington North (the Township). The Township has initiated a Class Environmental Assessment (EA) to examine options for increasing the capacity of the WWTP.

The Arthur WWTP consists of an extended aeration facility complete with effluent filtration and aerobic digestion and conventional lagoons for seasonal effluent storage. The rated capacity of the facility is 1,465 m^3/day expressed as an annual average flow.

Current flows, combined with development commitments, have resulted in a situation where there is limited capacity for future growth. The goal of the study is to examine alternatives for increasing the treatment capacity at the Arthur WWTP, and to determine a preferred design alternative.

The study is being undertaken as a Schedule C project in accordance with the requirements of the Municipal Class Environmental Assessment (EA) (Municipal Engineers Association, June 2000, as amended in 2007 and 2011).

Map courtesy of Google Maps

A Public Information Centre (PIC) has been scheduled to present and receive comments on the project, alternative design concepts and the recommended preferred design concept for increasing the capacity of the WWTP. The PIC will be held as follows:

Tuesday, June 10, 2014
6:00 PM to 8:00 PM
Arthur Community Centre, 158 Domville Street
Arthur, Ontario

Information on the Arthur WWTP Class EA study will be posted on the Township's web site at: http://www.wellington-north.com. The information presented at this PIC will be available on this web site after June 10, 2014.

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:

Mr. Barry Trood
Water and Sewer Superintendent
The Township of Wellington North
7490 Sideroad 7 West
P.O. Box 125
Kenilworth, ON N0G 2E0
Phone: 519-848-5327
Fax: 519-848-5291
E-mail: btrood@wellington-north.com

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

This notice first issued on May 28, 2014.

Published: Enterprise News Express – Wednesday, May 28, 2014 and Wednesday, June 4, 2014; Wellington Advertiser – Friday, May 30, 2014

Township of Wellington North

P.O. Box 125 • 7490 Sideroad 7 W • Kenilworth • ON • N0G 2E0

May 28, 2014

Arthur & District Chamber of Commerce
Ms. Mary Schmidt, President
PO Box 519
146 George Street
Arthur, ON N0G 1A0

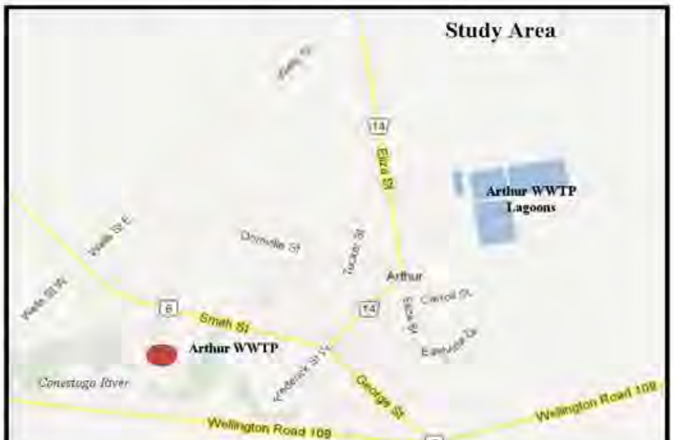
RE: Municipal Class Environmental Assessment
Arthur Wastewater Treatment Plant
Notice of Public Information Centre # 2

Dear Ms. Schmidt,

The Arthur Wastewater Treatment Plant (WWTP) is owned and operated by the Township of Wellington North (the Township). The Township has initiated a Class Environmental Assessment (EA) to examine options for increasing the capacity of the WWTP.

The Arthur WWTP consists of an extended aeration facility complete with effluent filtration and aerobic digestion and conventional lagoons for seasonal effluent storage. The rated capacity of the facility is 1,465 m^3/day expressed as an annual average flow.

The map below illustrates the location of the Arthur WWTP.



Map courtesy of Google Maps

Current flows, combined with development commitments, have resulted in a situation where there is limited capacity for future growth. The goal of the study is to examine alternatives for increasing the treatment capacity at the Arthur WWTP, and to determine a preferred design alternative.

Tel 519-848-3620 Toll Free 1-866-848-3620 Fax 519-848-3228
www.wellington-north.com township@wellington-north.com

The study is being undertaken as a Schedule C project in accordance with the requirements of the Municipal Class Environmental Assessment (EA) (Municipal Engineers Association, June 2000, as amended in 2007 and 2011).

A Public Information Centre (PIC) has been scheduled to present and receive comments on the project, alternative design concepts and the recommended preferred design concept for increasing the capacity of the WWTP. The PIC will be held as follows:

Tuesday, June 10, 2014
6:00 PM to 8:00 PM
Arthur Community Centre, 158 Domville Street
Arthur, Ontario

Information on the Arthur WWTP Class EA study will be posted on the Township's web site at: http://www.wellington-north.com. The information presented at this PIC will be available on this web site after June 10, 2014.

If you have any questions or would like further information about the study, please contact the undersigned by phone at 519-848-5327 (Toll Free: 1-866-848-3620) or by e-mail at btrood@wellington-north.com. Thank you very much for your interest in the study.

Sincerely,

Mr. Barry Trood
Water and Sewer Superintendent

Cc: Mr. Stephen Nutt, XCG Consultants Ltd.

Tel 519-848-3620 Toll Free 1-866-848-3620 Fax 519-848-3228
www.wellington-north.com township@wellington-north.com

Township of Wellington North

P.O. Box 125 • 7490 Sideroad 7 W • Kenilworth • ON • N0G 2E0

May 28, 2014

Ministry of Natural Resources
Mr. Ken Cornelisse
Water Resources Coordinator
Guelph District Office
1 Stone Road West
Guelph, ON N1G 4Y2

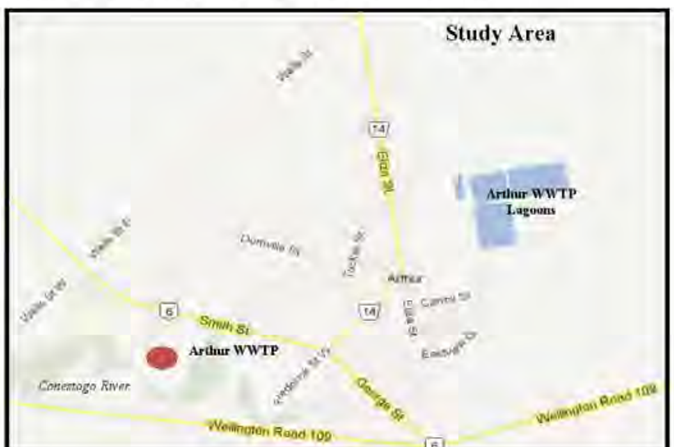
RE: Municipal Class Environmental Assessment
Arthur Wastewater Treatment Plant
Notice of Public Information Centre # 2

Dear Mr. Cornelisse,

The Arthur Wastewater Treatment Plant (WWTP) is owned and operated by the Township of Wellington North (the Township). The Township has initiated a Class Environmental Assessment (EA) to examine options for increasing the capacity of the WWTP.

The Arthur WWTP consists of an extended aeration facility complete with effluent filtration and aerobic digestion and conventional lagoons for seasonal effluent storage. The rated capacity of the facility is 1,465 m^3/day expressed as an annual average flow.

The map below illustrates the location of the Arthur WWTP.



Map courtesy of Google Maps

Current flows, combined with development commitments, have resulted in a situation where there is limited capacity for future growth. The goal of the study is to examine alternatives for

Tel 519-848-3620 Toll Free 1-866-848-3620 Fax 519-848-3228
www.wellington-north.com township@wellington-north.com

increasing the treatment capacity at the Arthur WWTP, and to determine a preferred design alternative.

The study is being undertaken as a Schedule C project in accordance with the requirements of the Municipal Class Environmental Assessment (EA) (Municipal Engineers Association, June 2000, as amended in 2007 and 2011).

A Public Information Centre (PIC) has been scheduled to present and receive comments on the project, alternative design concepts and the recommended preferred design concept for increasing the capacity of the WWTP. The PIC will be held as follows:

Tuesday, June 10, 2014
6:00 PM to 8:00 PM
Arthur Community Centre, 158 Domville Street
Arthur, Ontario

Information on the Arthur WWTP Class EA study will be posted on the Township's web site at: http://www.wellington-north.com. The information presented at this PIC will be available on this web site after June 10, 2014.

If you have any questions or would like further information about the study, please contact the undersigned by phone at 519-848-5327 (Toll Free: 1-866-848-3620) or by e-mail at btrood@wellington-north.com. Thank you very much for your interest in the study.

Sincerely,

Mr. Barry Trood
Water and Sewer Superintendent

Cc: Mr. Stephen Nutt, XCG Consultants Ltd.

Tel 519-848-3620 Toll Free 1-866-848-3620 Fax 519-848-3228
www.wellington-north.com township@wellington-north.com

Township of Wellington North
P.O. Box 125 • 7490 Sideroad 7 W • Kenilworth • ON • N0G 2E0

May 28, 2014

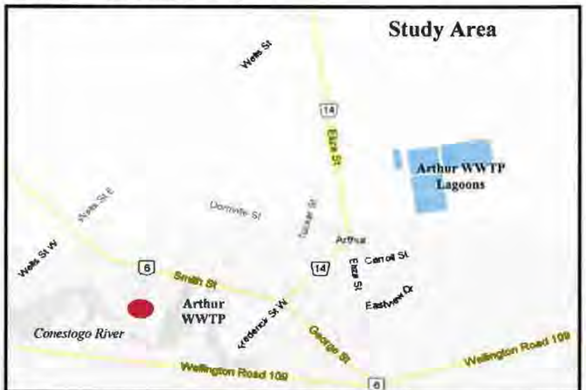
RE: Municipal Class Environmental Assessment
Arthur Wastewater Treatment Plant
Notice of Public Information Centre # 2

Dear Property Owner:

The Arthur Wastewater Treatment Plant (WWTP) is owned and operated by the Township of Wellington North (the Township). The Township has initiated a Class Environmental Assessment (EA) to examine options for increasing the capacity of the WWTP.

The Arthur WWTP consists of an extended aeration facility complete with effluent filtration and aerobic digestion and conventional lagoons for seasonal effluent storage. The rated capacity of the facility is 1,465 m^3/day expressed as an annual average flow.

The map below illustrates the location of the Arthur WWTP.



Map courtesy of Google Maps

Current flows, combined with development commitments, have resulted in a situation where there is limited capacity for future growth. The goal of the study is to examine alternatives for increasing the treatment capacity at the Arthur WWTP, and to determine a preferred design alternative.

The study is being undertaken as a Schedule C project in accordance with the requirements of the Municipal Class Environmental Assessment (EA) (Municipal Engineers Association, June 2000, as amended in 2007 and 2011).

A Public Information Centre (PIC) has been scheduled to present and receive comments on the project, alternative design concepts and the recommended preferred design concept for increasing the capacity of the WWTP. The PIC will be held as follows:

Tuesday, June 10, 2014
6:00 PM to 8:00 PM
Arthur Community Centre, 158 Domville Street
Arthur, Ontario

Information on the Arthur WWTP Class EA study will be posted on the Township's web site at: http://www.wellington-north.com. The information presented at this PIC will be available on this web site after June 10, 2014.

If you have any questions or would like further information about the study, please contact the undersigned by phone at 519-848-5327 (Toll Free: 1-866-848-3620) or by e-mail at btrood@wellington-north.com. Thank you very much for your interest in the study.

Sincerely,

BTrood

Mr. Barry Trood
Water and Sewer Superintendent

Cc: Mr. Stephen Nutt, XCG Consultants Ltd.

Tel 519-848-3620 Toll Free 1-866-848-3620 Fax 519-848-3228
www.wellington-north.com township@wellington-north.com

ARTHUR WASTEWATER TREATMENT PLANT
CLASS ENVIRONMENTAL ASSESSMENT

PUBLIC INFORMATION CENTRE # 2
June 10, 2014 – Arthur Community Centre, Arthur
6:00 PM to 8:00 PM

ATTENDANCE SHEET

Thank you for your interest in this project. Please print legibly.

NAME	ADDRESS	PHONE NUMBER	E-MAIL ADDRESS
John Rooney			
Jim Coffey			
Steve McCabe			
Lee Normet			
Mary Schmidt			
B T J NIELSEN			
BERT COFFEY			
Rhonda Watt.			
Karen Idzik			
Mark Anderson			
Evelyn Morrison			
[illegible]			
Andy Morrison			
Paul Smith			
Dave Stack			

The collection of personal information on this form is necessary for the proper administration of a lawfully authorized activity under the *Environmental Assessment Act* and will be used for the purposes of proving compliance with the consultation and public notice requirements under the *Act*. For more information about this collection, please contact Barry Trood, Water and Sewer Superintendent, The Township of Wellington North, P.O. Box 125, 7490 Sideroad 7 W, Kenilworth, ON, Tel: 519-848-5327, Fax: 519-848-5291 or E-mail: btrood@wellington-north.com.

ARTHUR WASTEWATER TREATMENT PLANT
CLASS ENVIRONMENTAL ASSESSMENT

PUBLIC INFORMATION CENTRE # 2
June 10, 2014 – Arthur Community Centre, Arthur
6:00 PM to 8:00 PM

ATTENDANCE SHEET

Thank you for your interest in this project. Please print legibly.

NAME	ADDRESS	PHONE NUMBER	E-MAIL ADDRESS
DAVID MARTIN			
DALE SMALL			
Mark Goetz			
JOHN VANDERWOERD			
TOM NORMET			
SHEP			
JOHN MATUSINEC			
Sherry Burke			
Bonnie McIntosh			
Chris McIntosh			
Teresa Hutchison			
Tammy + Hugh Ball			

The collection of personal information on this form is necessary for the proper administration of a lawfully authorized activity under the *Environmental Assessment Act* and will be used for the purposes of proving compliance with the consultation and public notice requirements under the *Act*. For more information about this collection, please contact Barry Trood, Water and Sewer Superintendent, The Township of Wellington North, P.O. Box 125, 7490 Sideroad 7 W, Kenilworth, ON, Tel: 519-848-5327, Fax: 519-848-5291 or E-mail: btrood@wellington-north.com.

ARTHUR WASTEWATER TREATMENT PLANT
CLASS ENVIRONMENTAL ASSESSMENT

PUBLIC INFORMATION CENTRE # 2
June 10, 2014 – Arthur Community Centre, Arthur
6:00 PM to 8:00 PM

ATTENDANCE SHEET

Thank you for your interest in this project. Please print legibly.

NAME	ADDRESS	PHONE NUMBER	E-MAIL ADDRESS
Stephen Burnett			

The collection of personal information on this form is necessary for the proper administration of a lawfully authorized activity under the *Environmental Assessment Act* and will be used for the purposes of proving compliance with the consultation and public notice requirements under the *Act*. For more information about this collection, please contact Barry Trood, Water and Sewer Superintendent, The Township of Wellington North, P.O. Box 125, 7490 Sideroad 7 W, Kenilworth, ON, Tel: 519-848-5327, Fax: 519-848-5291 or E-mail: btrood@wellington-north.com.

COMMENT SHEET

Arthur Wastewater Treatment Plant (WWTP)
Schedule C Class Environmental Assessment
Public Information Centre # 2
Tuesday, June 10, 2014

Thank you for your interest in the **Arthur Wastewater Treatment Plant Class Environmental Assessment.** You are encouraged to provide your comments. Please print legibly.

Name: ______________________________

Address: ______________________________ ______________
Street Apt. No.

______________ ______________ ______________
City Province Postal Code

Phone: ______________________________

I would like to be placed on a mailing list to receive future notifications regarding this project.
Please indicate Yes or No. ☐ Yes ☐ No

Comment sheets can be left with a project team member or in the Comment Box, or can be sent by mail, fax or e-mail to one of the following team members. Please submit Comment Sheets before Tuesday, June 24, 2014.

Mr. Barry Trood
The Township of Wellington North
Water and Sewer Superintendent
7490 Sideroad 7 West, P.O. Box 125
Kenilworth, ON, N0G 2E0
Phone: 519-848-5327
Fax: 519-848-5291
E-mail: btrood@wellington-north.com

or

Mr. Stephen Nutt, M. Eng., P. Eng.
Consultant Project Manager
XCG Consultants Ltd.
820 Trillium Drive
Kitchener, ON, N2R 1K4
Phone: 519-741-5774
Fax: 519-741-5627
E-mail: stephen@xcg.com

1. **Please provide your comments on the alternatives for providing additional capacity at the Arthur WWTP.**

____
____
____
____
____

The collection of personal information on this form is necessary for the proper administration of a lawfully authorized activity under the *Environmental Assessment Act* and will be used for the purposes of proving compliance with the consultation and public notice requirements under the *Act*. For more information about this collection, please contact Barry Trood, Water and Sewer Superintendent, The Township of Wellington North, P.O. Box 125, 7490 Sideroad 7 W, Kenilworth, ON, Tel: 519-848-5327, Fax: 519-848-5291 or E-mail: btrood@wellington-north.com

2. Please provide your comments on the evaluation of the alternatives for providing additional capacity at the Arthur WWTP.

3. Please provide your comments on the recommended preferred alternative for providing additional capacity at the Arthur WWTP.

4. Please provide any additional comments.

The collection of personal information on this form is necessary for the proper administration of a lawfully authorized activity under the *Environmental Assessment Act* and will be used for the purposes of proving compliance with the consultation and public notice requirements under the *Act*. For more information about this collection, please contact Barry Trood, Water and Sewer Superintendent, The Township of Wellington North, P.O. Box 125, 7490 Sideroad 7 W, Kenilworth, ON, Tel: 519-848-5327, Fax: 519-848-5291 or E-mail: btrood@wellington-north.com

Arthur WWTP
Class Environmental Assessment Study

Public Information Centre #2

June 10, 2014

6:00 p.m. – 8:00 p.m.

Project team members are here to answer your questions and receive your comments about the study.

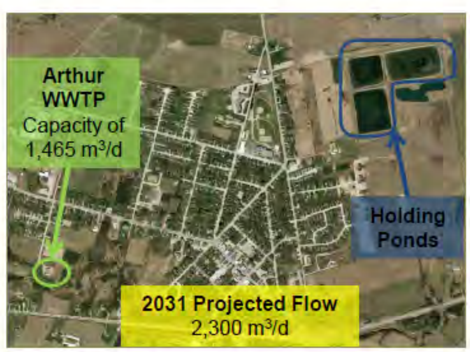
XCG Environmental Engineers & Scientists | Burnside

Purpose of the Study

The Township of Wellington North is undertaking a Class Environmental Assessment (Class EA) to determine the most cost-effective, environmentally sound, and sustainable approach to provide wastewater treatment to accommodate future growth in the Village of Arthur until 2031.

The objectives of the Class EA are:

- To examine the future wastewater treatment needs in the Village of Arthur until 2031;
- To evaluate the alternative solutions available for wastewater treatment in the Village of Arthur; and
- To identify the preferred solution to meet the future treatment needs of the Village of Arthur.



XCG | Burnside

Why Are We Here?

The objectives of this Public Information Centre are:

- To present an overview of the project;
- To provide an overview of the Class Environmental Assessment process that is being followed;
- To present the wastewater treatment design concepts that have been evaluated; and
- To present the recommended preferred design concept for wastewater treatment.

Public participation is an integral part of the study process. We encourage you to provide us with any comments that you might have.

Class EA Study Process

Arthur Wastewater Treatment Plant Class EA completes Phases 1 to 4 of the Municipal Class EA process

Phase 1
Problem or Opportunity → Existing Data Collection Review and Analysis

Phase 2
Alternative Solutions → Development and Evaluation of Servicing Alternatives

PIC No. 1

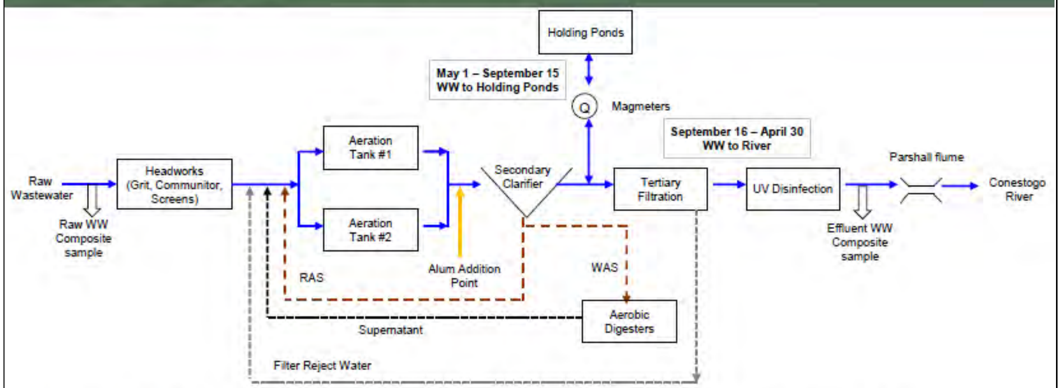
Phase 3
Alternative Design Concepts for Preferred Solution → Development and Evaluation of Alternative Design Concepts for the Preferred Solution

PIC No. 2 - We Are Here

Phase 4
Environmental Study Report (ESR) → Completion of an Environmental Study Report (ESR) and placement on public record for 30-day review period

Phase 5
Implementation → Construction of the Preferred Solution

General Plant Overview



- May 1st to September 15 -> Flow to holding ponds for storage / No discharge to Conestogo River
- September 16 to April 30 -> Effluent from plant (and Holding ponds) able to be discharged to Conestogo River, dependent on river flow

XCG

BURNSIDE

Preferred Solution

- The preferred servicing solution is:

  Expand the Existing Plant to Service Existing and Proposed Growth on Existing Property.

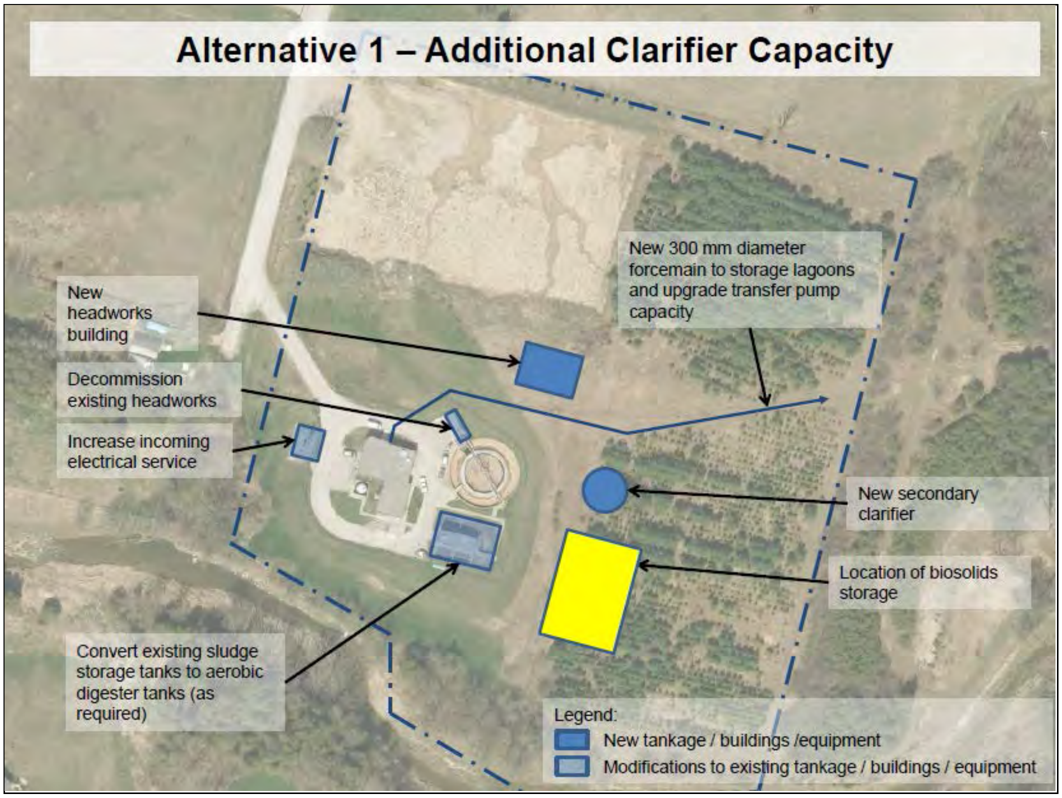
  Advantages of this solution:
  - Construction limited to the existing property
  - No land acquisition required
  - Some flexibility with respect to selecting treatment technologies for the expansion of the Existing Plant
  - Continued use of existing New Plant infrastructure; minimizing capital costs
  - Lowest relative 25-year life-cycle cost
- The preferred servicing solution was presented at PIC No. 1

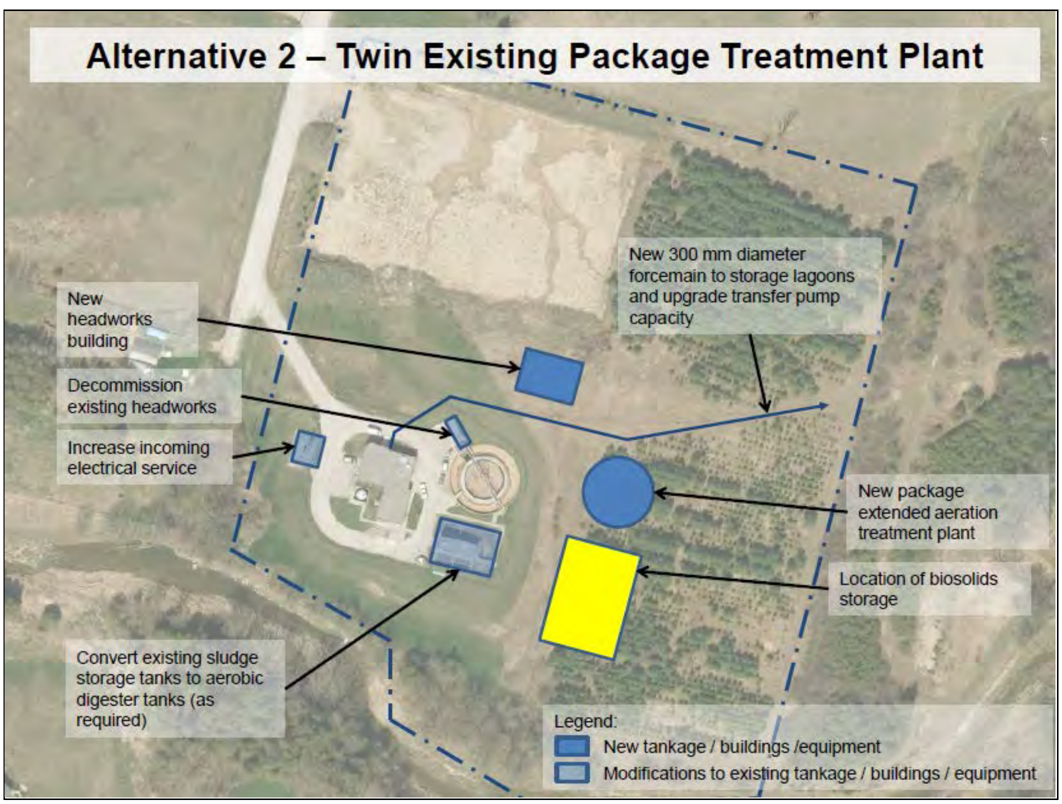
XCG BURNSIDE

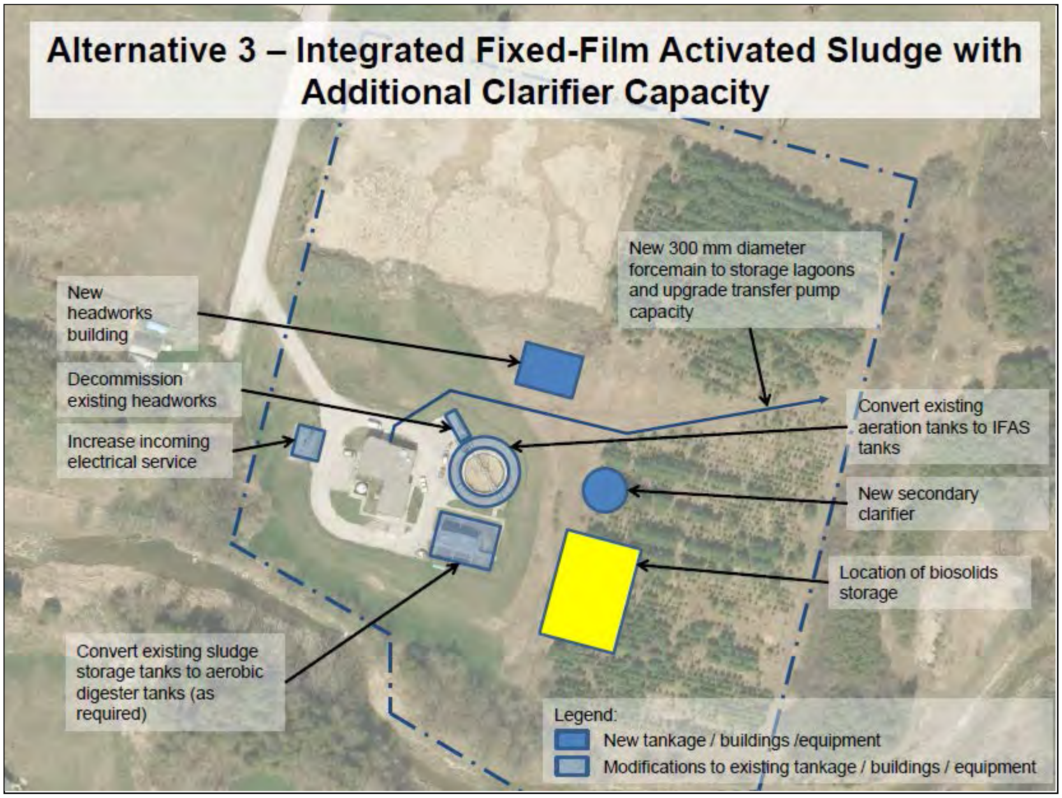
Alternative Design Concepts

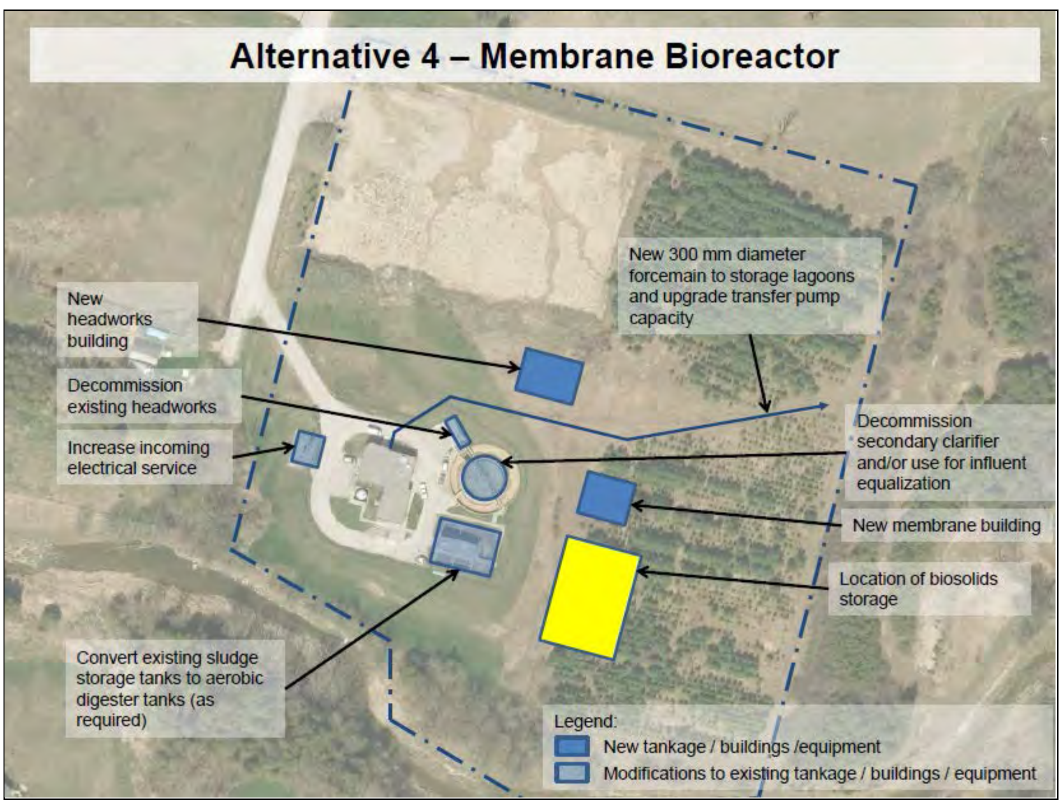
- Four alternative design concepts for the preferred solution were developed and evaluated:
  - Alternative 1 – Provide additional clarifier capacity
  - Alternative 2 – Twin the existing package treatment plant
  - Alternative 3 – Integrated Fixed-film Activated Sludge (IFAS) with additional clarifier capacity
  - Alternative 4 – Membrane Bioreactor (MBR)
- Two biosolids (digested sludge) storage options were considered for each of the above alternatives:
  - Option A – Liquid Biosolids Storage
  - Option B – Geotextile Dewatering and Cake Storage

XCG BURNSIDE


Alternative 1 – Additional Clarifier Capacity
New 300 mm diameter forcemain to storage lagoons and upgrade transfer pump capacity
New headworks building
Decommission existing headworks
Increase incoming electrical service
New secondary clarifier
Location of biosolids storage
Convert existing sludge storage tanks to aerobic digester tanks (as required)
Legend:
New tankage / buildings /equipment
Modifications to existing tankage / buildings / equipment

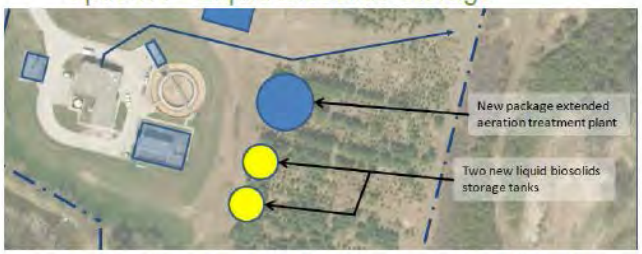

Alternative 2 – Twin Existing Package Treatment Plant
New 300 mm diameter forcemain to storage lagoons and upgrade transfer pump capacity
New headworks building
Decommission existing headworks
Increase incoming electrical service
New package extended aeration treatment plant
Location of biosolids storage
Convert existing sludge storage tanks to aerobic digester tanks (as required)
Legend:
New tankage / buildings /equipment
Modifications to existing tankage / buildings / equipment


Alternative 3 – Integrated Fixed-Film Activated Sludge with Additional Clarifier Capacity
New headworks building
Decommission existing headworks
Increase incoming electrical service
Convert existing sludge storage tanks to aerobic digester tanks (as required)
New 300 mm diameter forcemain to storage lagoons and upgrade transfer pump capacity
Convert existing aeration tanks to IFAS tanks
New secondary clarifier
Location of biosolids storage
Legend:
New tankage / buildings /equipment
Modifications to existing tankage / buildings / equipment


Alternative 4 – Membrane Bioreactor
New headworks building
Decommission existing headworks
Increase incoming electrical service
Convert existing sludge storage tanks to aerobic digester tanks (as required)
New 300 mm diameter forcemain to storage lagoons and upgrade transfer pump capacity
Decommission secondary clarifier and/or use for influent equalization
New membrane building
Location of biosolids storage
Legend:
New tankage / buildings /equipment
Modifications to existing tankage / buildings / equipment

Biosolids Storage Options

- Option A – Liquid Biosolids Storage



-Liquid biosolids currently stored on-site
- More truck traffic than Option B
- Higher capital and operations and maintenance (O&M) costs

- Option B – Geotextile Dewatering and Cake Storage

- Relatively new process
- Less truck traffic than Option A
- Lower capital and O&M costs

Evaluation of Alternatives

Construction Phase Evaluation Criteria

Group	Criteria	Definition
Natural Environment	Effect on surface waters	This criterion refers to the effects of the construction of the alternative design concept on the surface water quality, quantity and aquatic ecosystems
	Disruption of terrestrial features	This criterion refers to the temporary disruption or displacement of terrestrial features during construction activities.
Social/Cultural/ Community Environments	Disruption of adjacent residential, community and recreational features	This criterion addresses the potential nuisance impacts (noise, dust, odour, etc) and traffic on adjacent land owners and residents as a result of construction.
Economic Environment	Capital costs of construction	This criterion provides an estimate of capital cost of the alternative.
Technical Environment	Constructability	This criterion addresses the ability to maintain the performance of the treatment process during construction.

Evaluation of Alternatives

Operation Phase Evaluation Criteria

Group	Criteria	Definition
Natural Environment	Effect on surface waters	This criterion refers to the effects of operation of the alternative on surface water quality.
Social/Cultural/ Community Environments	Disruption of adjacent residential, community and recreational features	This criterion addresses the potential nuisance impacts (noise, odour, dust, etc) and truck traffic on adjacent land owners and residents as a result of the operation of the facility at the re-rated capacity with operation of the design alternative.
Economic Environment	Annual operating costs for processes that vary between the alternatives	This criterion addresses the cost of operation of the alternative. The alternatives were scored for this criterion based on the estimated annual operating costs of processes that vary between the alternatives. Processes that are similar between the alternatives and the labour at the WWTP were assumed constant.
Technical Environment	Performance and experience in similar climates and size	The criterion refers to the performance and experience of operating other WWTPs similar in size and design to the alternative design concept, in comparable climates as the area.
	Operating requirements	This criterion refers to the operational complexity of the alternative in terms of operator attention and staffing requirements.
	Compatibility with existing infrastructure	This criterion refers to the compatibility of the alternative with existing infrastructure in terms of the application/use of existing equipment and ability for retrofit.
	Ability to consistently meet effluent criteria	This criterion refers to the ability for the alternative to consistently be able to meet the WWTP effluent criteria.

Evaluation of Alternatives

Conceptual Level Cost Estimates

Alternative	Capital Costs	Annual O&M Cost	25-Yr Life-cycle Cost
1A – Additional clarifier capacity with liquid biosolids storage	◔	◔	◔
1B – Additional clarifier capacity with geotextile dewatering	○	○	○
2A – Twin existing package treatment plant with liquid biosolids storage	◑	◔	◑
2B – Twin existing package treatment plant with geotextile dewatering	○	○	○
3A – IFAS with additional clarifier capacity with liquid biosolids storage	◑	◔	◑
3B – IFAS with additional clarifier capacity with geotextile dewatering	○	○	○
4A – MBR with liquid biosolids dewatering	●	●	●
4B – MBR with geotextile dewatering	◕	◕	◕

Notes:

○ ◔ ◑ ◕ ●

Least expensive → Most expensive

Evaluation of Alternatives

Conceptual Level Cost Estimates

Parameter	Option 1A Secondary Clarifier w/Liquid Storage	Option 1B Secondary Clarifier w/Cake Storage	Option 2A Twin EA Plant w/Liquid Storage	Option 2B Twin EA Plant w/Cake Storage	Option 3A IFAS w/Liquid Storage	Option 3B IFAS w/Cake Storage	Option 4A MBR w/Liquid Storage	Option 4B MBR w/Cake Storage
Capital Costs:								
Liquid Treatment	$11.2M	$11.2M	$12.5M	$12.5M	$12.4M	$12.4M	$18.9M	$18.9M
Sludge Management	$5.1M	$2.3M	$5.1M	$2.3M	$5.1M	$2.3M	$4.3M	$2.3M
Total Capital Cost (1)	**$16.3M**	**$13.5M**	**$17.6M**	**$14.8M**	**$17.5M**	**$14.7M**	**$23.2M**	**$21.2M**
Annual O&M Costs	**$422K**	**$405K**	**$422K**	**$405K**	**$427K**	**$410K**	**$551K**	**$533K**
25-Year NPV O&M Cost (2)	$10.6M	$10.1M	$10.6M	$10.1M	$10.7M	$10.3M	$13.8M	$13.3M
25-Year Life-Cycle Cost (2)	**$26.9M**	**$23.6M**	**$28.2M**	**$24.9M**	**$28.2M**	**$25.0M**	**$37.0M**	**$34.5M**

Notes:

All costs are conceptual level opinions of probable costs and are considered to be accurate to within -25 to +40 percent and are exclusive of HST.

1. Includes a 30% allowance for contingency and 12% allowance for approvals, permits and engineering.
2. Based on interest rate of 5%, and inflation rate of 3%.

Evaluation of Alternatives

Overall Evaluation

Evaluation Criterion	Option 1A	Option 1B	Option 2A	Option 2B	Option 3A	Option 3B	Option 4A	Option 4B
Construction Phase	14	16	15	17	14	16	14	15
Operation Phase	27	26	28	27	25	25	22	22
Total	**41**	**42**	**43**	**44**	**39**	**41**	**36**	**37**

Preferred Alternative

XCG

BURNSIDE

Recommended Preferred Alternative

- The recommended preferred design alternative is:

  Option 2 – Twin Existing Package Treatment Plant and provide either Geotextile Dewatering or Liquid Biosolids Storage

  Advantages to this Alternative:

  – Known, robust and well proven treatment process (same as existing)
  – Allows for opportunities to undertake maintenance on existing EA plant
  – Continued use of existing New Plant infrastructure
  – Competitive 25-year life-cycle cost

- **Final selection of biosolids storage option to be made during preliminary design**

XCG BURNSIDE

What Will Happen Next?

- Receive and consider comments from the public and review agencies and confirm the Preferred Design Concept.
- Preparation of the Environmental Study Report.
- Place the Environmental Study Report on public record for 30-day review.
- Completion of the Class EA Study is scheduled for Fall 2014.

Public input is an important component of the Class EA process that will greatly assist the County in developing a solution to provide wastewater treatment to accommodate future growth in the Village of Arthur. Please deposit your comment form in the box provided or forward them to the Township. To obtain additional information, or to be placed on a mailing list, please contact:

Mr. Barry Trood
Water and Sewer Superintendent
The Township of Wellington North
7490 Sideroad 7 West, P.O. Box 125
Kenilworth, Ontario, N0G 2E0
Phone: 519-848-5327
Fax: 519-848-5291
e-mail: btrood@wellington-north.com

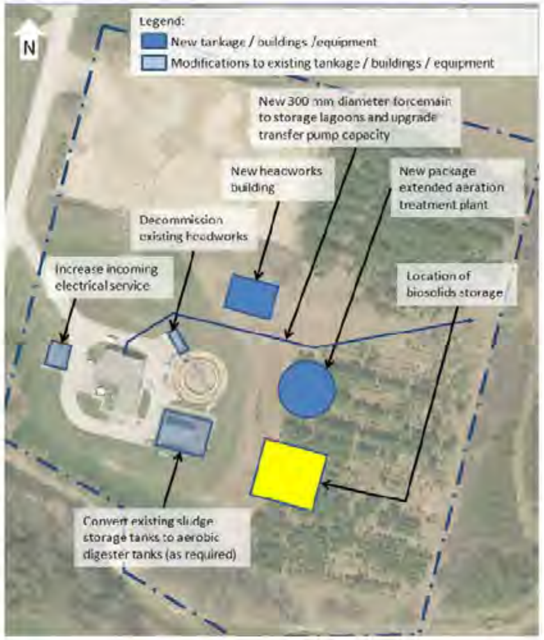
or

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
e-mail: stephen@xcg.com

XCG BURNSIDE

SITE LAYOUT OF RECOMMENDED PREFERRED DESIGN CONCEPT

A site layout of the recommended preferred design concept is provided to the right. All new tankage will be constructed within the existing property boundary.



WHAT ARE THE NEXT STEPS?

The selection of the recommended alternative design concept will be finalized based on public and agency input.

The study findings will be documented in an Environmental Study Report (ESR). The ESR will be placed on public record for a 30-day review period. Completion of the Class EA Study is scheduled for fall of 2014.

OPPORTUNITIES FOR PUBLIC COMMENT

We are interested in receiving your input. If you wish to comment on the Arthur WWTP Class EA, obtain additional information, or be placed on the mailing list to receive future project notifications, please contact either of the following project team members:

Mr. Barry Trood

Water and Sewer Superintendent
The Township of Wellington North
7490 Sideroad 7 West, P.O. Box 125
Kenilworth, ON, N0G 2E0
Phone: 519-848-5327
Fax: 519-848-5291
E-mail: btrood@wellington-north.com

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
E-mail: stephen@xcg.com

Arthur WWTP Class Environmental Assessment

Public Information Centre No. 2
Arthur Community Centre
158 Domville Street, Arthur, ON
Tuesday, June 10, 2014
6:00 p.m. to 8:00 p.m.

INTRODUCTION

The Township of Wellington North has initiated a Class Environmental Assessment (Class EA) to address the long-term wastewater treatment needs for the former Village of Arthur.

As the former Village of Arthur continues to grow, the population will eventually exceed the capacity of the existing infrastructure. In preparation, the Township of Wellington North has commenced this study to identify the most cost-effective, environmentally sound, and sustainable approach to provide wastewater treatment for future growth in the former Village of Arthur to the year 2031.

This Public Information Centre (PIC) presents an overview of the objectives of the study, the preferred solution and associated alternative design concepts, and the recommended preferred design concept for increasing the capacity of the Arthur Wastewater Treatment Plant (WWTP).

This is the second of two PICs that are being held as part of the Arthur WWTP Class EA. The first PIC was held on March 19, 2013.

STUDY APPROACH

This study has included the following components:

- Problem Identification;
- Development and evaluation of alternative solutions and selection of the preferred solution; and
- Development and evaluation of alternative design concepts for the preferred solution, and selection of the recommended preferred design concept.

CLASS ENVIRONMENTAL ASSESSMENT PROCESS

This study has followed the Municipal Class Environmental Assessment (MCEA) process, and includes opportunities for public and agency comment. This study is being undertaken as a Schedule C project and will complete Phases 1 through 4 of the MCEA process.

PROBLEM IDENTIFICATION

The Arthur WWTP provides tertiary treatment for wastewater from the former Village of Arthur. The plant has a rated average day capacity of 1,465 m^3/d and consists of an extended aeration facility complete with effluent filtration and aerobic digestion, and holding ponds (lagoons) for seasonal effluent storage. The Arthur WWTP treats both domestic and industrial wastewaters.

During the period from September 16 to April 30, effluent from the plant can be discharged to the Conestogo River, dependent on river flow. At other times, effluent from the WWTP is pumped to the holding ponds.

Based on the County of Wellington's Official Plan, there is planned growth in the former Village of Arthur. The projected 2031 average wastewater flows will exceed the existing rated capacity of the WWTP. As a result, additional wastewater treatment capacity must be provided to accommodate planned growth in the community.

PREFERRED SERVICING SOLUTION

The preferred solution is: **Expand the Existing Plant to Service Existing and Proposed Growth on Existing Property.** This was the recommended solution that was presented at PIC No. 1.

In addition to works required at the WWTP, the preferred solution includes the following components:

- Reduce wastewater flows through water efficiency measures and reduction of Inflow/ Infiltration (I/I); and
- Optimize the existing treatment process.

ALTERNATIVE DESIGN CONCEPTS

The following alternatives design concepts for the preferred solution were developed and evaluated. Alternatives were developed for both the liquid treatment train and solids (sludge) treatment train.

Liquid Treatment Alternatives were:

1. Provide additional clarifier capacity;
2. Twin the existing package treatment plant;
3. Integrated fixed-film activated sludge (IFAS) with additional clarifier capacity; and
4. Membrane bioreactor (MBR);

Solids (Sludge) Treatment Alternatives were:

A. Liquid biosolids storage (existing treatment type); and

B. Geotextile dewatering and cake storage.

Items common to all alternatives include a new headworks building, new forcemain from the WWTP to the storage lagoons, and electrical upgrades.

EVALUATION CRITERIA & RESULTS OF PRELIMINARY EVALUATION

A set of evaluation criteria were developed and used to evaluate the alternative design concepts. The criteria included economic, social, technical and natural environmental factors.

Based on the results of the evaluation, the recommended preferred design concept is Option 2 – Twin Existing Package Treatment Plant and provide either Geotextile Dewatering or Liquid Biosolids Storage.

Advantages of Option 2 include:

- Liquid treatment option is a robust and well proven process;
- Provides operational flexibility;
- Continued use of existing infrastructure; and
- Competitive 25-year life cycle cost.

Dianne Damman

From:	Barry Trood <btrood@wellington-north.com>
Sent:	Friday, June 13, 2014 8:31 AM
To:	lee normet; stephen@scg.com; Katie Normet; tom normet
Cc:	Stephen Nutt; Melody Johnson; Mike Givens
Subject:	RE: Comment sheet-Arthur Treatment Plant

Good Morning,
Thank you for taking the time to make your comments. I am attaching this email to our engineering firm (XCG) for the their records and confirming your comments have been received.

Barry Trood
Superintendant
Water/Wastewater

From: lee normet
Sent: Thursday, June 12, 2014 8:24 PM
To: Barry Trood; stephen@scg.com; Katie Normet; tom normet
Subject: Comment sheet-Arthur Treatment Plant

We attended the information session in Arthur on Tuesday, June 10, 2014. I have attached our comment sheet as requested. Please confirm that you have received this and can open the files attached. We look forward to hearing from you.

COMMENT SHEET

Arthur Wastewater Treatment Plant (WWTP)
Schedule C Class Environmental Assessment
Public Information Centre # 2
Tuesday, June 10, 2014

Thank you for your interest in the **Arthur Wastewater Treatment Plant Class Environmental Assessment.** You are encouraged to provide your comments. Please print legibly.

Name: TOM, LEE & KATIE NORMET

Address: ______ Street ______ Apt. No.

______ City ______ Province ______ Postal Code

Phone: ______

I would like to be placed on a mailing list to receive future notifications regarding this project.
Please indicate Yes or No. [✓] Yes [ ] No

Comment sheets can be left with a project team member or in the Comment Box, or can be sent by mail, fax or e-mail to one of the following team members. Please submit Comment Sheets before Tuesday, June 24, 2014

Mr. Barry Trood
The Township of Wellington North
Water and Sewer Superintendent
7490 Sideroad 7 West, P.O. Box 125
Kenilworth, ON, N0G 2E0
Phone: 519-848-5327
Fax: 519-848-5291
E-mail: btrood@wellington-north.com

or

Mr. Stephen Nutt, M. Eng., P. Eng.
Consultant Project Manager
XCG Consultants Ltd.
820 Trillium Drive
Kitchener, ON, N2R 1K4
Phone: 519-741-5774
Fax: 519-741-5627
E-mail: stephen@xcg.com

1. Please provide your comments on the alternatives for providing additional capacity at the Arthur WWTP.

No concern

2. Please provide your comments on the evaluation of the alternatives for providing additional capacity at the Arthur WWTP.

Increased capacity of the treatment plant will impact the lagoons. There is currently an environmental impact of the lagoons because of their sub-standard design. How will the municipality address the <u>leakage</u> of the current lagoons, now and in the future?

#4. Please provide any additional comments.

The recommended plan should address all environmental impacts. The recommendation to increase the capacity of the sewage plant should include changes to the existing sewage lagoons to avoid further environmental impact.

This plan does not address the sub-standard design of the existing lagoons:

- ***no setbacks from adjacent property lines***
- ***no means of leak detection***
- ***no collection system for leakage***
- ***leakage drains directly to the Conestoga River***
- ***leakage has made a section of our back field too wet to farm***

We are owners of the farm land adjacent to the existing lagoons. In the past we have brought this issue to the attention of the municipality but no changes have been made.

We find it ironic and sad that we as farmers worked with conservation authority to put into place an Environmental Farm Plan. We have protected the river from our animals and retired land in order to preserve the health of the water in the Conestoga River only to learn that the lagoons are leaking onto our land and ultimately into the river. This is the time to correct the problems, before the capacity of the treatment plant increases and causes further environmental problems.

Dianne Damman

From: Stephen Nutt <stephen.nutt@xcg.com>
Sent: June-27-14 5:23 PM
To: Tom Normet; btrood@wellington-north.com
Cc: Katie Normet; lee normet; mgivens@wellington-north.com; 'Dianne Damman'
Subject: RE: Comment sheet-Arthur Treatment Plant

Thank you for your note, Tom. As I noted in my response, the Environmental Study Report will recommend that the condition of the lagoons be assessed as part of the Preliminary Design and Detailed Design of the plant expansion which will follow the completion of the Class EA. I recommend that you keep in touch with the Township with respect to this assessment.

Barry: Are you aware of any monitoring or reports prepared regarding the lagoons as noted by Tom in his email?

Stephen G. Nutt, M.Eng., P.Eng.
Senior Consultant
XCG Consultants Ltd.

From: Tom Normet
Sent: June-27-14 3:10 PM
To: Stephen Nutt
Cc: Katie Normet; lee normet; btrood@wellington-north.com; mgivens@wellington-north.com
Subject: RE: Comment sheet-Arthur Treatment Plant

Dear Mr. Nutt

All communication with the sewage plant operator, during 2001 and 2002, was verbal. I met with whoever was in charge of the sewage plant at the northeast corner of the lagoon. A piezometer was installed by a consultant in our field and measurements were made. This device is still there but we are not aware of any monitoring. Zero information on what was discovered was ever communicated to us. So it is tough to send you copies of anything.

After a while the north east corner of the lagoon was dug up and we were advised that the leak had been fixed. At the same time the ditch along the old rail line was cleaned out to allow better drainage of the area.

There is still a problem of excessive moisture on our side of the fence. The moisture appears to be from two sources. Snow melt and run-off from the berm and leakage from underground. Later in the summer when all areas of the farm are dry, adjacent to the berm remains wet when the lagoon is full. The soil moisture is high enough to get the tractor stuck trying to work the land in the area adjacent to the lagoon. The liquid level in the lagoon is about 15 to 20 feet higher than the ground surface on our side of the fence and the berm is built on the property line.

We have avoided cropping the area because of the excessive moisture. Four years ago we planted 300 silver maples and other moisture tolerant trees within about 300 to 400 feet of the property line on our side. Not many have survived.

The expansion of the sewage plant should not proceed before the issues with the lagoon design and leakage have been addressed. With expansion of the sewage plant the utilization of the lagoons will increase and the moisture problems on our side of the fence will be worse than it is now.

The lagoon design is sub- standard and the sewage plant operator has no means to detect or contain leakage. Our comments on leakage seem to be the only method of leak detection right now.

Should this issue be addressed with some other agency?

Tom Normet

From: stephen.nutt@xcg.com
To:
Subject: FW: Comment sheet-Arthur Treatment Plant
Date: Wed, 25 Jun 2014 13:05:26 +0000

Stephen G. Nutt, M.Eng., P.Eng.
Senior Consultant
XCG Consultants Ltd.

Please consider the environment before printing this email.

From: Stephen Nutt
Sent: June-25-14 8:57 AM
To: 'leenormet ; 'tomnormet '; 'katienormet
Cc: Barry Trood; 'Mike Givens'; 'Dianne Damman'; Melody Johnson
Subject: Comment sheet-Arthur Treatment Plant

Lee, Tom and Katie Normet:

Thank you for attending the Public Information Centre for the Arthur Wastewater Treatment Plant on June 10 and for taking the time to submit a comment form. We note that you also attended the first Arthur WWTP PIC on March 19, 2013 at which time you expressed concerns about the storage lagoons near your property. For your reference, the response provided to you at that time is attached to this email.

With respect to the lagoons, the expansion of the Arthur WWTP does not involve any expansion of the storage lagoons. However, we note your concerns about possible leakage from these lagoons. The Environmental Study Report (ESR) that will be issued on completion of the Class EA will note these concerns and will recommend to the Township that the stability and integrity of the lagoon berms be assessed and remediation, if needed, undertaken as part of the Preliminary and Detailed Design phase of the project that will follow completion of the Class Environmental Assessment.

The ESR will be posted for public and agency review when complete and you will be notified at that time and given an opportunity to review and provide any further comments. Meanwhile, if you have any further questions or concerns, do not hesitate to contact me.

Stephen Nutt
XCG Consultants Ltd.

--Forwarded Message Attachment--
From: StephenN@xcg.com
To: tomnormet
CC: btrood@wellington-north.com; ddamman@kw.igs.net
Subject: RE: Arthur Waste Treatment
Date: Wed, 22 May 2013 12:26:32 -0400

Mr. Normet:

The Municipal Class Environmental Assessment (EA) document, which provides an approved planning process for the execution of Class EAs such as the Arthur Wastewater Treatment Plant Class EA, does not specify a notification period for Public Information Centres. We have found that the two weeks notification provided for this study is a fairly standard approach that we have taken on numerous similar Class EAs, and is an approach that satisfies MOE's expectations.

There is a 30 day review period required once the Environmental Study Report documenting the outcome of the Class EA is made available to the public and review agencies for review and comment.

With respect to the issues that you have raised regarding drainage in the area of the Arthur lagoons, have you raised these concerns previously with either the Township or with the Ontario Clean Water Agency, the wastewater plant operator? If so, please provide us with documentation related to these complaints (dates, contact person, copies of letters or emails, etc.) so that we can review this information as we undertake our assessment.

Thank you. We look forward to an opportunity to have further discussions with you related to your concerns as the Arthur WWTP Class EA progresses.

Stephen G. Nutt, M.Eng., P.Eng.
Senior Consultant
XCG Consultants Ltd.

From: Tom Normet |
Sent: Wednesday, May 22, 2013 8:27 AM
To: Stephen Nutt
Subject: RE: Arthur Waste Treatment

Legal Notification Period is 30 days. I think the Class EA includes this time for notification.

An e-mail in advance would be terrific. Thank you.

Tom Normet

From: StephenN@xcg.com
To: tomnormet
CC: btrood@wellington-north.com; ddamman@kw.igs.net; katie.normet
Subject: RE: Arthur Waste Treatment
Date: Tue, 21 May 2013 13:18:09 +0000
Mr. Normet:

Thank you for your continued interest in the Arthur Wastewater Treatment Plant Class EA. Letters to residents announcing the Public Information Centre (PIC) were mailed by the Township about two weeks in advance of the meeting and the announcements were published in the local papers two weeks and one week in advance. We have found that if announcements are made earlier, there is a risk that some residents will forget about the meeting.

With respect to the next PIC, we expect that it will be in the fall of 2013 (September or October). The announcements will again be posted on the Township website and in the local paper as well as being mailed to local residents. Please visit the Township website and watch the papers for the announcement or, if you wish, you can contact either me or Barry Trood at the Township to get an update on the schedule.

With respect to the plans for the existing lagoons, those details are still being developed based on input from the Ministry of Environment and the Grand River Conservation Authority. More detail will be provided at the next PIC.

If you need any further information, do not hesitate to contact me.

Stephen G. Nutt, M.Eng., P.Eng.
Senior Consultant
XCG Consultants Ltd.

From: Tom Normet
Sent: Thursday, May 16, 2013 9:38 PM
To: Stephen Nutt
Cc: btrood@wellington-north.com; ddamman@kw.igs.net; Katie Normet
Subject: RE: Arthur Waste Treatment

Thank you for the link to the information presented at the March 19 meeting. My daughter did in fact receive the letter a few days before the meeting. I was out of the country and she had previous commitments which could not be changed on such short notice. It would be easier for us if we could have 2 to 3 weeks notice of future meetings.

Our interest in the study is the location and design of the storage lagoons. The ones adjacent to our farm do not perform as they should. The berm sheds runoff into our field each spring with the snow melt. There is a huge snow drift each spring which melts and sends a large volume of water unto our property.

In addition to the snow melt the existing lagoon has substantial leakage. There is no provision in the design of the lagoon to collect the leakage. Even last summer - one of the driest in years - we were not able to work the field because of the wetness of the ground adjacent to the lagoon.

The information provided did not make clear if the plans include increasing the size or capacity of the existing lagoons. The only alternatives presented involved the treatment plant on the other side of town. We do not have concerns with the alternatives to expand the existing treatment plant on the existing site. What are the plans for the lagoons?

Thank you

Tom Normet

From: StephenN@xcg.com
To: tomnormet
CC: btrood@wellington-north.com; ddamman@kw.igs.net
Subject: Arthur Waste Treatment
Date: Thu, 16 May 2013 13:32:47 +0000

Good morning Mr. Normet

I am responding on behalf of Dianne Damman. Thank you very much for your note and for bringing this matter to our attention.

The first Public Information Centre (PIC) for the Arthur Wastewater Treatment Plant (WWTP) Class Environmental Assessment (EA) was held on Tuesday, March 19, 2013 at the Arthur Community Centre. The notification for this PIC was published in the Arthur Entrerprise on March 6 and 13, 2013 and the Wellington Advertiser on March 8 and 15, 2013. This notification was also posted on the Township's web site.

The Township also sent a notification letter to property owners surrounding the WWTP and lagoons on March 6, 2013. I have attached a copy of this letter, for your information.

Our mailing list includes a T.A Normet at 8102 Wellington Road 109, RR 3, Arthur, Ontario. Could you please confirm that this is your correct mailing address? Alternatively, if you could provide your correct mailing address, that would be much appreciated. We will ensure that our records are updated accordingly.

I have included a link to the display boards that were available for viewing at the PIC. Please feel free to contact me if you have any questions about these materials or further comments on the project.

Please accept our apologies for any inconvenience.

http://www.wellington-north.com/uploads/userfiles/files/wwtp%20class%20ea%20%20public%20info%20march%2019%20presentation.pdf

Stephen G. Nutt, M.Eng., P.Eng.
Senior Consultant
XCG Consultants Ltd.

Please consider the environment before printing this email.

From: Tom Normet
Sent: Wednesday, May 15, 2013 8:49 PM
To: ddamman@kw.igs.net
Subject: Arthur Waste Treatment

I understand that a meeting was held on this subject. Why did I NOT get notification?

Tom Normet

I-5

PUBLIC INFORMATION CENTRE # 3

- ***NEWSPAPER AD***
- ***EXAMPLE LETTERS***
- ***ATTENDANCE RECORD***
- ***COMMENT SHEET***
- ***DISPLAY BOARDS***
- ***HANDOUT***
- ***COMMENTS RECEIVED***

Enterprise News Express – March 16 and 23, 2016

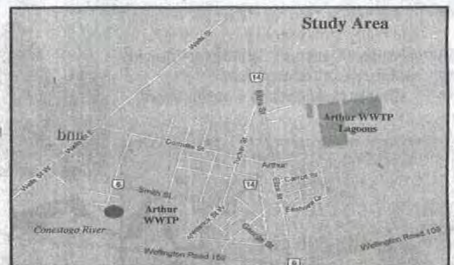
NOTICE OF PUBLIC INFORMATION CENTRE # 3

CLASS ENVIRONMENTAL ASSESSMENT
ARTHUR WASTEWATER TREATMENT PLANT

The Arthur Wastewater Treatment Plant (WWTP) is owned and operated by the Township of Wellington North (the Township). The Township is undertaking a Class Environmental Assessment (EA) to examine options for increasing the capacity of the WWTP.

The Arthur WWTP consists of an extended aeration facility complete with effluent filtration and aerobic digestion and conventional lagoons for seasonal effluent storage. The rated capacity of the facility is 1,465 m^3/day expressed as an annual average flow.

Current flows, combined with development commitments, have resulted in a situation where there is limited capacity for future growth. The study has examined alternatives for increasing the treatment capacity at the Arthur WWTP, and has identified a recommended preferred design.



Map courtesy of Google Maps

The study is being undertaken as a Schedule C project in accordance with the requirements of the Municipal Class Environmental Assessment (EA) (Municipal Engineers Association, June 2000, as amended in 2007, 2011 and 2015).

Two Public Information Centres (PICs) have been held to date. At PIC # 2 (June 2014), alternative design concepts for the expansion of the WWTP were presented, along with a recommended preferred design concept. Subsequent to *PIC # 2*, new information on wastewater flows currently received at the WWTP resulted in a need to re-examine the implementation of the preferred design concept, as well as evaluating the sewage pumping stations (SPSs) servicing the WWTP.

A third PIC has been scheduled to present and receive comments on the phasing of the expansion of the WWTP, options for the management of biosolids at the WWTP and the recommended preferred option for biosolids management, as well as information on the SPSs. The PIC will be held as follows:

Wednesday, March 30, 2016
6:00 PM to 8:00 PM
Arthur Community Centre (Upper Hall), 158 Domville Street
Arthur, Ontario

Information on the Arthur WWTP Class EA study will be posted on the Township's web site at: http://www.wellington-north.com. The information presented at this PIC will be available on this web site after March 30, 2016.

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:

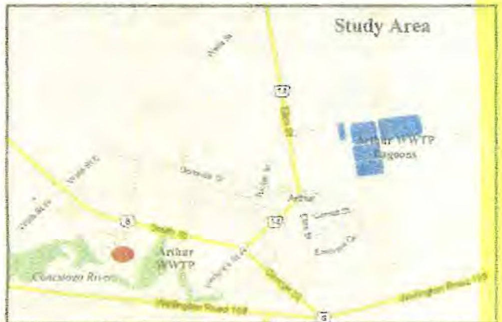
Mr. Matthew Aston, Director of Public Works
Township of Wellington North
7490 Sideroad 7 West
P.O. Box 125
Kenilworth, ON N0G 2E0
Phone: 519-848-3620, ext. 31
E-mail: maston@wellington-north.com

Ms. Melody Johnson, M.A.Sc., P. Eng.
Senior Project Manager
XCG Consulting Limited
2620 Bristol Circle, Suite 300
Oakville, ON L6H 6Z7
Phone: 905-829-8880, ext. 4250
Email: melody.johnson@xcg.com

This notice first issued on March 16, 2016.

NOTICE OF PUBLIC INFORMATION CENTRE # 3
CLASS ENVIRONMENTAL ASSESSMENT
ARTHUR WASTEWATER TREATMENT PLANT

The Arthur Wastewater Treatment Plant (WWTP) is owned and operated by the Township of Wellington North (the Township). The Township is undertaking a Class Environmental Assessment (EA) to examine options for increasing the capacity of the WWTP.



Map courtesy of Google Maps

The Arthur WWTP consists of an extended aeration facility complete with effluent filtration and aerobic digestion and conventional lagoons for seasonal effluent storage. The rated capacity of the facility is 1,465 m3/day expressed as an annual average flow.

Current flows, combined with development commitments, have resulted in a situation where there is limited capacity for future growth. The study has examined alternatives for increasing the treatment capacity at the Arthur WWTP, and has identified a recommended preferred design.

The study is being undertaken as a Schedule C project in accordance with the requirements of the Municipal Class Environmental Assessment (EA) (Municipal Engineers Association, June 2000. as amended in 2007, 2011 and 2015).

Two Public Information Centres (PICs) have been held to date. At PIC # 2 (June 2014), alternative design concepts for the expansion of the WWTP were presented, along with a recommended preferred design concept. Subsequent to PIC # 2, new information on wastewater flows currently received at the WWTP resulted in a need to re-examine the implementation of the preferred design concept, as well as evaluating the sewage pumping stations (SPSs) servicing the WWTP.

A third PIC has been scheduled to present and receive comments on the phasing of the expansion of the WWTP, options for the management of biosolids at the WWTP and the recommended preferred option for biosolids management, as well as information on the SPSs. The PIC will be held as follows:

Wednesday, March 30, 2016
6:00 PM to 8:00 PM
Arthur Community Centre (Upper Hall), 158 Domville Street
Arthur, Ontario

Information on the Arthur WWTP Class EA study will be posted on the Township's web site at: http://www.wellington-north.com. The information presented at this PIC will be available on this web site after March 30, 2016.

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:

Mr. Matthew Aston
Director of Public Works
Township of Wellington North
7490 Sideroad 7 West
P.O. Box 125
Kenilworth, ON N0G 2E0
Phone: 519-848-3620, ext. 31
E-mail: maston@wellington-north.com

Ms. Melody Johnson, M.A.Sc., P. Eng.
Senior Project Manager
XCG Consulting Limited
2620 Bristol Circle, Suite 300
Oakville, ON L6H 6Z7
Phone: 905-829-8880, ext. 4250
Email: melody.johnson@xcg.com

This notice first issued on March 16, 2016.

Township of Wellington North

P.O. Box 125 • 7490 Sideroad 7 W • Kenilworth • ON • N0G 2E0

March 16, 2016

Carol Neumann
Ministry of Agriculture, Food and Rural Affairs
Elora Resource Centre, Unit 10, 6484 Wellington Road 7
Elora, ON N0B 1S0

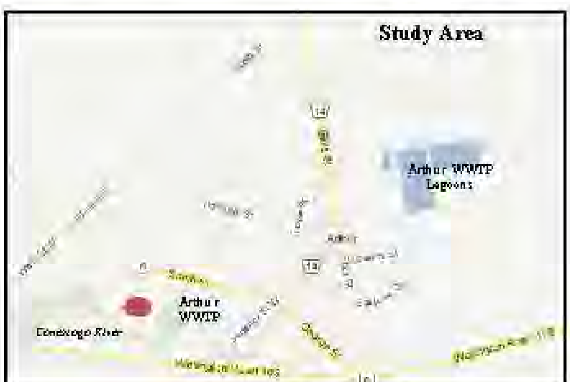
RE: Municipal Class Environmental Assessment
Arthur Wastewater Treatment Plant
Notice of Public Information Centre # 3

Dear Ms. Neumann:

The Arthur Wastewater Treatment Plant (WWTP) is owned and operated by the Township of Wellington North (the Township). The Township is undertaking a Class Environmental Assessment (EA) to examine options for increasing the capacity of the WWTP.

The Arthur WWTP consists of an extended aeration facility complete with effluent filtration and aerobic digestion and conventional lagoons for seasonal effluent storage. The rated capacity of the facility is 1,465 m^3/day expressed as an annual average flow.

The map below illustrates the location of the Arthur WWTP.



Map courtesy of Google Maps

The study is being undertaken as a Schedule C project in accordance with the requirements of the Municipal Class Environmental Assessment (EA) (Municipal Engineers Association, June 2000, as amended in 2007, 2011 and 2015).

Tel 519-848-3620 Toll Free 1-866-848-3620 Fax 519-848-3228
www.wellington-north.com township@wellington-north.com

Current flows, combined with development commitments, have resulted in a situation where there is limited capacity for future growth. The study has examined alternatives for increasing the treatment capacity at the Arthur WWTP, and has identified a recommended preferred design.

Two Public Information Centres (PICs) have been held to date. At PIC # 2 (June 2014), alternative design concepts for the expansion of the WWTP were presented, along with a recommended preferred design concept. Subsequent to PIC # 2, new information on wastewater flows currently received at the WWTP resulted in a need to re-examine the implementation of the preferred design concept, as well as evaluating the sewage pumping stations (SPSs) servicing the WWTP.

A third PIC has been scheduled to present and receive comments on the phasing of the expansion of the WWTP, options for the management of biosolids at the WWTP and the recommended preferred option for biosolids management, as well as information on the SPSs.

The PIC will be held as follows:

Wednesday, March 30, 2016
6:00 PM to 8:00 PM
Arthur Community Centre (Upper Hall), 158 Domville Street
Arthur, Ontario

Information on the Arthur WWTP Class EA study will be posted on the Township's web site at: http://www.wellington-north.com. The information presented at this PIC will be available on this web site after March 30, 2016.

If you have any questions or would like further information about the study, please contact the undersigned by phone at 519-848-3620, ext. 31 (Toll Free: 1-866-848-3620) or by e-mail at maston@wellington-north.com. Thank you very much for your interest in the study.

Sincerely,

Mr. Matthew Aston
Director of Public Works

Cc: Ms. Melody Johnson, XCG Consulting Limited

Township of Wellington North

P.O. Box 125 • 7490 Sideroad 7 W • Kenilworth • ON • N0G 2E0

March 16, 2016

Mark Anderson
Grand River Conservation Authority
400 Clyde Road, P.O. Box 729
Cambridge, ON N1R 5W6

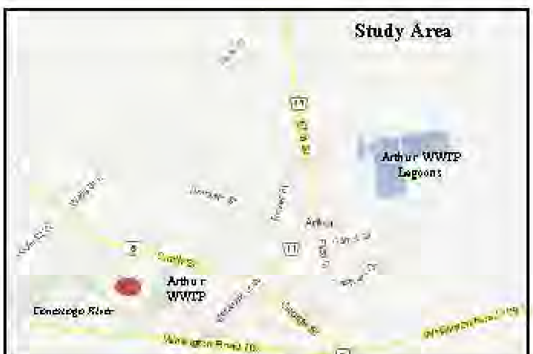
RE: Municipal Class Environmental Assessment
Arthur Wastewater Treatment Plant
Notice of Public Information Centre # 3

Dear Mr. Anderson:

The Arthur Wastewater Treatment Plant (WWTP) is owned and operated by the Township of Wellington North (the Township). The Township is undertaking a Class Environmental Assessment (EA) to examine options for increasing the capacity of the WWTP.

The Arthur WWTP consists of an extended aeration facility complete with effluent filtration and aerobic digestion and conventional lagoons for seasonal effluent storage. The rated capacity of the facility is 1,465 m^3/day expressed as an annual average flow.

The map below illustrates the location of the Arthur WWTP.



Map courtesy of Google Maps

The study is being undertaken as a Schedule C project in accordance with the requirements of the Municipal Class Environmental Assessment (EA) (Municipal Engineers Association, June 2000, as amended in 2007, 2011 and 2015).

Current flows, combined with development commitments, have resulted in a situation where there is limited capacity for future growth. The study has examined alternatives for increasing the treatment capacity at the Arthur WWTP, and has identified a recommended preferred design.

Two Public Information Centres (PICs) have been held to date. At PIC # 2 (June 2014), alternative design concepts for the expansion of the WWTP were presented, along with a recommended preferred design concept. Subsequent to PIC # 2, new information on wastewater flows currently received at the WWTP resulted in a need to re-examine the implementation of the preferred design concept, as well as evaluating the sewage pumping stations (SPSs) servicing the WWTP.

A third PIC has been scheduled to present and receive comments on the phasing of the expansion of the WWTP, options for the management of biosolids at the WWTP and the recommended preferred option for biosolids management, as well as information on the SPSs.

The PIC will be held as follows:

Wednesday, March 30, 2016
6:00 PM to 8:00 PM
Arthur Community Centre (Upper Hall), 158 Domville Street
Arthur, Ontario

Information on the Arthur WWTP Class EA study will be posted on the Township's web site at: http://www.wellington-north.com. The information presented at this PIC will be available on this web site after March 30, 2016.

If you have any questions or would like further information about the study, please contact the undersigned by phone at 519-848-3620, ext. 31 (Toll Free: 1-866-848-3620) or by e-mail at maston@wellington-north.com. Thank you very much for your interest in the study.

Sincerely,

Mr. Matthew Aston
Director of Public Works

Cc: Ms. Melody Johnson, XCG Consulting Limited

Township of Wellington North
P.O. Box 125 • 7490 Sideroad 7 W • Kenilworth • ON • N0G 2E0

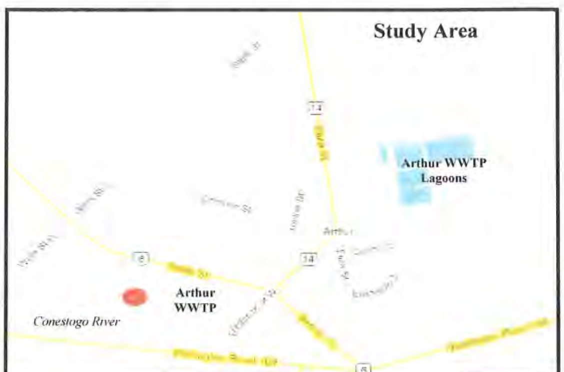
March16, 2016

RE: Municipal Class Environmental Assessment
Arthur Wastewater Treatment Plant
Notice of Public Information Centre # 3

Dear Property Owner:

The Arthur Wastewater Treatment Plant (WWTP) is owned and operated by the Township of Wellington North (the Township). The Township is undertaking a Class Environmental Assessment (EA) to examine options for increasing the capacity of the WWTP.

The map below illustrates the location of the Arthur WWTP.



Map courtesy of Google Maps

The study is being undertaken as a Schedule C project in accordance with the requirements of the Municipal Class Environmental Assessment (EA) (Municipal Engineers Association, June 2000, as amended in 2007, 2011 and 2015).

Current flows, combined with development commitments, have resulted in a situation where there is limited capacity for future growth. The study has examined alternatives for increasing the treatment capacity at the Arthur WWTP, and has identified a recommended preferred design.

Two Public Information Centres (PICs) have been held to date. At PIC # 2 (June 2014), alternative design concepts for the expansion of the WWTP were presented, along with a recommended preferred design concept. Subsequent to PIC # 2, new information on wastewater flows currently received at the WWTP resulted in a need to re-examine the implementation of the preferred design concept, as well as evaluating the sewage pumping stations (SPS) servicing the WWTP.

A third PIC has been scheduled to present and receive comments on the phasing of the expansion of the WWTP, options for the management of biosolids at the WWTP and the recommended preferred option for biosolids management, as well as information on the SPSs.

The PIC will be held as follows:

Wednesday, March 30, 2016
6:00 PM to 8:00 PM
Arthur Community Centre (Upper Hall), 158 Domville Street
Arthur, Ontario

Information on the Arthur WWTP Class EA study will be posted on the Township's web site at: http://www.wellington-north.com. The information presented at this PIC will be available on this web site after March 30, 2016.

If you have any questions or would like further information about the study, please contact the undersigned by phone at 519-848-3620, ext. 31 (Toll Free: 1-866-848-3620) or by e-mail at maston@wellington-north.com. Thank you very much for your interest in the study.

Sincerely,

Mr. Matthew Aston
Director of Public Works

Cc: Ms. Melody Johnson, XCG Consulting Limited

ARTHUR WASTEWATER TREATMENT PLANT
CLASS ENVIRONMENTAL ASSESSMENT

PUBLIC INFORMATION CENTRE # 3
March 30, 2016 – Arthur Community Centre (Upper Hall), Arthur
6:00 PM to 8:00 PM

ATTENDANCE SHEET

Thank you for your interest in this project. Please print legibly.

NAME	ADDRESS	PHONE NUMBER	E-MAIL ADDRESS
Matthew Aston			
AL RAWLINS			
Antonio Piazza			
DONNA & JIM KUNKEL			
JUDY WATT			
Steve McCabe			
Mark Anderson			
JIM PETROPOULOS			
Harold & Barb Mastragen			
Paul Smith			
Bob Crane			
JOHN COWLE			
MARY JO MARSHALL			

ARTHUR WASTEWATER TREATMENT PLANT
CLASS ENVIRONMENTAL ASSESSMENT

PUBLIC INFORMATION CENTRE # 3
March 30, 2016 – Arthur Community Centre (Upper Hall), Arthur
6:00 PM to 8:00 PM

ATTENDANCE SHEET

Thank you for your interest in this project. Please print legibly.

NAME	ADDRESS	PHONE NUMBER	E-MAIL ADDRESS
Bruce Voisin			
[illegible] Yake			
Sherry Burke			
Andy Lennox			
Gary Williamson			
Frank Vanderloo			
Jim Coffey			
Steve O'Neill			
Barry Trood			

The collection of personal information on this form is necessary for the proper administration of a lawfully authorized activity under the *Environmental Assessment Act* and will be used for the purposes of proving compliance with the consultation and public notice requirements under the *Act*. For more information about this collection, please contact Matthew Aston, Director of Public Works, Township of Wellington North, P.O. Box 125, 7490 Sideroad 7 W, Kenilworth, ON, Tel: 519-848-3620, ext. 31 or E-mail: maston@wellington-north.com.

COMMENT SHEET

Arthur Wastewater Treatment Plant (WWTP)
Schedule C Class Environmental Assessment
Public Information Centre # 3
Wednesday, March 30, 2016

Thank you for your interest in the **Arthur Wastewater Treatment Plant Class Environmental Assessment.** You are encouraged to provide your comments. Please print legibly.

Name: ______________________________

Address: ______________________ Street ______________________ Apt. No.

______________ City ______________ Province ______________ Postal Code

Phone: ______________________________

I would like to be placed on a mailing list to receive future notifications regarding this project.

Please indicate Yes or No. ☐ Yes ☐ No

Comment sheets can be left with a project team member or in the Comment Box, or can be sent by mail, fax or e-mail to one of the following team members. Please submit Comment Sheets before Wednesday, April 13, 2016.

Mr. Matthew Aston C.E.T., M.B.A.
Director of Public Works
Township of Wellington North
7490 Sideroad 7 West
P.O. Box 125
Kenilworth, ON N0G 2E0
Phone: 519-848-3620, ext. 31
E-mail: maston@wellington-north.com

or

Ms. Melody Johnson, M.A.Sc., P. Eng.
Senior Project Manager
XCG Consulting Limited
2620 Bristol Circle, Suite 300
Oakville, ON L6H 6Z7
Phone: 905-829-8880, ext. 4250
Email: melody.johnson@xcg.com

1. **Please provide your comments on the proposed phasing of the WWTP expansion, as presented on the display boards.**

____

____

____

____

____

2. **Please provide your comments on the four options for the management of biosolids at the Arthur WWTP.**

3. **Please provide your comments on the recommended preferred alternative for the management of biosolids at the Arthur WWTP during Phase 1 of the expansion of the plant.**

4. **Please provide any additional comments.**

The collection of personal information on this form is necessary for the proper administration of a lawfully authorized activity under the *Environmental Assessment Act* and will be used for the purposes of proving compliance with the consultation and public notice requirements under the *Act*. For more information about this collection, please contact Matthew Aston, Director of Public Works, Township of Wellington North, P.O. Box 125, 7490 Sideroad 7 W, Kenilworth, ON, Tel: 519-848-3620, ext. 31 or E-mail: maston@wellington-north.com.

Arthur WWTP
Class Environmental Assessment Study

Public Information Centre No.3

March 30, 2016

6:00 p.m. – 8:00 p.m.

Project team members are here to answer your questions and receive your comments about the study.

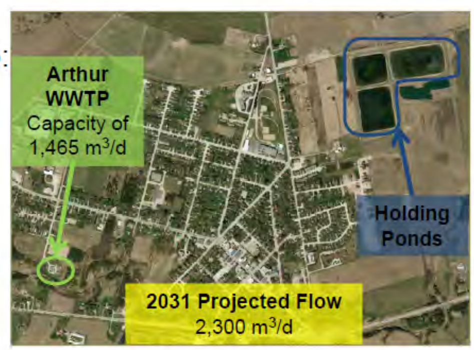
XCG Environmental Engineers & Scientists   BURNSIDE

Purpose of the Study

The Township of Wellington North is undertaking a Class Environmental Assessment (Class EA) to determine the most cost-effective, environmentally sound, and sustainable approach to provide wastewater treatment to accommodate future growth in the Village of Arthur until 2031.

The objectives of the Class EA are to:

- Examine the future wastewater treatment needs in the Village of Arthur until 2031
- Evaluate the alternative solutions available for wastewater treatment in the Village of Arthur
- Identify the preferred solution to meet the future treatment needs of the Village of Arthur



XCG   BURNSIDE

What Has Changed Since PIC No. 2 (June 2014)?

- PIC No. 2 presented the alternative wastewater treatment design concepts and recommended preferred design
- Subsequent to PIC No. 2, there was new information on wastewater flows currently being received at the wastewater treatment plant (WWTP)
- Increased flows between 2013 and 2014 resulted in a need to re-examine the implementation of the preferred design concept, as well as evaluating the sewage pumping stations servicing the WWTP

XCG

BURNSIDE

Why Are We Here?

The objectives of this Public Information Centre (PIC) are to present:

- An overview of the project and of the Class Environmental Assessment (Class EA) process that is being followed
- Minor changes to the preferred design alternative that was presented at the last PIC
- An updated evaluation of biosolids handling options
- Upgrades required at the Wells St. and Frederick St. sewage pumping stations

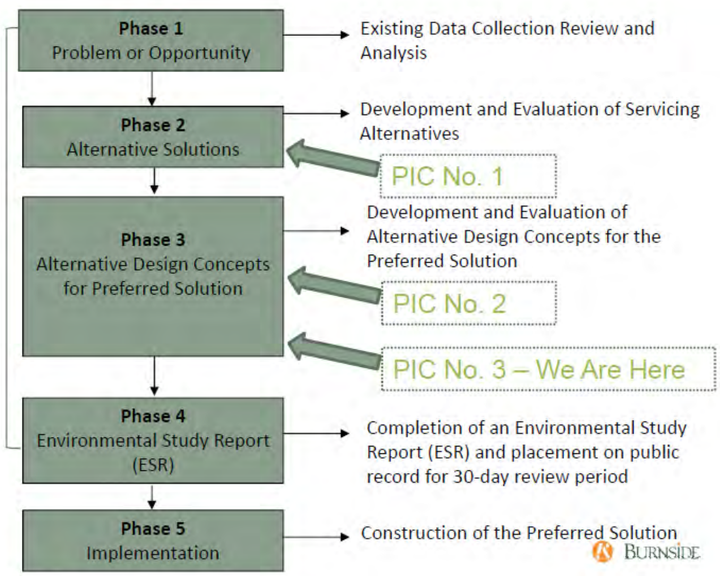
Public participation is an integral part of the study process. A comment sheet is available to provide us with feedback that you may have.

XCG

BURNSIDE

Class EA Study Process

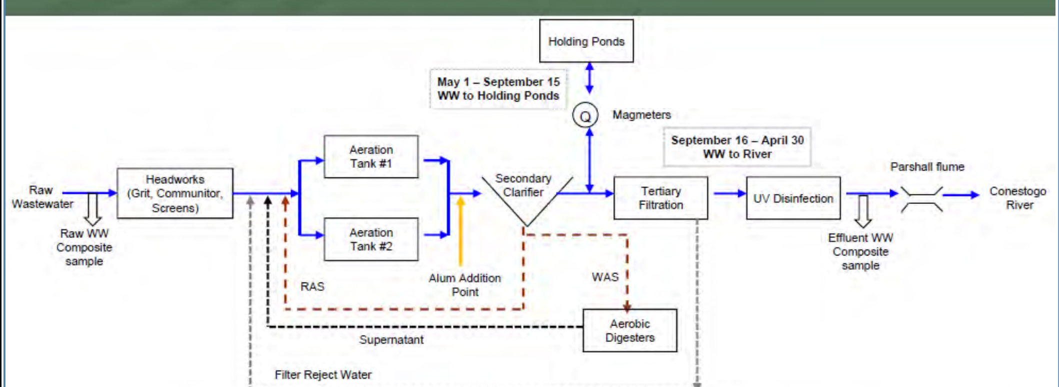
Arthur Wastewater Treatment Plant Class EA completes Phases 1 to 4 of the Municipal Class EA process



XCG

BURNSIDE

General Plant Overview



- May 1st to September 15 → Flow to holding ponds (lagoons) for storage / No discharge to Conestogo River
- September 16 to April 30 → Effluent from plant (and Holding ponds) can be discharged to Conestogo River, dependent on river flow

XCG

BURNSIDE

Preferred Solution

- The preferred servicing solution is:

  Expand the Existing Plant to Service Existing and Proposed Growth on Existing Treatment Plant Property

  Advantages of this solution:
  - Construction limited to the existing property
  - No land acquisition required
  - Some flexibility with respect to selecting treatment technologies for the expansion of the Existing Plant
  - Continued use of existing infrastructure; minimizing capital costs
  - Lowest relative 25-year life-cycle cost

- **The preferred servicing solution was presented at PIC No. 1**

XCG BURNSIDE

Preferred Design Alternative

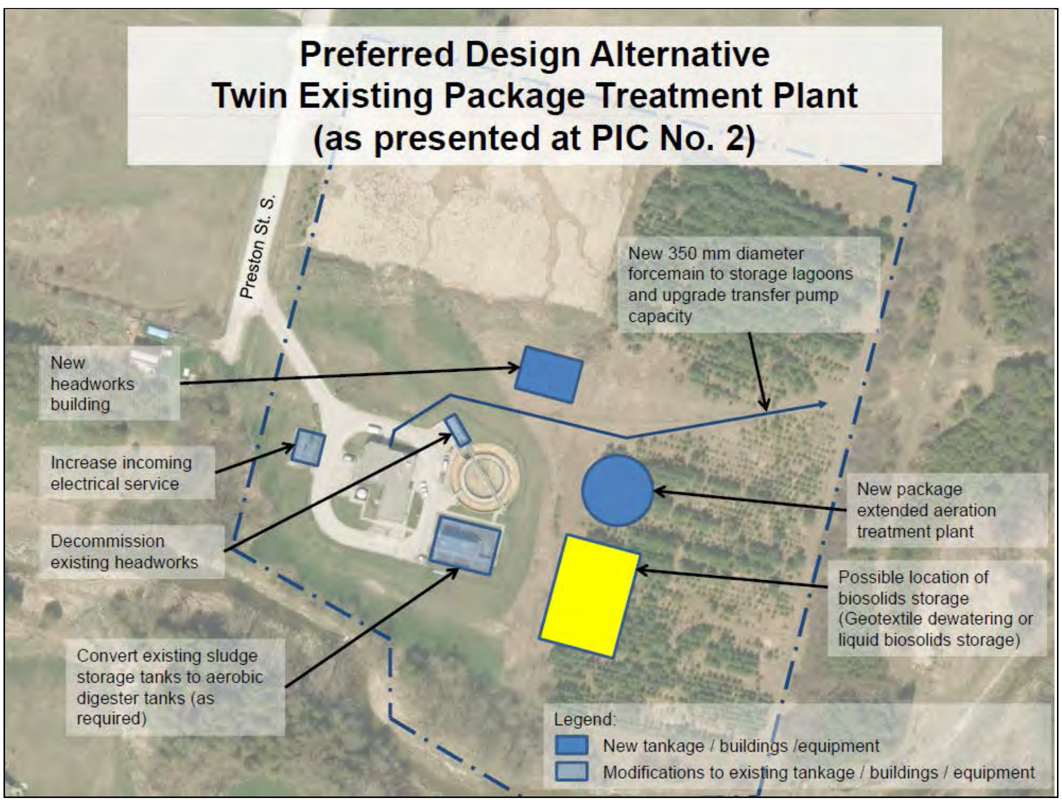
- The preferred design alternative is:

  Twin Existing Package Treatment Plant and Provide Either Geotextile Dewatering or Liquid Biosolids Storage

  Advantages to this Alternative:
  - Known, robust and well proven treatment process (same as existing)
  - Allows for opportunities to undertake maintenance on existing extended aeration plant by providing process redundancy
  - Continued use of existing infrastructure
  - Competitive 25-year life-cycle cost relative to other alternatives

- Final selection of biosolids handling/disposal to be made during preliminary design
- **The preferred design alternative was presented at PIC No. 2**

XCG BURNSIDE



Impact of Recent Flow Data

- Since completion of PIC No. 2, average day flows at the Arthur WWTP increased significantly and exceeded the existing rated capacity
- Detailed analysis confirmed the accuracy of flow measurements but could not identify the source(s) of the increased flow

To address current capacity limitations, it was recommended that the preferred design alternative be re-examined to determine if construction can be phased-in to:

- Provide capacity for existing flows in Phase 1
- Provide capacity for future growth to 2031 in Phase 2
- Reduce time to implementation

XCG BURNSIDE

Phased Expansion

Summary of Liquid Treatment Train Upgrades

- Construction to be divided over two phases

Phase 1

- Capacity increase to 1,860 m^3/d
- Construction of new equalization tank and process improvements (fine bubble aeration, dual point alum addition)
- Upgrades to lagoon conveyance system and standby power

Phase 2

- Capacity increase to 2,300 m^3/d
- Conversion of equalization tank into extended aeration plant
- Construction of new preliminary treatment
- Upgrades to lagoon conveyance system

XCG BURNSIDE

Phased Expansion

Review of Biosolids Management Options

- As part of the change to a phased-in construction approach, biosolids management options also need to be re-examined
- Four options considered for biosolids management
  - Option A: Onsite Liquid Biosolids Storage
  - Option B: Onsite Geotextile Dewatering and Storage
  - Option C: Offsite Liquid Storage at the Mount Forest WWTP
  - Option D: Offsite Liquid Disposal at the Regional Lystek Facility located in Dundalk, Ontario

The priority was to address biosolids management requirements for Phase 1

Phased Expansion

Conceptual Costs of Biosolids Management Options – Phase 1

Option	Capital Costs	Annual O&M Cost	5-Yr Life-cycle Cost
Option A – Onsite Liquid Biosolids Storage	●	◑	●
Option B – Onsite Geotextile Dewatering and Storage	◑	◔	◑
Option C – Offsite liquid storage at the Mount Forest WWTP	◕	◑	◕
Option D – Offsite liquid disposal at the Lystek Facility	○	●	◔

Notes:

○ ◔ ◑ ◕ ●

Least expensive → Most expensive

Phased Expansion

Preferred Biosolids Management Option

The recommended biosolids management option for Phase 1:

Option D: Offsite Liquid Biosolids Disposal at the Regional Lystek Facility in Dundalk, Ontario

Advantages to this Option

- Phase 1 capital costs - $0
- Lowest cost option over 5-year cost cycle
- Flexibility to change biosolids management strategy to reach Phase 2 capacity

Prior to implementation of Phase 2, all options will be re-evaluated to select a preferred biosolids management option for Phase 2

XCG BURNSIDE

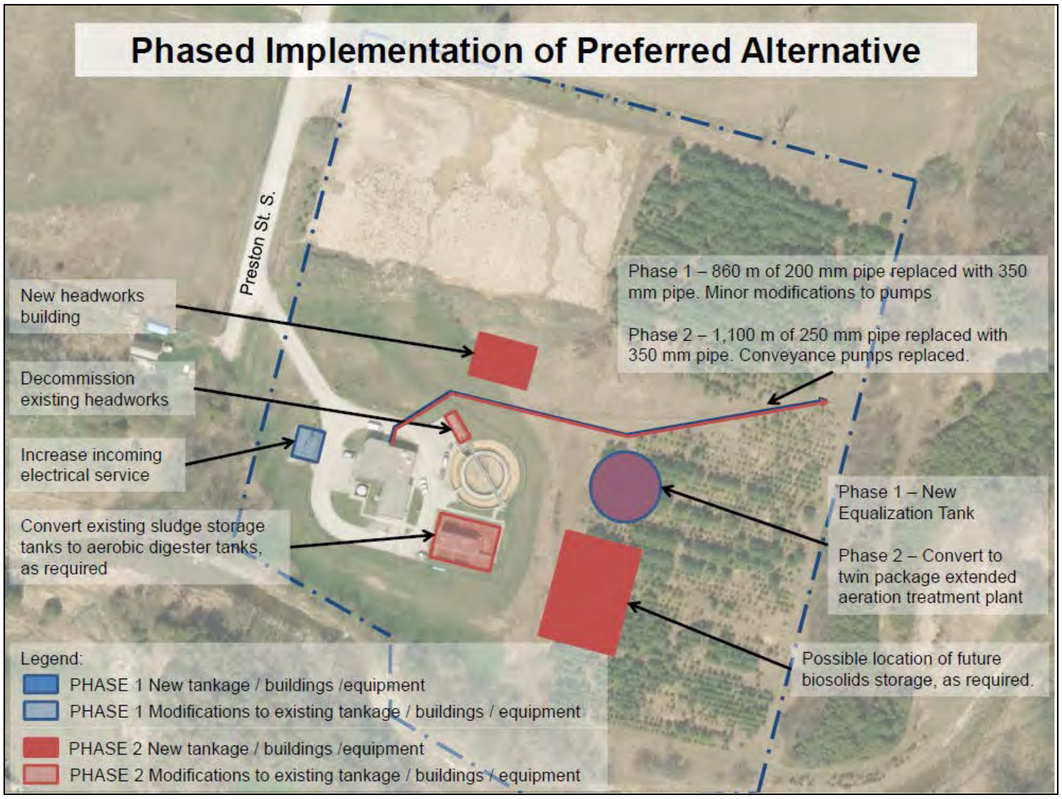
Phased Expansion

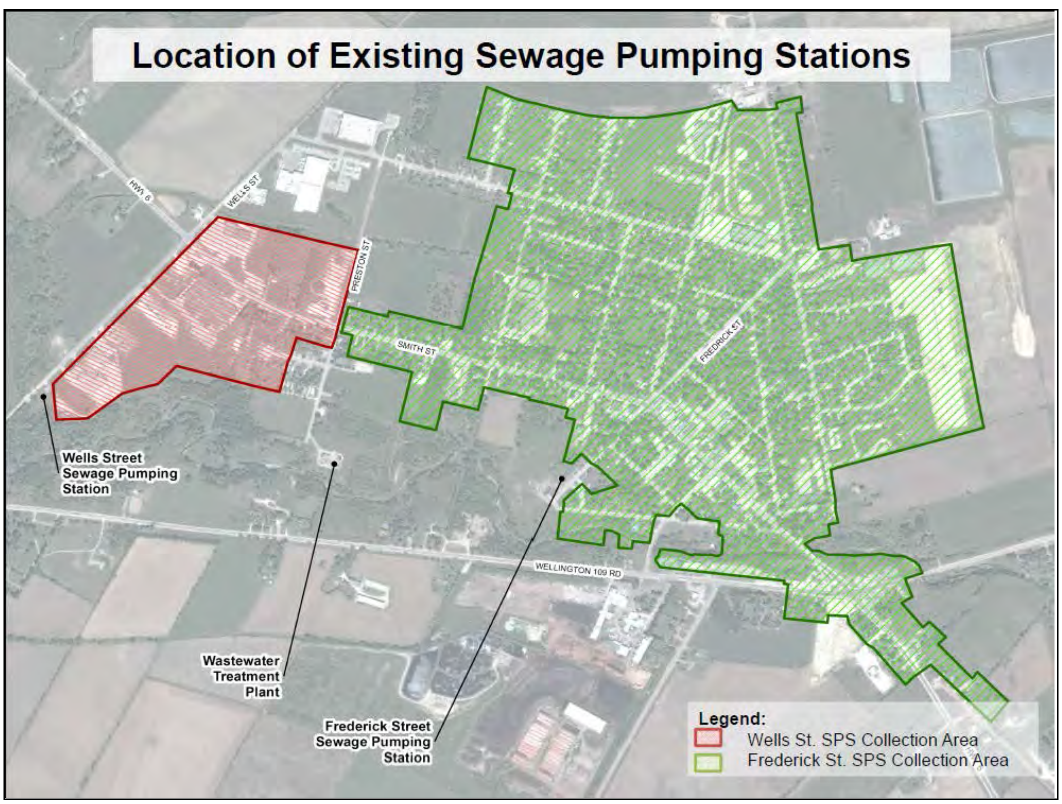
Summary of Conceptual Level Capital Cost Estimates

	Liquid Treatment	Biosolids Treatment
Phase 1	$4.8 million	$0
Phase 2	$8.1 million	$0 - $6.2 million
Overall	$12.9 million	$0 - $6.2 million

- Excludes operating costs and life cycle costs
- Excludes costs for pumping station upgrades – these costs are presented separately

XCG BURNSIDE


Phased Implementation of Preferred Alternative
Preston St. S.
New headworks building
Decommission existing headworks
Increase incoming electrical service
Convert existing sludge storage tanks to aerobic digester tanks, as required
Phase 1 – 860 m of 200 mm pipe replaced with 350 mm pipe. Minor modifications to pumps
Phase 2 – 1,100 m of 250 mm pipe replaced with 350 mm pipe. Conveyance pumps replaced.
Phase 1 – New Equalization Tank
Phase 2 – Convert to twin package extended aeration treatment plant
Possible location of future biosolids storage, as required.
Legend:
PHASE 1 New tankage / buildings /equipment
PHASE 1 Modifications to existing tankage / buildings / equipment
PHASE 2 New tankage / buildings /equipment
PHASE 2 Modifications to existing tankage / buildings / equipment


Location of Existing Sewage Pumping Stations
HWY 6
WELLS ST
PRESTON ST
SMITH ST
FREDERICK ST
WELLINGTON 109 RD
Wells Street Sewage Pumping Station
Wastewater Treatment Plant
Frederick Street Sewage Pumping Station
Legend:
Wells St. SPS Collection Area
Frederick St. SPS Collection Area

Wells St. Sewage Pumping Station

Historical Review (2007 – 2014):

- No recorded bypass over the review period
- Excess capacity relative to current flows

Projected Growth to 2031

- Minimal growth expected over the design period

Result: No upgrades or expansion to the Wells St. sewage pumping station

XCG

BURNSIDE

Frederick St. Sewage Pumping Station

- Current capacity is insufficient for existing flows (bypasses observed during wet weather)
- Additional capacity is required to service projected growth in the pumping station catchment area

Result: Expansion of the Frederick St. SPS is required

Proposed expansion includes: new wet wells with pretreatment and new backup generator

Estimated capital cost is **$2.9 million** (includes allowance for purchased land)

XCG

BURNSIDE

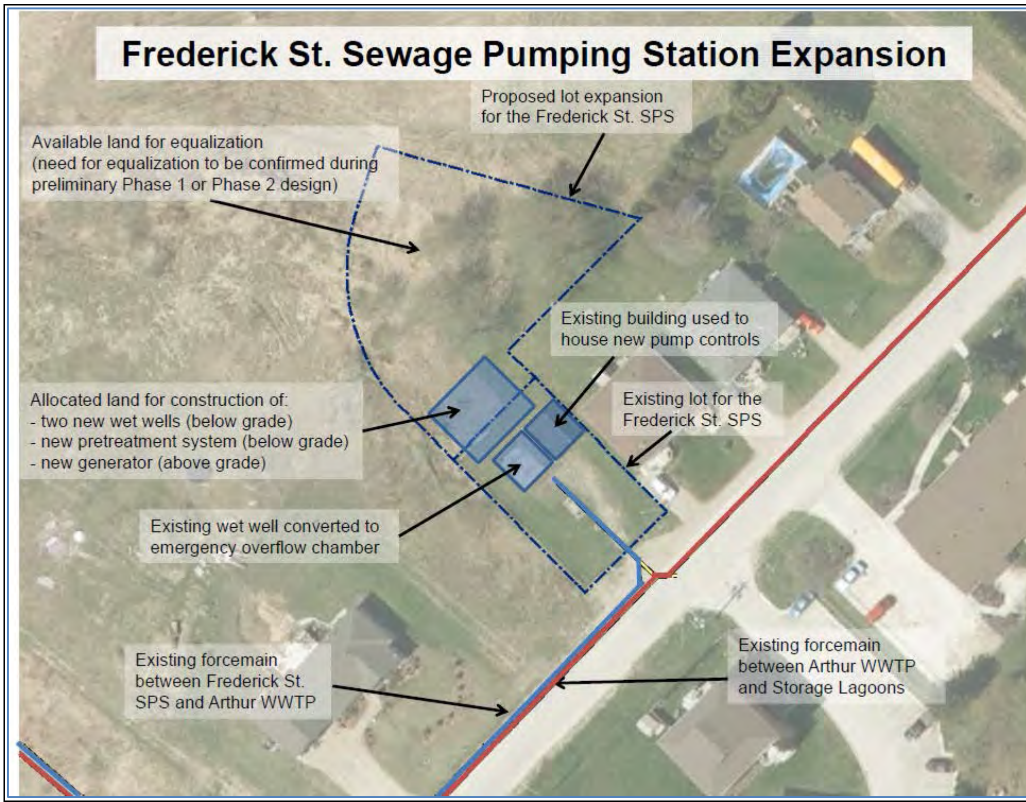
Frederick St. Sewage Pumping Station

- As part of the upgrades to the Frederick St. SPS, an equalization tank could be provided to address peak flows in the collection system (tank either above or below grade)
- The cost of an equalization tank was not included in the estimated SPS upgrade costs

Typical above grade tank

- Providing equalization at the Frederick St. SPS may reduce or eliminate the need for an equalization tank and/or effluent pumping upgrades at the Arthur WWTP, which could reduce WWTP upgrade costs
- The benefits of / need for equalization at the SPS will be confirmed during preliminary design of Phase 1 and Phase 2 upgrades at the WWTP

XCG BURNSIDE



What Will Happen Next?

- Receive and consider comments from the public and review agencies and confirm the Preferred Design Concept and Frederick St. SPS upgrade requirements
- Preparation of the Environmental Study Report
- Place the Environmental Study Report on public record for 30-day review
- Completion of the Class EA Study is scheduled for Spring 2016

Public input is an important component of the Class EA process that will greatly assist the Township in developing a solution to provide wastewater treatment to accommodate future growth in the Village of Arthur. Please deposit your comment form in the box provided or forward them to the Township. To obtain additional information, or to be placed on a mailing list, please contact:

Mr. Matthew Aston, C.E.T., M.B.A.
Director of Public Works
The Township of Wellington North
7490 Sideroad 7 West, P.O. Box 125
Kenilworth, Ontario, N0G 2E0
Phone: 519-848-3620 (ext.31)
Fax: 519-848-3228
e-mail: maston@wellington-north.com

or

Mrs. Melody Johnson, M. A.Sc., P. Eng.
Consultant Project Manager
XCG Consultants Ltd. Suite 300
2620 Bristol Circle
Oakville, Ontario L6H 6Z7
Phone: 905-829-8880
Fax: 905-829-8890
e-mail: melody.johnson@xcg.com

XCG

BURNSIDE

SITE LAYOUT FOR PHASED IMPLEMENTATION OF RECOMMENDED PREFERRED DESIGN CONCEPT

WHAT ARE THE NEXT STEPS?

The selection of the recommended alternative design concept will be finalized based on public and agency input.

The study findings will be documented in an Environmental Study Report (ESR). The ESR will be placed on public record for a 30-day review period. Completion of the Class EA Study is scheduled for spring of 2016.

OPPORTUNITIES FOR PUBLIC COMMENT

We are interested in receiving your input. If you wish to comment on the Arthur WWTP Class EA, obtain additional information, or be placed on the mailing list to receive future project notifications, please contact either of the following project team members:

Mr. Matthew Aston, C.E.T., M.B.A.

Director of Public Works
Township of Wellington North
7490 Sideroad 7 West, P.O. Box 125
Kenilworth, ON, N0G 2E0
Phone: 519-848-3630, ext. 31
E-mail: maston@wellington-north.com

Ms. Melody Johnson, M. A. Sc., P. Eng.

Senior Project Manager
XCG Consultants Ltd.
2620 Bristol Circle
Suite 300
Oakville, Ontario L6H 6Z7
Phone: 905-829-8880, ext. 4250
E-mail: melody.johnson@xcg.com

Arthur WWTP Class Environmental Assessment

Public Information Centre No. 3
Arthur Community Centre (Upper Hall)
158 Domville Street, Arthur, ON
Wednesday, March 30, 2016
6:00 p.m. to 8:00 p.m.

INTRODUCTION

The Township of Wellington North is undertaking a Class Environmental Assessment (Class EA) to address the long-term wastewater treatment needs for the former Village of Arthur.

As the former Village of Arthur continues to grow, the population will eventually exceed the capacity of the existing infrastructure. In preparation, the Township of Wellington North is undertaking this study to identify the most cost-effective, environmentally sound, and sustainable approach to provide wastewater treatment for future growth to the year 2031.

This Public Information Centre (PIC) presents information on how the wastewater treatment plant (WWTP) expansion would be implemented, alternatives for biosolids management and a recommended preferred alternative for biosolids.

This is the third PIC that has been held as part of this study. The first PIC was held on March 19, 2013 and the second PIC was held on June 10, 2014.

STUDY APPROACH

This study has included the following components:

- Problem Identification;
- Development and evaluation of alternative solutions and selection of the preferred solution; and
- Development and evaluation of alternative design concepts for the preferred solution, and selection of the recommended preferred design concept.

CLASS ENVIRONMENTAL ASSESSMENT PROCESS

This study has followed the Municipal Class EA process, and includes opportunities for public and agency comment. This study is being undertaken as a Schedule C project and will complete Phases 1 through 4 of the Class EA process.

PROBLEM IDENTIFICATION

The Arthur WWTP provides tertiary treatment for wastewater from the former Village of Arthur. The plant has a rated average day capacity of 1,465 m^3/d and consists of an extended aeration facility complete with effluent filtration and aerobic digestion, and holding ponds (lagoons) for seasonal effluent storage. The Arthur WWTP treats both domestic and industrial wastewaters.

During the period from September 16 to April 30, effluent from the plant can be discharged to the Conestogo River, dependent on river flow. At other times, effluent from the WWTP is pumped to the holding ponds.

Based on the County of Wellington's Official Plan, there is planned growth in the former Village of Arthur. The projected 2031 average wastewater flows will exceed the existing rated capacity of the WWTP. As a result, additional wastewater treatment capacity must be provided to accommodate planned growth in the community.

PREFERRED SERVICING SOLUTION

The preferred solution is: **Expand the Existing Plant to Service Existing and Proposed Growth on Existing Property.** This was the recommended solution that was presented at PIC No. 1.

PREFERRED DESIGN CONCEPT

The preferred design concept is: **Twin Existing Package Treatment Plant and Provide Either Geotextile Dewatering or Liquid Biosolids Storage.**

The advantages of this design concept include:

- Liquid treatment option is a robust and well proven process;
- Provides operational flexibility;
- Continued use of existing infrastructure; and
- Competitive 25-year life cycle cost.

In addition to works required at the WWTP, the preferred solution includes the following components:

- Reduce wastewater flows through water efficiency measures and reduction of Inflow/ Infiltration (I/I); and
- Optimize the existing treatment process.

WHAT HAS CHANGED SINCE PIC # 2?

After PIC # 2 was held in June 2014, average day flows at the WWTP increased significantly beyond the rated capacity of the Arthur WWTP. A detailed analysis confirmed the accuracy of the flow measurements but could not identify the source(s) of the additional flow.

In order to address capacity limitations at the plant (given these additional flows), it was determined that the preferred design alternative should be re-examined in greater detail to address the existing flows and to determine how construction of the expansion of the WWTP could be phased. This part of the study has examined how the WWTP expansion could be constructed in two phases.

OPTIONS FOR BIOSOLIDS MANAGEMENT

The following options were evaluated for the management of biosolids:

- Option A – Onsite Liquid Biosolids Storage;
- Option B – Onsite Geotextile Dewatering and Storage;
- Option C – Offsite Liquid Storage at the Moutn Forest WWTP; and
- Option D – Offsite Liquid Disposal at the Regional Lystek Facility (Dundalk, ON).

Based on the results of the evaluation, the preferred option for biosolids management for Phase 1 is **Option D – Offsite Liquid Disposal at the Regional Lystek Facility (Dundalk ON).** This option is the lowest cost option and offers the flexibility to change the biosolids management strategy for Phase 2, if required.

COMMENT SHEET

Arthur Wastewater Treatment Plant (WWTP)
Schedule C Class Environmental Assessment
Public Information Centre # 3
Wednesday, March 30, 2016

Thank you for your interest in the **Arthur Wastewater Treatment Plant Class Environmental Assessment.** You are encouraged to provide your comments. Please print legibly.

Name: HAROLD & BARB MARSBERGEN

Address:

Street Apt. No.

City Province Postal Code

Phone:

I would like to be placed on a mailing list to receive future notifications regarding this project.

Please indicate Yes or No. ☑ Yes ☐ No

Comment sheets can be left with a project team member or in the Comment Box, or can be sent by mail, fax or e-mail to one of the following team members. Please submit Comment Sheets before Wednesday, April 13, 2016.

Mr. Matthew Aston C.E.T., M.B.A.
Director of Public Works
Township of Wellington North
7490 Sideroad 7 West
P.O. Box 125
Kenilworth, ON N0G 2E0
Phone: 519-848-3620, ext. 31
E-mail: maston@wellington-north.com

or

Ms. Melody Johnson, M.A.Sc., P. Eng.
Senior Project Manager
XCG Consulting Limited
2620 Bristol Circle, Suite 300
Oakville, ON L6H 6Z7
Phone: 905-829-8880, ext. 4250
Email: melody.johnson@xcg.com

1. **Please provide your comments on the proposed phasing of the WWTP expansion, as presented on the display boards.**

I believe EITHER WILL BE GOOD.
TIME to get STARTED.

The collection of personal information on this form is necessary for the proper administration of a lawfully authorized activity under the *Environmental Assessment Act* and will be used for the purposes of proving compliance with the consultation and public notice requirements under the *Act*. For more information about this collection, please contact Matthew Aston, Director of Public Works, Township of Wellington North, P.O. Box 125, 7490 Sideroad 7 W, Kenilworth, ON, Tel: 519-848-3620, ext. 31 or E-mail: maston@wellington-north.com.

2. **Please provide your comments on the four options for the management of biosolids at the Arthur WWTP.**

3. **Please provide your comments on the recommended preferred alternative for the management of biosolids at the Arthur WWTP during Phase 1 of the expansion of the plant.**

4. **Please provide any additional comments.**

The collection of personal information on this form is necessary for the proper administration of a lawfully authorized activity under the *Environmental Assessment Act* and will be used for the purposes of proving compliance with the consultation and public notice requirements under the *Act*. For more information about this collection, please contact Matthew Aston, Director of Public Works, Township of Wellington North, P.O. Box 125, 7490 Sideroad 7 W, Kenilworth, ON, Tel: 519-848-3620, ext. 31 or E-mail: maston@wellington-north.com.

COMMENT SHEET

Arthur Wastewater Treatment Plant (WWTP)
Schedule C Class Environmental Assessment
Public Information Centre # 3
Wednesday, March 30, 2016

Thank you for your interest in the **Arthur Wastewater Treatment Plant Class Environmental Assessment.** You are encouraged to provide your comments. Please print legibly.

Name: BRUCE VOISIN

Address: ____________________ Street ____________ Apt. No.

____________ City ____________ Province ____________ Postal Code

Phone: ____________________

I would like to be placed on a mailing list to receive future notifications regarding this project.
Please indicate Yes or No. ☑ Yes ☐ No

Comment sheets can be left with a project team member or in the Comment Box, or can be sent by mail, fax or e-mail to one of the following team members. Please submit Comment Sheets before Wednesday, April 13, 2016.

Mr. Matthew Aston C.E.T., M.B.A.
Director of Public Works
Township of Wellington North
7490 Sideroad 7 West
P.O. Box 125
Kenilworth, ON N0G 2E0
Phone: 519-848-3620, ext. 31
E-mail: maston@wellington-north.com

or

Ms. Melody Johnson, M.A.Sc., P. Eng.
Senior Project Manager
XCG Consulting Limited
2620 Bristol Circle, Suite 300
Oakville, ON L6H 6Z7
Phone: 905-829-8880, ext. 4250
Email: melody.johnson@xcg.com

1. **Please provide your comments on the proposed phasing of the WWTP expansion, as presented on the display boards.**

MAKES SENSE.

2. **Please provide your comments on the four options for the management of biosolids at the Arthur WWTP.**

OPTION D BEST

3. **Please provide your comments on the recommended preferred alternative for the management of biosolids at the Arthur WWTP during Phase 1 of the expansion of the plant.**

BACK UP OPTIONS IN PLACE.

4. **Please provide any additional comments.**

PLANNING ONLY TO 2031 SEEMS SHORT,

COMMENT SHEET

Arthur Wastewater Treatment Plant (WWTP)
Schedule C Class Environmental Assessment
Public Information Centre # 3
Wednesday, March 30, 2016

Thank you for your interest in the **Arthur Wastewater Treatment Plant Class Environmental Assessment.** You are encouraged to provide your comments. Please print legibly.

Name: 4L RAWLINS.

Address: ______ Street ______ Apt. No.

______ City ______ Province ______ Postal Code

Phone: ______

I would like to be placed on a mailing list to receive future notifications regarding this project.
Please indicate Yes or No. ☑ Yes ☐ No

Comment sheets can be left with a project team member or in the Comment Box, or can be sent by mail, fax or e-mail to one of the following team members. Please submit Comment Sheets before Wednesday, April 13, 2016.

Mr. Matthew Aston C.E.T., M.B.A.
Director of Public Works
Township of Wellington North
7490 Sideroad 7 West
P.O. Box 125
Kenilworth, ON N0G 2E0
Phone: 519-848-3620, ext. 31
E-mail: maston@wellington-north.com

or

Ms. Melody Johnson, M.A.Sc., P. Eng.
Senior Project Manager
XCG Consulting Limited
2620 Bristol Circle, Suite 300
Oakville, ON L6H 6Z7
Phone: 905-829-8880, ext. 4250
Email: melody.johnson@xcg.com

1. **Please provide your comments on the proposed phasing of the WWTP expansion, as presented on the display boards.**

I WAS PLEASANTLY SURPRISED TO SEE THAT THIS PROJECT IS DESIGNED TO GIVE ARTHUR AN ADDITIONAL 20 YEARS APPROX. OF CAPACITY

2. **Please provide your comments on the four options for the management of biosolids at the Arthur WWTP.**

I AGREE THAT OPTION D MAKES THE MOST SENSE.

3. **Please provide your comments on the recommended preferred alternative for the management of biosolids at the Arthur WWTP during Phase 1 of the expansion of the plant.**

SAME AS #2.

4. **Please provide any additional comments.**

I REALIZE THAT THE PROJECT HAS A LOT OF HURDLES TO CLEAR BEFORE IT CAN PROCEED, BUT AT LEAST THE PROCESS IS UNDERWAY. THE SOONER IT IS COMPLETE THE BETTER.

I-6

AGENCY AND STAKEHOLDER CONSULTATION

– CORRESPONDENCE

AGENCIES

Dianne Damman

From: Matt Aston <maston@wellington-north.com>
Sent: August-05-16 10:41 AM
To: Muller, Joseph (MTCS)
Cc: Graham Seggewiss; Dianne Damman; Barry Trood
Subject: Arthur WWTP - CHIA Addendum
Attachments: Addendum Arthur WWTP Cultural Heritage Impact Assessment Report August 2016.pdf; Letter to Joseph M 20160805MA.pdf

Please confirm receipt of two (2) attached PDF files with this e-mail.

Good Morning Mr. Muller,

Please find attached a letter and addendum to the CHIA for the Arthur WWTP.

If you would prefer hard copies be mailed to your office, let me know.

Please do not hesitate to contact me at 519-848-3620 x31 if you require anything further.

Regards,
MA

Matthew Aston
Director of Public Works

519.848.3620 ext 31
1.866.848.3620 FAX 519.848.3228
maston@wellington-north.com

7490 Sideroad 7 W, PO Box 125,
Kenilworth, Ontario, N0G 2E0
www.wellington-north.com

THE TOWNSHIP OF WELLINGTON NORTH

7490 Sideroad 7 W, PO Box 125,
Kenilworth, ON N0G 2E0

www.wellington-north.com

519.848.3620
1.866.848.3620 FAX 519.848.3228

Plan to Simply Explore
www.simplyexplore.ca

August 5, 2016

E-MAILED

Joseph Muller, RPP, MCIP
Heritage Planner
Ministry of Tourism, Culture and Sport
Culture Division | Programs and Services Branch | Heritage Program Unit
401 Bay Street, Suite 1700
Toronto, Ontario M7A 0A7

Subject: **Arthur Wastewater Treatment Plant**
Municipal Class Environmental Assessment
CHIAR Addendum

Dear Mr. Muller,

I trust all is well on your end and that you are having a good summer.

Please find enclosed with this letter a copy of the addendum to the Cultural Heritage Impact Assessment Report (CHIAR) for the Arthur Wastewater Treatment Plant (WWTP) Class EA in response to your letter dated April 13, 2016. The enclosed CHIAR includes the Frederick St. sewage pumping station site and the force-main that connects the Arthur WWTP to the holding ponds.

7490 Sideroad 7 W, PO Box 125,
Kenilworth, ON N0G 2E0
www.wellington-north.com
519.848.3620
1.866.848.3620 FAX 519.848.3228

It is our intent to include the updated CHIAR as an appendix to the Environmental Study Report (ESR). We will also be providing a summary of the CHIAR findings in the ESR.

Thank you very much for your on-going interest in this study and feel free to contact me at 519-848-3620 x31 or maston@wellington-north.com if I can be of further assistance.

Best regards,

Matthew Aston, C.E.T., C.Mgr.
Director of Public Works

CC:

Mr. Barry Trood, Township of Wellington North
Mr. Graham Seggewiss, XCG Consultants Ltd.

7490 Sideroad 7 W, PO Box 125,
Kenilworth, ON N0G 2E0
www.wellington-north.com
519.848.3620
1.866.848.3620 F: 519.848.3228
Plan to Simply Explore www.simplyexplore.ca

April 28, 2016

Joseph Muller, RPP, MCIP
Heritage Planner
Ministry of Tourism, Culture and Sport
Culture Division | Programs and Services Branch | Heritage Program Unit
401 Bay Street, Suite 1700
Toronto, Ontario M7A 0A7

Subject: Arthur Wastewater Treatment Plant
Municipal Class Environmental Assessment
Response to Joseph Muller – MTCS

Dear Mr. Muller,

Thank you very much for your April 13, 2016 comments which you provided in response to the Town's Notice of Public Information Centre # 3 for the Arthur Wastewater Treatment Plant Class EA.

As you may recall, a Cultural Heritage Impact Assessment Report (CHIAR) for the wastewater treatment plant site was prepared for this project by LRA Heritage. The CHIAR was provided for your review and comment on August 29, 2014 by Mr. Stephen Nutt of XCG Consulting Limited. You had provided a response to Stephen on September 16, 2014, indicating that the CHIAR was fine.

THE TOWNSHIP OF WELLINGTON NORTH
7490 Sideroad 7 W, PO Box 125,
Kenilworth, ON N0G 2E0
www.wellington-north.com
519.848.3620
1.866.848.3620 FAX 519.848.3228
Plan to Simply Explore
www.simplyexplore.ca

Since then, we have again retained LRA Heritage to complete an update to the CHIAR to include the Frederick St. sewage pumping station site. Once the update is complete, we will provide this document to you for your review. We anticipate it could take approximately six weeks to complete this update.

It is our intent to include the updated CHIAR as an appendix to the Environmental Study Report (ESR). We will also be providing a summary of the CHIAR findings in the ESR.

Once again, thank you very much for your on-going interest in this study and feel free to contact me at 519-848-3620 x31 or maston@wellington-north.com if I can be of further assistance.

Best regards,

Matthew Aston, C.E.T., C.Mgr.
Director of Public Works

CC:

Mr. Barry Trood, Township of Wellington North
Ms. Melody Johnson, XCG Consultants Ltd.

Ministry of Tourism, Culture and Sport

Heritage Program Unit
Programs and Services Branch
401 Bay Street, Suite 1700
Toronto ON M7A 0A7
Tel: 416 314 7145
Fax: 416 212 1802

Ministère du Tourisme, de la Culture et du Sport

Unité des programmes patrimoine
Direction des programmes et des services
401, rue Bay, Bureau 1700
Toronto ON M7A 0A7
Tél: 416 314 7145
Téléc: 416 212 1802

Ontario

April 13, 2016 (EMAIL ONLY)

Mr. Matthew Aston, C.E.T.
Director of Public Works
Township of Wellington North
7490 Sideroad 7 West, P.O. Box 125
Kenilworth, ON, N0G 2E0
E: maston@wellington-north.com

RE:	**MTCS file #:**	**23EA040**
	Proponent:	**Township of Wellington North**
	Subject:	**Notice of Public Information Centre #3** **Arthur Wastewater Treatment Plant**
	Location:	**Village of Arthur, Township of Wellington North, Ontario**

Dear Matthew Aston:

Thank you for providing the Ministry of Tourism, Culture and Sport (MTCS) with the Notice of Public Information Centre (PIC) #3 and presentation materials for your project. MTCS's interest in this Environmental Assessment (EA) project relates to its mandate of conserving Ontario's cultural heritage, which includes:

- Archaeological resources, including land-based and marine;
- Built heritage resources, including bridges and monuments; and,
- Cultural heritage landscapes.

Under the EA process, the proponent is required to determine a project's potential impact on cultural heritage resources. While some cultural heritage resources may have already been formally identified, others may be identified through screening and evaluation. Aboriginal communities may have knowledge that can contribute to the identification of cultural heritage resources, and we suggest that any engagement with Aboriginal communities includes a discussion about known or potential cultural heritage resources that are of value to these communities. Municipal Heritage Committees, historical societies and other local heritage organizations may also have knowledge that contributes to the identification of cultural heritage resources.

Archaeological Resources

Your EA project may impact archaeological resources and you should screen the project with the MTCS *Criteria for Evaluating Archaeological Potential* to determine if an archaeological assessment is needed. MTCS archaeological sites data are available at *archaeology@ontario.ca*. If your EA project area exhibits archaeological potential, then an archaeological assessment (AA) should be undertaken by an archaeologist licenced under the *Ontario Heritage Act* (*OHA*), who is responsible for submitting the report directly to MTCS for review.

Built Heritage and Cultural Heritage Landscapes

The MTCS *Criteria for Evaluating Potential for Built Heritage Resources and Cultural Heritage Landscapes* should be completed to help determine whether your EA project may impact cultural heritage resources. The Clerks for the Township of Wellington North and County of Wellington can provide information on property registered or designated under the *OHA*. Municipal Heritage Planners can also provide information that will assist you in completing the checklist.

If potential or known heritage resources exist, MTCS recommends that a Heritage Impact Assessment (HIA), prepared by a qualified consultant, should be completed to assess potential project impacts. Our Ministry's *Info Sheet #5: Heritage Impact Assessments and Conservation Plans* outlines the scope of HIAs. Please send the HIA to MTCS for review, and make it available to local organizations or individuals who have expressed interest in review.

Environmental Assessment Reporting
All technical heritage studies and their recommendations are to be addressed and incorporated into EA projects. Please advise MTCS whether any technical heritage studies will be completed for your EA project, and provide them to MTCS before issuing a Notice of Completion. If your screening has identified no known or potential cultural heritage resources, or no impacts to these resources, please include the completed checklists and supporting documentation in the EA report or file.

Our earlier correspondence (January 4, 2013, and June 20, 2014) on receipt of the Notices of Commencement and PIC #2 for your project identified cultural heritage resources, including archaeology, built heritage and cultural heritage landscapes, as falling within the scope of this Class Environmental Assessment. Cultural heritage resources are not discussed in the PIC materials circulated, however, and the lack of public discourse to date on these resources leaves the impression that their consideration has been omitted from the EA process. Confirming that due diligence has been carried out on cultural heritage resources warrants inclusion in the public record, as the preferred alternatives (expansion at the wastewater treatment plant and Frederick Street sewage pumping station) extend beyond the footprints of the existing facilities into areas that may retain archaeological potential.

Thank-you for consulting MTCS on this project: please continue to do so through the EA process, and contact me for any questions or clarification.

Sincerely,

Joseph Muller, RPP/MCIP
Heritage Planner
Joseph.Muller@Ontario.ca

Copied to: Melody Johnson, P.Eng
Project Manager, XCG Consultants Ltd

Barbara Slattery, Environmental Resource Planner & EA Coordinator
Ministry of the Environment and Climate Change

It is the sole responsibility of proponents to ensure that any information and documentation submitted as part of their EA report or file is accurate. MTCS makes no representation or warranty as to the completeness, accuracy or quality of the any checklists, reports or supporting documentation submitted as part of the EA process, and in no way shall MTCS be liable for any harm, damages, costs, expenses, losses, claims or actions that may result if any checklists, reports or supporting documents are discovered to be inaccurate, incomplete, misleading or fraudulent.

Please notify MTCS if archaeological resources are impacted by EA project work. All activities impacting archaeological resources must cease immediately, and a licensed archaeologist is required to carry out an archaeological assessment in accordance with the Ontario Heritage Act and the Standards and Guidelines for Consultant Archaeologists.

If human remains are encountered, all activities must cease immediately and the local police as well as the Cemeteries Regulation Unit of the Ministry of Government and Consumer Services must be contacted. In situations where human remains are associated with archaeological resources, MTCS should also be notified to ensure that the site is not subject to unlicensed alterations which would be a contravention of the Ontario Heritage Act.

Dianne Damman

From:	Muller, Joseph (MTCS) <Joseph.Muller@ontario.ca>
Sent:	March-31-16 12:18 PM
To:	Melody Johnson; Matt Aston
Cc:	Dianne Damman
Subject:	RE: Arthur Wastewater Treatment Plant PIC#3

Thank-you Matt and Melody, much appreciated. Take care,

Joe

Joseph Muller, RPP, MCIP

Heritage Planner
Ministry of Tourism, Culture and Sport
Culture Division | Programs and Services Branch | Heritage Program Unit

401 Bay Street, Suite 1700
Toronto, Ontario M7A 0A7

Tel. 416.314.7145 | Fax. 416.212.1802

From: Melody Johnson [mailto:melody.johnson@xcg.com]
Sent: March 31, 2016 12:16 PM
To: Matt Aston; Muller, Joseph (MTCS)
Cc: Dianne Damman
Subject: RE: Arthur Wastewater Treatment Plant PIC#3

Hi Joseph,

Comments are being accepted until April 13, 2016. A link to the comment sheet can be found below.
http://wellington-north.com/content/page-content/arthur-wwtp-class-ea-pic-3-comment-sheet.pdf

Let me know if you have any other questions.

Thanks,

Melody Johnson, M.A.Sc., P.Eng.
Sr. Project Manager

XCG Consulting Limited, Environmental Engineers & Scientists
2620 Bristol Circle, Suite 300, Oakville, Ontario L6H 6Z7
www.xcg.com | T 905 829 8880 x4250 | F 905 829 8890 | C 416 931 0717

From: Matt Aston [mailto:maston@wellington-north.com]
Sent: March-31-16 11:16 AM

To: Muller, Joseph (MTCS) <Joseph.Muller@ontario.ca>; Melody Johnson <melody.johnson@xcg.com>
Subject: RE: Arthur Wastewater Treatment Plant PIC#3

Hi Joseph,

Thank you for your e-mail.

The Township has a link to the PIC3 presentation material at http://wellington-north.com/content/page-content/arthur-pic-no.-3-mar-30-2016.pdf .

Melody will comment on the other items.

Regards,
MA

Matthew Aston
Director of Public Works

519.848.3620 ext 31
1.866.848.3620 FAX 519.848.3228
maston@wellington-north.com

7490 Sideroad 7 W, PO Box 125,
Kenilworth, Ontario, N0G 2E0
www.wellington-north.com

From: Muller, Joseph (MTCS) [mailto:Joseph.Muller@ontario.ca]
Sent: March-31-16 10:10 AM
To: melody.johnson@xcg.com
Cc: Matt Aston
Subject: Arthur Wastewater Treatment Plant PIC#3

Hello Melody Johnson:

I was unable to attend yesterday's PIC#3 and checked the Wellington North web site this morning for the PIC materials – do you know when they will be posted, and the deadline for any comments on the PIC? Thank-you for your assistance,

Joe

Joseph Muller, RPP, MCIP

Heritage Planner
Ministry of Tourism, Culture and Sport
Culture Division | Programs and Services Branch | Heritage Program Unit

401 Bay Street, Suite 1700
Toronto, Ontario M7A 0A7

Tel. 416.314.7145 | Fax. 416.212.1802

Ministry of Tourism, Culture and Sport

Culture Services Unit
Programs and Services Branch
401 Bay Street, Suite 1700
Toronto ON M7A 0A7
Tel: 416 314 7145
Fax: 416 212 1802

Ministère du Tourisme, de la Culture et du Sport

Unité des services culturels
Direction des programmes et des services
401, rue Bay, Bureau 1700
Toronto ON M7A 0A7
Tél: 416 314 7145
Téléc: 416 212 1802

Ontario

June 20, 2014 (EMAIL ONLY)

Stephen Nutt, P.Eng
XCG Consultants Ltd.
820 Trillium Drive
Kitchener, Ontario N2R 1K4
E: stephen@xcg.com

MTCS file #: **23EA040**
Proponent: **Township of Wellington North**
Subject: **Public Information Centre #2**
Arthur Wastewater Treatment Plant
Location: **Village of Arthur, Township of Wellington North, Ontario**

Dear Stephen Nutt:

Thank you for providing the Ministry of Tourism, Culture and Sport (MTCS) with the Public Information Centre (PIC) materials for your project's second PIC. MTCS's interest in this EA project relates to its mandate of protecting, conserving and preserving Ontario's culture heritage, which includes:

- Archaeological resources, including land-based and marine;
- Built heritage resources, including bridges and monuments; and,
- Cultural heritage landscapes.

Under the EA process, the proponent is required to determine a project's potential impact on cultural heritage resources. Please advise MTCS whether an archaeological assessment and/or a heritage impact assessment will be completed for your EA project, and provide them to MTCS before issuing a Notice of Completion.

Aboriginal communities may have knowledge that can contribute to the identification of cultural heritage resources, and we suggest that any engagement with Aboriginal communities includes a discussion about known or potential cultural heritage resources that are of value to these communities.

Archaeological Resources
Your EA project may impact archaeological resources and we advise you to screen the project with the MTCS *Criteria for Evaluating Archaeological Potential* to determine if an archaeological assessment is needed. MTCS archaeological sites data are available at archaeologicalsites@ontario.ca. If your EA project area exhibits archaeological potential, then an archaeological assessment (AA) by an *Ontario Heritage Act* (*OHA*) licensed archaeologist, who is responsible for submitting the report directly to MTCS for review, is recommended.

Built Heritage and Cultural Heritage Landscapes
The attached MTCS checklist *Screening for Impacts to Built Heritage and Cultural Heritage Landscapes* helps determine whether your EA project may impact cultural heritage resources. The clerks for the Township of Wellington North and Wellington County can provide information on property registered or designated under the *Ontario Heritage Act*.

If your EA project will impact heritage resources, MTCS recommends that a Heritage Impact Assessment (HIA) be prepared by a qualified consultant. Our Ministry's *Info Sheet #5: Heritage Impact Assessments and Conservation Plans* outlines the scope of HIAs. Please send HIAs to MTCS for review, and make it available to local organizations or individuals who have expressed their interested in heritage.

Environmental Assessment Reporting
HIA and AA reports and their recommendations are to be addressed and incorporated into EA projects. If your screening has identified no known or potential cultural heritage resources, or no impacts to these resources, please include the completed checklists and supporting documentation in in the EA report or file. MTCS is in no way liable if the information in the completed checklists is found to be inaccurate or incomplete.

Discussion
Our earlier correspondence (January 4, 2013) on receipt of the Notice of Commencement for your project identified cultural heritage resources, including archaeology, built heritage and cultural heritage landscapes, as falling within the scope of this Class Environmental Assessment. Cultural heritage resources (CHRs) are not discussed in the PIC materials circulated to date, however, and the lack of public discourse to date on these resources leaves the impression that their consideration has been omitted from the EA process. Confirming that due diligence has been carried out on CHRs warrants inclusion in the public record.

Thank-you for circulating MTCS on this project: please continue to do so through the EA process, and contact me for any questions or clarification.

Sincerely,

Joseph Muller, RPP/MCIP
Heritage Planner
Joseph.Muller@Ontario.ca

Copied to: Barry Trood, Water and Sewer Superintendent, Township of Wellington North

Please notify MTCS if archaeological resources are impacted by EA project work. All activities impacting archaeological resources must cease immediately, and a licensed archaeologist is required to carry out a determination of their nature and significance.

If human remains are encountered, all activities must cease immediately and the local police be contacted as well as the Cemeteries Regulation Unit of the Ministry of Consumer Services must be contacted. In situations where human remains are associated with archaeological resources, MTCS should also be notified to ensure that the site is not subject to unlicensed alterations which would be a contravention of the Ontario Heritage Act.

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
APR 18 2013
TWP. OF WELLINGTON NORTH

Reference: 78

April 11, 2013

Barry Trood
Township of Wellington North
P.O.Box 125, 7490 Sideroad 7 W
Kenilworth, Ontario
N0G 2E0

Re: Municipal Class Environmental Assessment
Arthur Wastewater Treatment Plant
Notice of Public Information Centre # 1

Dear Barry Trood:

Thank you for informing the Ministry of Aboriginal Affairs (MAA) of your project. Please note that MAA treats all letters, emails, general notices, etc. about a project as a request for information about which Aboriginal communities may have rights or interests in the project area.

For future Environmental Assessment (EA) inquiry correspondence to MAA, please take note of the following:

1. please send all future EA correspondence to the following email address: MAA.EA.Review@ontario.ca ; or
2. if you prefer to send a hard copy rather than email, please address your correspondence as follows:
   Ministry of Aboriginal Affairs, Consultation Unit
   160 Bloor Street East, 4th floor
   Toronto, Ontario, Canada
   M7A 2E6.

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 the area of the project.

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/or 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 First Nations may have existing or asserted rights or claims in Ontario'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, 1695 Chiefswood Road 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, ON N0A 1M0	Hohahes Leroy Hill Secretary to Haudenosaunee Confederacy Chiefs Council Cell 519 717 7326 jocko@sixnationsns.com
Mississaugas of the New Credit First Nation 2789 Mississauga Rd., R.R. #6 HAGERSVILLE, Ontario N0A 1H0	Chief Bryan LaForme (905) 768-1133 (Fax) 768-1225 bryanlaforme@newcreditfirstnation.com

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

RECEIVED

APR 18 2013

TWP. OF WELLINGTON NORTH

occur that could result in additional communities being affected by or interested in your undertaking.

Through Aboriginal Affairs and Northern Development (AANDC), the Government of Canada sometimes receives claims that Ontario does not receive, or with which Ontario does not become involved. AANDC's Consultation and Accommodation Unit (CAU) established a "single window" to respond to requests for baseline information held by AANDC on established or potential Aboriginal Treaty and rights. To request information from the Ontario Subject Matter Expert send an email to: UCA-CAU@aadnc-aandc.gc.ca

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. MAA does not wish to be kept informed of the progress of the project; please be sure to remove MAA from the mailing list.

Yours truly,

Heather Levecque

Heather Levecque
Manager, Consultation Unit
Aboriginal Relations and Ministry Partnerships Division

Dianne Damman

From:	Stephen Nutt <StephenN@xcg.com>
Sent:	Wednesday, April 10, 2013 2:01 PM
To:	Dianne Damman
Cc:	Lorna Neely
Subject:	FW: Arthur Wastewater Treatment Plant, Class EA notice of commencement

FYI and for the EA file, Dianne.

Stephen G. Nutt, M.Eng., P.Eng.
Senior Consultant
XCG Consultants Ltd.

From: Muller, Joseph (MTCS) [mailto:Joseph.Muller@ontario.ca]
Sent: Wednesday, April 10, 2013 1:06 PM
To: btrood@wellington-north.com
Cc: Stephen Nutt
Subject: RE: Arthur Wastewater Treatment Plant, Class EA notice of commencement

Hello Barry (and Stephen):

Thanks again for the help in getting me to this PIC material. Rather than a formal comment/response, which would reiterate the previous letter, I would add that the consideration of cultural heritage resources is included within the evaluation of alternatives by review of the archaeology/built heritage/cultural heritage landscapes (ABC) screening documents. If identified/potential resources are flagged, please incorporate their evaluation within the final EA report: if not, please include the completed screening document in the final report. This documentation confirms that due diligence was followed in the EA process. Thanks very much, and I look forward to seeing the next stage. Take care,

Joe

Joseph Muller, RPP, MCIP

Heritage Planner
Ministry of Tourism, Culture and Sport
Culture Division | Programs and Services Branch | Culture Services Unit

401 Bay Street, Suite 1700
Toronto, Ontario M7A 0A7

Tel. 416.314.7145 | Fax. 416.314.7175

Please sponsor me: I am part of the 2013 OPS Ride for Heart Team.
Reserve lunch, a massage and a posture check on April 26 at our team kick-off event!

From: Stephen Nutt [mailto:StephenN@xcg.com]
Sent: January 4, 2013 11:57 AM
To: Muller, Joseph (MTCS)
Cc: btrood@wellington-north.com
Subject: RE: Arthur Wastewater Treatment Plant, Class EA notice of commencement

Thank you for your comments and interest in the Arthur WWTP Class EA, Joe. MTCS will be kept informed as this Class EA proceeds.

Stephen G. Nutt, M.Eng., P.Eng.
Senior Consultant
XCG Consultants Ltd.

From: Muller, Joseph (MTCS) [mailto:Joseph.Muller@ontario.ca]
Sent: Friday, January 04, 2013 11:28 AM
To: Stephen Nutt
Cc: btrood@wellington-north.com
Subject: Arthur Wastewater Treatment Plant, Class EA notice of commencement

Hello Stephen Nutt:

We have received the Notice of Commencement for the above Municipal Class EA project: Please find attached our Ministry of Tourism, Culture and Sport (MTCS), Culture Services Unit (CSU), comments on this project, and contact me if you have any questions or would like some clarification, Thank-you for your assistance,

Joe

Joseph Muller, RPP, MCIP

Heritage Planner
Ministry of Tourism, Culture and Sport
Culture Division | Programs and Services Branch | Culture Services Unit

401 Bay Street, Suite 1700
Toronto, Ontario M7A 0A7

Tel. 416.314.7145 | Fax. 416.314.7175

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

April 2nd, 2013

Township of Wellington North
7490 Sideroad 7 West, Box 125
Kenilworth, Ontario
N0G 2E0

Attention: Mr. Barry Trood

Re: Class Environmental Assessment, Arthur Wastewater Treatment Plant (WWTP)

In follow up to the Public Information Centre #1 which was attended by Mark Anderson from our office. The GRCA staff would request future notification and information through the EA process. There are no concerns with the preferred alternatives 3 through 8 provided on the handout. Should alternatives 5, 6, 7 or 8 be selected as the preferred plan, a permit may be required from our office should any works or development occur within an area regulated by the GRCA.

Should you have any questions or comments please feel free to contact Nathan Garland at 519-621-2763 ext. 2236.

Yours truly,

F. Natolochny

Fred Natolochny
Supervisor Resource Planning
Grand River Conservation Authority

FN/ng

Stephen Nut, XCG Consultants Ltd., 820 Trillium Drive, Kitchener, ON N2R 1K4

Dianne Damman

From:	Stephen Nutt <StephenN@xcg.com>
Sent:	Tuesday, February 12, 2013 2:51 PM
To:	Slattery, Barbara (ENE)
Cc:	Barry Trood; Dianne Damman; Lorna Neely
Subject:	RE: Arthur WWTP EA

Hi Barb.

Barry Trood, the Superintendent of Water and Sewer Services for the Township of Wellington North, is away on vacation until February 19th. I have asked the plant manager if he can provide any information on what actions have been taken by the Township related to I/I reduction and will pass along any information that he provides when I receive it.

Meanwhile, Triton Engineering completed a Master Plan Study of the Arthur Water Supply and Sanitary Sewage Systems in January 2012 that has some information on work done related to I/I that should be helpful to you - see pages 16, 19, 24 and Appendix G of the final report. You should have a copy of the Master Plan report in your files but if not, let me know and we can arrange to get you a copy. Hope this helps.

Stephen G. Nutt, M.Eng., P.Eng.
Senior Consultant
XCG Consultants Ltd.

From: Slattery, Barbara (ENE) [mailto:barbara.slattery@ontario.ca]
Sent: Tuesday, February 12, 2013 12:15 PM
To: Stephen Nutt
Subject: Arthur WWTP EA

Hello Stephen, hope that all is very well with you!

So, I have been directed to update briefing materials and one of the topics is the Arthur WWTP Class EA….

As I go through our very outdated Briefing Note, I see that the ministry suggested that the town look at I&I improvements that could be made….if I leave that point in the Note, I guarantee that senior management will ask whether any progress has been made on that front….

And since I don't know, I'm asking whether you can advise if an I&I study was done, whether any capital improvements were made as a result, and/or whether this may be part of the current Schedule C Class EA….

Thank you!!!!

Dianne Damman

From:	Stephen Nutt <StephenN@xcg.com>
Sent:	Thursday, February 07, 2013 2:59 PM
To:	Glassco, Jane (ENE)
Cc:	Shaw, Amy (ENE); Hall, Cameron (ENE); Slattery, Barbara (ENE); Barry Trood; Dianne Damman; Lorna Neely
Subject:	RE: Arthur WWTP Class EA - ACS Status Summary

Thank you for your response, Jane. We have added Amy Shaw and Cam Hall to our contact list for the EA, although our communications with MOE related to the Class EA are generally with Barb Slattery, the EA Coordinator at West Central Region.

Stephen G. Nutt, M.Eng., P.Eng.
Senior Consultant
XCG Consultants Ltd.

From: Glassco, Jane (ENE) [mailto:Jane.Glassco@ontario.ca]
Sent: Thursday, February 07, 2013 1:31 PM
To: Stephen Nutt
Cc: Shaw, Amy (ENE); Hall, Cameron (ENE)
Subject: RE: Arthur WWTP Class EA - ACS Status Summary

Thanks very much for your email......
Your contacts at the Guelph District office are Cam Hall and Amy Shaw.

Jane Glassco
Guelph District Manager I Ministry of the Environment
1 Stone Road I Guelph Ontario IN1G 4Y2 I (519) 826-4258

From: Stephen Nutt [mailto:StephenN@xcg.com]
Sent: February 7, 2013 10:45 AM
To: Glassco, Jane (ENE)
Cc: Barry Trood; Slattery, Barbara (ENE); Dianne Damman; Colin Clarke; Lorna Neely
Subject: Arthur WWTP Class EA - ACS Status Summary

Good morning, Jane.

We understand that you have contacted Barry Trood at the Township of North Wellington to inquire as to the status of the Assimilative Capacity Study (ACS) being undertaken as part of the Class Environmental Assessment of the Arthur WWTP. The email below summarizes the current status of the ACS and the steps that will be required to complete that part of the Class EA. We plan to meet with representatives from MOE West Central Region once the ACS is completed and submitted to discuss the findings and the proposed effluent limits that would apply to an expanded Arthur WWTP.

If you have any specific questions about the ACS or the Class EA in general, please do not hesitate to contact me at your convenience. Do you wish to be included on the contact list for the Class EA to be informed about the status of the EA and scheduled Public Information Centres?

Stephen G. Nutt, M.Eng., P.Eng.
Senior Consultant
XCG Consultants Ltd.

From: Colin Clarke
Sent: Thursday, February 07, 2013 10:15 AM
To: Lorna Neely; Stephen Nutt; Janet Noyes
Subject: FW: Arthur ACS Summary

The following outlines the work completed as well as the next steps required for the Arthur ACS.

1. Receiver Water Quality: Water quality information collected by the Township of Wellington North was provided in paper format and has been entered into a database. There are two upstream stations one located on Wellington Road 109 and one located on Sideroad 16. The period of record is from 2007 – 2012.
2. Low flow data: Streamflow data has been collected from the Township of Wellington North and the GRCA. The GRCA dataset is more complete and includes infilled data points and an updated rating curve. The period of record is from 1994 – 2012. Given the length of record a reasonable estimate of monthly 7Q20 flows should be achievable.
3. XCG is currently in the process of defining Policy status for the water quality parameters of interest (i.e. TP, unionized ammonia, DO and E. coli) and determining the 7Q20 low flows.
4. When the ambient conditions classification is complete XCG will use this information to generate proposed effluent limits for an expanded WWTP at Arthur.
5. A draft report will be submitted to the Township of Wellington North on March 1, 2013 for their review prior to circulation to Ministry of the Environment.

Colin Clarke, M.Sc., P.Eng
Project Engineer

XCG Consultants Ltd. Environmental Engineers & Scientists
6 Cataraqui Street, Kingston, Ontario, Canada K7K 1Z7
www.xcg.com | T 613 542 5888 x214 | F 613 542 0844 |

Ministry of Tourism, Culture and Sport

Culture Services Unit
Programs and Services Branch
401 Bay Street, Suite 1700
Toronto ON M7A 0A7

Tel. 416 314-7145
Fax: 416 314 7175

Ministère du Tourisme, de la Culture et du Sport

Unité des services culturels
Direction des programmes et des services
401, rue Bay, Bureau 1700
Toronto ON M7A 0A7
Tél. : 416 314-7145
Téléc. : 416 314 7175

Ontario

January 4, 2013

Stephen Nutt, P.Eng (by email only)
Project Manager
XCG Consultants Ltd.
820 Trillium Drive
Kitchener, Ontario N2R 1K4

Project: **Arthur Wastewater Treatment Plant Municipal Class Environmental Assessment**
Location: **Town of Arthur, Wellington North**
MTC File: **23EA040**

Dear Stephen Nutt:

On November 23, 2012, the Ministry of Tourism, Culture and Sport (MTCS) received a Notice of Commencement for the above project as part of the Municipal Class Environmental Assessment process. For such projects, it is the mandate of the Ministry of Tourism, Culture and Sport (MTCS), under the *Ontario Heritage Act* (*OHA*), to conserve, protect and preserve the heritage of Ontario including:

- Archaeological resources;
- Built heritage (including bridges and monuments); and,
- Cultural heritage landscapes.

Under the EA process, a determination of the undertaking's impact on these cultural heritage resources must be carried out, as below: please advise MTCS on whether archaeological and/or heritage impact assessments will be undertaken for your EA project, and forward them to MTCS, prior to issuing a Notice of Completion.

Archaeological Resources

Screening your EA project with the MTCS "*Criteria for Evaluating Archaeological Potential*" will determine whether it may impact archaeological resources: MTCS archaeological sites data are available at archaeologysites@ontario.ca. If so, then an archaeological assessment (AA) by an *OHA* licensed archaeologist is recommended, and the AA report forwarded to MTCS for review.

Built Heritage and Cultural Heritage Landscapes

The MTCS *"Screening for Impacts to Built Heritage and Cultural Heritage Landscapes"* checklist determines whether your EA project may impact these cultural heritage resources: the clerk for the municipality encompassing your EA project can provide information on property registered or designated under the *Ontario Heritage Act*. If your EA project may impact these cultural heritage resources, MTCS recommends that a Heritage Impact Assessment (HIA – see MTCS *Info Sheet #5: Heritage Impact Assessments and Conservation Plans*) be prepared by a qualified consultant. Please send completed HIAs to MTCS and the local municipality for review, and make it available to local heritage organizations with an interest, prior to your EA project approval.

EA and ESR Documentation
HIA and AA reports and their recommendations are part of the EA project. Determinations that no heritage resources are impacted and no technical studies are warranted should be documented and summarized as part of the EA process, and incorporated in the final EA report.

Please continue to circulate MTCS through the review process for this EA project. Thank you for the opportunity to provide comment, and please contact me for any questions or clarification.

Sincerely,

Joseph Muller
Heritage Planner

Copied: Barry Trood, Superintendent Township of Wellington North

Please notify MTCS at 416-212-0644 or toll free at 1-866-454-0049 if archaeological resources are impacted by EA project work. All activities impacting archaeological resources must cease immediately, and a licensed archaeologist is required to carry out a determination of their nature and significance.

Ministry of Tourism and Culture
Criteria for Determining Archaeological Potential

A Checklist for the Non-Specialist

Feature of Archaeological Potential	Yes	No	Unknown
1. Known archaeological sites within 300 m of property	❑	❑	❑

Physical Features	Yes	No	Unknown
2. Water on or near the property If yes, what kind of water?	❑	❑	❑
a) Primary water source (lake, river, large creek, etc) • within 300 m, OR • 50 m for properties in northern Ontario and Canadian Shield terrain*	❑	❑	❑
b) Secondary water source (stream, spring, marsh, swamp, etc) • within 300 m, OR • 50 m for properties in northern Ontario and Canadian Shield terrain*	❑	❑	❑
c) Past water source (beach ridge, river bed, relic creek, ancient shoreline, etc) • within 300 m, OR • 150 m for properties in northern Ontario and Canadian Shield terrain*	❑	❑	❑
3. Elevated topography on property (knolls, drumlins, eskers, plateaus, etc)	❑	❑	❑
4. Pockets of sandy soil in a clay or rocky area on property	❑	❑	❑
5. Distinctive land formations on property (mounds, caverns, waterfalls, peninsulas, etc)	❑	❑	❑

Cultural Features	Yes	No	Unknown
6. Known burial site or cemetery on or adjacent to the property (cemetery is registered with the Cemeteries Regulation Unit)	❑	❑	❑
7. Food or scarce resource harvest areas on property (traditional fishing locations, agricultural/berry extraction areas, etc)	❑	❑	❑
8. Indications of early Euro-Canadian settlement within 300 m of property (monuments, cemeteries, structures, etc)	❑	❑	❑
9. Early historic transportation routes within 100 m of property (historic road, trail, portage, rail corridor, etc)	❑	❑	❑

Property-specific Information	Yes	No	Unknown
10. Property is designated and/or listed under the *Ontario Heritage Act* (municipal register and lands described in Reg. 875 of the *Ontario Heritage Act*)	❑	❑	❑
11. Local knowledge of archaeological potential of property (from aboriginal communities, heritage organisations, municipal heritage committees, etc)	❑	❑	❑
12. Recent ground disturbance† (post-1960, extensive and deep land alterations)	❑	❑	❑

The entire property should be screened for archaeological potential, not only the footprint where work is proposed.

*Northern Ontario is defined as Manitoulin Island, the Districts of Muskoka, Haliburton and Nipissing, and areas to the north. The Canadian Shield is defined as the area of Ontario underlain by the Precambrian Shield.

† Archaeological potential can be determined not to be present for either the entire property or a part(s) of it when the area under consideration has been subject to extensive and deep land alterations that have severely damaged the integrity of any archaeological resources. This is commonly referred to as 'disturbed' or 'disturbance', and may include: quarrying, major landscaping involving grading below topsoil, building footprints, sewage and infrastructure development. Activities such as agricultural cultivation, gardening, minor grading and landscaping do not necessarily affect archaeological potential.

Scoring the results:

If **Yes** to any of **1**, **2a-c, 6** or **11**	→ archaeological potential is **determined** – assessment is required
If **Yes** to two or more of **3 to 5 or 7-10**	→ archaeological potential is **determined** – assessment is required
If **Yes** to **12** or **No** to **1 to 10**	→ **low** archaeological potential is **determined** – assessment may or may not be required (depending on answers from 1-11)
If 3 or more **Unknown**	→ more research is required **(See note below for more information)**

Note: If archaeological potential features are unknown, a professional archaeologist licensed under the *Ontario Heritage Act* should be retained to carry out a minimum Stage 1 archaeological assessment report confirming potential or low potential. All reports are to be in compliance with provincial archaeological assessment standards and guidelines.

Screening for Impacts to Built Heritage and Cultural Heritage Landscapes

This checklist is intended to help proponents determine whether their project could affect known or potential cultural heritage resources. The completed checklist should be returned to the appropriate Heritage Planner or Heritage Advisor at the Ministry of Tourism and Culture.

Step 1 – Screening for Recognized Cultural Heritage Value			
YES	**NO**	**Unknown**	
❑	❑	❑	1. Is the subject property designated or adjacent* to a property designated under the *Ontario Heritage Act*?
❑	❑	❑	2. Is the subject property listed on the municipal heritage register or a provincial register/list? (e.g. Ontario Heritage Bridge List)
❑	❑	❑	3. Is the subject property within or adjacent to a Heritage Conservation District?
❑	❑	❑	4. Does the subject property have an Ontario Heritage Trust easement or is it adjacent to such a property?
❑	❑	❑	5. Is there a provincial or federal plaque on or near the subject property?
❑	❑	❑	6. Is the subject property a National Historic Site?
❑	❑	❑	7. Is the subject property recognized or valued by an Aboriginal community?

Step 2 – Screening Potential Resources			
			Built heritage resources
YES	**NO**	**Unknown**	1. Does the subject property or an adjacent property contain any buildings or structures **over forty years old**† that are:
❑	❑	❑	▪ Residential structures (e.g. house, apartment building, shanty or trap line shelter)
❑	❑	❑	▪ Farm buildings (e.g. barns, outbuildings, silos, windmills)
❑	❑	❑	▪ Industrial, commercial or institutional buildings (e.g. a factory, school, etc.)
❑	❑	❑	▪ Engineering works (e.g. bridges, water or communications towers, roads, water/sewer systems, dams, earthworks, etc.)
❑	❑	❑	▪ Monuments or Landmark Features (e.g. cairns, statues, obelisks, fountains, reflecting pools, retaining walls, boundary or claim markers, etc.)
❑	❑	❑	2. Is the subject property or an adjacent property associated with a known architect or builder?
❑	❑	❑	3. Is the subject property or an adjacent property associated with a person or event of historic interest?
❑	❑	❑	4. When the municipal heritage planner was contacted regarding potential cultural heritage value of the subject property, did they express interest or concern?
			Cultural heritage landscapes
YES	**NO**	**Unknown**	5. Does the subject property contain landscape features such as
❑	❑	❑	▪ Burial sites and/or cemeteries
❑	❑	❑	▪ Parks or gardens
❑	❑	❑	▪ Quarries, mining, industrial or farming operations
❑	❑	❑	▪ Canals
❑	❑	❑	▪ Prominent natural features that could have special value to people (such as waterfalls, rocky outcrops, large specimen trees, caves, etc.)
❑	❑	❑	▪ Evidence of other human-made alterations to the natural landscape (such as trails, boundary or way-finding markers, mounds, earthworks, cultivation, non-native species, etc.)
❑	❑	❑	6. Is the subject property within a Canadian Heritage River watershed?
❑	❑	❑	7. Is the subject property near the Rideau Canal Corridor UNESCO World Heritage Site?
❑	❑	❑	8. Is there any evidence from documentary sources (e.g., local histories, a local recognition program, research studies, previous heritage impact assessment reports, etc.) or local knowledge or Aboriginal oral history, associating the subject property/ area with historic events, activities or persons?

Note:

If the answer is "yes" to any question in Step 1, proceed to Step 3.

The following resources can assist in answering questions in Step 1:

Municipal Clerk or Planning Department – Information on properties designated under the Ontario Heritage Act (individual properties or Heritage Conservation Districts) and properties listed on a Municipal Heritage register.

Ontario Heritage Trust – Contact the OHT directly regarding easement properties. A list of OHT plaques can be found on the website: Ontario Heritage Trust

Parks Canada – A list of National Historic Sites can be found on the website: Parks Canada

Ministry of Tourism and Culture – The Ontario Heritage Properties Database includes close to 8000 identified heritage properties. Note while this database is a valuable resource, it has not been updated since 2005, and therefore is not comprehensive or exhaustive. Ontario Heritage Properties Database

Local or Provincial archives

***Local heritage organizations**, such as the municipal heritage committee, historical society, local branch of the Architectural Conservancy of Ontario, etc.*

Consideration should also be given to obtaining oral evidence of CHRs. For example, in many Aboriginal communities, an important means of maintaining knowledge of cultural heritage resources is through oral tradition.

If the answer is "yes" to any question in Step 2, an evaluation of cultural heritage value is required. If cultural heritage resources are identified, proceed to Step 3.

If the answer to any question in Step 1 or to questions 2-4, 6-8 in Step 2, is "unknown", further research is required.

If the answer is "yes" to any of the questions in Step 3, a heritage impact assessment is required.

If uncertainty exists at any point, the services of a qualified person should be retained to assist in completing this checklist. All cultural heritage evaluation reports and heritage impact assessment reports must be prepared by a qualified person. Qualified persons means individuals (professional engineers, architects, archaeologists, etc.) having relevant, recent experience in the identification and conservation of cultural heritage resources. Appropriate evaluation involves gathering and recording information about the property sufficient to understand and substantiate its heritage value; determining cultural heritage value or interest based on the advice of qualified persons and with appropriate community input. If the property meets the criteria in Ontario Regulation 9/06 under the Ontario Heritage Act, it is a cultural heritage resource.

† The 40 year old threshold is an indicator of potential when conducting a preliminary survey for identification of cultural heritage resources. While the presence of a built feature that is 40 or more years old does not automatically signify cultural heritage value, it does make it more likely that the property could have cultural heritage value or interest. Similarly, if all the built features on a property are less than 40 years old, this does not automatically mean the property has no cultural heritage value. Note that age is not a criterion for designation under the *Ontario Heritage Act*.

Step 3 – Screening for Potential Impacts

YES	NO	Will the proposed undertaking/project involve or result in any of the following potential impacts to the subject property or an adjacent* property?
❑	❑	**Destruction, removal or relocation** of any, or part of any, heritage attribute or feature.
❑	❑	**Alteration** (which means a change in any manner and includes restoration, renovation, repair or disturbance).
❑	❑	**Shadows** created that alter the appearance of a heritage attribute or change the exposure or visibility of a natural feature or plantings, such as a garden.
❑	❑	**Isolation** of a heritage attribute from its surrounding environment, context or a significant relationship.
❑	❑	**Direct or indirect obstruction** of significant views or vistas from, within, or to a built or natural heritage feature.
❑	❑	**A change in land use** such as rezoning a battlefield from open space to residential use, allowing new development or site alteration to fill in the formerly open spaces.
❑	❑	**Soil disturbance** such as a change in grade, or an alteration of the drainage pattern, or excavation, etc.

* For the purposes of evaluating potential impacts of development and site alteration "adjacent" means: contiguous properties as well as properties that are separated from a heritage property by narrow strip of land used as a public or private road, highway, street, lane, trail, right-of way, walkway, green space, park, and/or easement or as otherwise defined in the municipal official plan.

Township of Wellington North

P.O. Box 125 • 7490 Sideroad 7 W • Kenilworth • ON • N0G 2E0

January 3, 2013

Ms. Lisa Myslicki
Environmental Advisor, Environmental Management
Infrastructure Ontario
1 Dundas Street West, Suite 2000
Toronto, Ontario
M5G 2L5

RE: Municipal Class Environmental Assessment
Arthur Wastewater Treatment Plant
Notice of Commencement

Dear Ms. Myslicki:

Thank you very much for your letter of December 25, 2102, responding to the Notice of Commencement for the Arthur Wastewater Treatment Plant (WWTP) Class Environmental Assessment (EA). We appreciate the comments that you provided.

Please be advised that there are no provincial government lands either on-site or within 500 m of the Arthur WWTP and associated lagoons.

If you have any questions or further comments on the study, please contact me by phone at 519-848-5327 or by e-mail at btrood@wellington-north.com. As per your request, we have removed IO from the project mailing list. Thank you very much for your interest in the study.

Sincerely,

Mr. Barry Trood
Water and Sewer Superintendent

cc: Mr. Stephen Nutt, XCG Consultants Ltd.

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.

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,

L. Myslicki

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

Ministry of the Environment
West-Central Region
Technical Standards Section
Air, Pesticides & Environmental Planning
12th Floor
119 King St W
Hamilton ON L8P 4Y7
Fax: (905)521-7820
Tel: (905) 521-7251

Ministère de l'Environnement
Direction régionale du Centre-Ouest
Secteur du Soutien Technique
Air, pesticides et planification environnementale
12e étage
119 rue King W
Hamilton ON L8P 4Y7
Télécopieur: (905)521-7820
Tél:(905) 521-7251

December 4, 2012

Mr. Barry Trood,
Water and Sewer Superintendent
Township of Wellington North
7490 Sideroad 7 West
P.O. Box 125
Kenilworth, Ontario
N0G 2E0

Dear Mr. Trood:

RE: Notice of Commencement
Class Environmental Assessment
Arthur Wastewater Treatment Plant

Thank you for your Notice advising of the commencement of a class EA for the above-noted project that will be undertaken as a Schedule "C" project to undertake the study to examine alternatives for increasing the treatment capacity at the Arthur WWTP, and to determine a preferred alternative. In accordance with the Class EA, Schedule "C" projects require that an Environmental Study Report (ESR) be prepared. The ESR is to be prepared when the preferred alternative has been selected and once the details of any environmental protection measures to be incorporated in the construction package have been finalized. A suggested outline for an ESR is presented in the MEA Class EA document. Once the ESR is finalized a Notice of Completion is required to be issued, allowing the public at least a 30 calendar day period during which documentation may be reviewed and comment and input submitted to the municipality.

You are also reminded that when concerns are raised during the public comment period, the concerned party should be consulted in an attempt to resolve the concerns. Discussions to this end should proceed for an appropriate period of time, even if this means the 30-day review period is exceeded. The concerned party must be advised that if such discussions are unsuccessful at resolving the concerns, they can submit a Part II Order request if they have not already done so to the Minister within a further seven calendar days following the end of discussions.

The final ESR is expected to contain a complete record of all activities associated with the planning of the Project and shall include:

- correspondence;
- copies of notices, letters, bulletins relating to public consultation;
- memoranda to file explaining the proponent's rationale in developing stages of the project; and,
- copies of reports prepared by consultants and others.

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. Once identified, you are advised to provide notification directly to the Aboriginal communities who may be affected by the project and provide them with an opportunity to participate in any planned public consultation sessions and comment on the project.

Should you have any questions regarding the Class EA process, please feel free to contact me at Thomas.lewis@ontario.ca or at (905) 521-7251.

Yours truly,

Tom L

Thomas Lewis
Scientist
West Central Region

File Storage Number: EA 04 WE AR

November 26, 2012

Barry Trood
Water and Sewer Superintendent
Township of Wellington North
P.O. Box 125
7490 Sideroad 7 West
Kenilworth, Ontario N0G 2E0
btrood@wellington-north.com

Dear Mr. Trood,

Thank you for your letter of November 16 , 2012 regarding your request for information held by Aboriginal Affairs and Northern Development Canada (AANDC) on established or potential Aboriginal and treaty rights in the vicinity of the Arthur Wastewater Treatment plant project in the Township of Wellington North, Ontario.

Consulting with Canadians on matters of interest or concern to them is an important part of good governance, sound policy development and decision-making. In addition to good governance objectives, there may be statutory or contractual reasons for consulting, as well as the common law duty to consult with First Nations, Métis and Inuit when conduct that might adversely impact rights Aboriginal or treaty rights (established or potential) is contemplated.

It is important to note that the information held by AANDC is provided as contextual information and may or may not pertain directly to Aboriginal or treaty rights. In most cases, the Aboriginal community remains best positioned to explain their traditional use of land, their practices or claims that may fall under section 35, including claims they may have put before the courts.

AANDC has developed the Aboriginal and Treaty Rights Information System (ATRIS), which brings together information regarding Aboriginal groups such as their location, related treaty information, claims (specific, comprehensive and special) and litigation data.

The Consultation Information Service (CIS) response
The CIS of the Consultation and Accommodation Unit responds to requests sent to AANDC for information on established or potential Aboriginal and treaty rights known to the Department. The CIS has prepared the attached response which combines the resources of ATRIS and the support of sectors and regions within the AANDC. Using a 100 km radius surrounding the project location, information regarding potentially affected Aboriginal communities is presented in the attached report in the following sections for each community:

Aboriginal Community Information includes key contact information and any other information such as Tribal Council affiliation.

Treaties includes information on historic and modern treaties.

Claims includes specific, comprehensive and special claims.

Self-Government Agreements and other negotiations may be part of comprehensive claims or stand-alone negotiations.

Litigation usually refers to litigation between the Aboriginal Group and the Crown, often pertaining to section 35 rights assertions or consultation matters.

Also included, where available, is a section entitled **Other Considerations**. This may include information on Métis rights or information on the assertions of other Aboriginal groups, consultation-related protocols or agreements and other relevant information.

Should you require further assistance regarding the information provided, or if you have any questions and/or comments about the enclosed response, please do not hesitate to contact me.

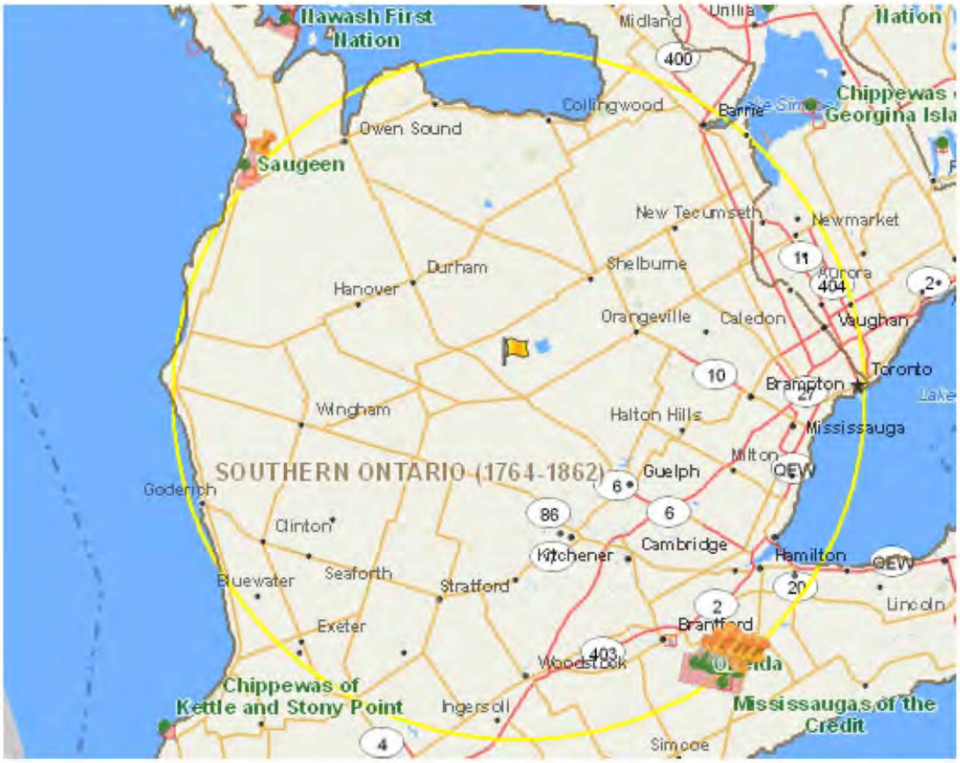
Regards,

Allison Berman
Regional Subject Expert for Ontario
Consultation and Accommodation Unit
Aboriginal Affairs and Northern Development Canada
5H- 5th Floor,
Gatineau, QC K1A 0H4
Tel: 819-934-5267

Disclaimer
This information is provided as a public service by the Government of Canada. All of the information is provided "as is" without warranty of any kind, whether express or implied, including, without limitation, implied warranties as to the accuracy or reliability of any of the information provided, its fitness for a particular purpose or use, or non-infringement, which implied warranties are hereby expressly disclaimed. References to any website are provided for information only shall not be taken as endorsement of any kind. The Government of Canada is not responsible for the content or reliability of any referenced website and does not endorse the content, products, services or views expressed within them.

Limitation of Liabilities
Under no circumstances will the Government of Canada be liable to any person or business entity for any reliance on the completeness or accuracy of this information or 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.

Within a 100 km radius of your project there are 2 First Nation communities. The following information should assist you in planning any consultation that may be required.



In general, where historic treaties have been signed, the rights of signatory First Nation's are defined by the terms of the Treaty. In many cases, however, there are divergent views between First Nations and the Crown as to what the treaty provisions imply or signify. For each First Nation below, the relevant treaty area is provided.

In areas where no historic treaty exists or where such treaties were limited in scope (i.e. where only certain rights were addressed by the treaty, such as the Peace and Friendship Treaties), there may be comprehensive claims that are asserted or being negotiated. Comprehensive claim negotiations are the means by which modern treaties are achieved.

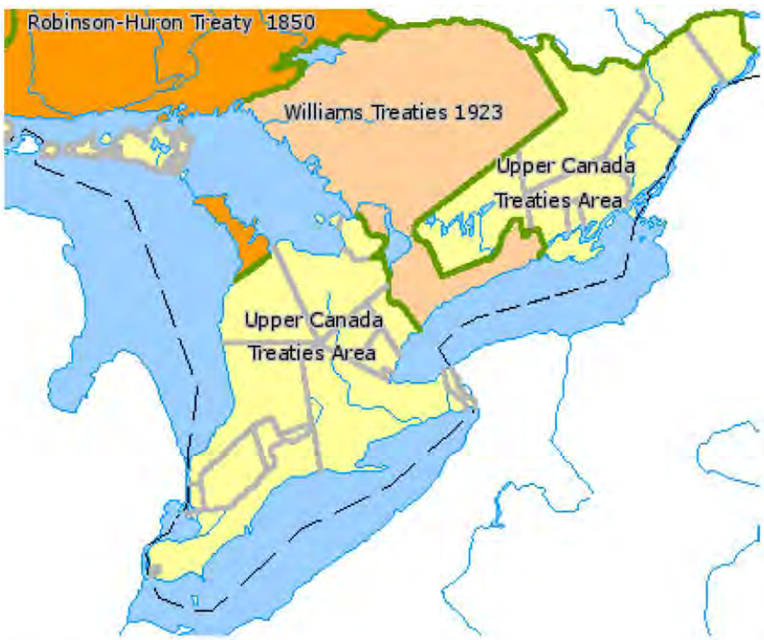
Specific claims refer to claims made by a First Nation against the federal government related to outstanding lawful obligations, such as the administration of land and other First Nation assets, and to the fulfillment of Indian treaties, although the treaties themselves are not open to re-negotiation. The below response provides summaries of relevant claims that are current to the date of the response. Claims that have been settled or closed may also be included to give a sense of the First Nation's claims history with the Crown.

As the claims progress regularly, it is recommended that the status of each claim be reviewed through the Reporting Centre on Specific Claims at:
http://pse5-esd5.ainc-inac.gc.ca/SCBRI_E/Main/ReportingCentre/External/externalreporting.aspx

First Nation/Aboriginal Communities

Mississaugas of the Credit
Chief M. Bryan Laforme (tenure expires December 15, 2013)
2789 Mississauga Road
RR 6
Hagersville, Ontario, N0A 1H0
Phone: (905) 768-1133 Fax: (905) 768-1225
www.newcreditfirstnation.com

Treaty Area – Southern Ontario treaties for Settlement: 1783 -1815
There are several treaty making eras which impact the province of Ontario. These eras are known as the Upper Canada Land Surrenders from 1764 to 1862. These surrenders are seen as treaties which transfer all Aboriginal rights and title to the Crown in exchange for one-time payments or annuities. They tended to be made with individual First Nation groups for tracts of land. In light of the evolution of Aboriginal law over the past twenty years, this position may not be as clear as believed. There may be residual rights remaining especially relating to hunting and fishing.



*Atlas of Canada

1783-1815- Treaties for Settlement
As part of the plan to resettle some 30,000 United Empire Loyalists who refused to accept American rule, and fled to Montreal, the Indian Department undertook a series of land surrenders west of the Ottawa River with the Mississauga and the Chippewa of the southern Great Lakes. These tended to be uncomplicated arrangements whereby for a particular Aboriginal group was paid a specific sum paid in trade goods, to surrender a stated amount of land.

Membership

Association of Iroquois and Allied Indians

This is a political organization which advocates the interests of its eight members. Using political lines the members form a collective to protect their Aboriginal and treaty rights.
387 Princess Avenue
London, Ontario, N6B 2A7
Phone: (519) 434-2761
www.aiai.on.ca

Chiefs of Ontario

The Chiefs of Ontario is a coordinating body for 133 First Nation communities in Ontario. The main objective of this body is to facilitate the discussion, planning, implementation and evaluation of all local, regional and national matters affecting its members.
www.chiefs-of-ontario.org

Administrative Office:
111 Peter Street, Suite 804
Toronto, Ontario, M5V 2H1
Phone: (416) 597-1266
Fax: (416) 597-8365

Political Office:
Fort William First Nation
RR 4, Suite 101, 9- Anemki Drive
Thunder Bay, Ontario, P7J 1A5
Phone: (807) 626-9339
Fax: (807) 626-9404

Specific Claims

Name: 1923 Williams Treaties
Status: active litigation
Description: The United Indian Council alleged that the Williams Treaty was invalid. They state that compensation has been inadequate for land taken, along with a failure to provide reserves. The First Nations involved are: Alderville, Beausoleil, Chippewas of Georgina Island, Chippewas of Mnjikaning, Curve Lake, Hiawatha, Mississauga's of Scugog Island.

Name: Brant Tract Purchase
Status: settled through negotiations
Description: The First Nation alleged that the 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.

Name: Crawford Purchase
Status: concluded- no lawful obligation found
Description: The First Nation alleged that the purchase of 1783-1784 covering lands in Frontenac, Prince Edward, Hastings counties and United County of Lennox Addington was illegal.

Name: Damages to Wild Rice
Status: concluded- no lawful obligation found
Description: The First Nation alleged that Mississauga title to wild rice, traditional economy, waters and lands beneath the waters. They claim that flooding by the Trent canal has destroyed the wild rice and hence their traditional economy.

Name: Gunshot Treaty
Status: concluded- no lawful obligation found

Description: The First Nation alleged that the Gunshot Treaty of 1788 covering lands in Prince Edward and Northumberland counties and regional municipality of Durham was illegal. The First Nations involved are: Curve Lake, New Credit, Alderville, Scugog and Hiawatha.

Name: Lake Ontario Lakeshore
Status: concluded- no lawful obligation found
Description: The Mississauga Tribal Claims Council alleged that part of the lakeshore in the townships of Oakville Burlington, Mississauga and Etobicoke were never ceded by treaty or otherwise. The First Nations involved are: Curve Lake, New Credit, Alderville, Scugog and Hiawatha.

Name: Navy Island
Status: concluded- no lawful obligation found
Description: The Mississauga Tribal Claims Council alleged that islands were never ceded in the Niagara treaty of 1781.

Name: Niagara Treaty Lands
Status: concluded- no lawful obligation found
Description: The Mississauga Tribal Claims Council (MTCC) alleged that lands covered by the Niagara Treaty of 1781 (Regional municipality of Niagara) were never properly ceded and the Mississauga compensated. This claim was originally submitted in 1986 by the MTCC as a component of the Williams Treaty claim, however, in 1990, it became a separate claim.

Name: 200 Acre
Status: settled through negotiations
Description: The First Nation alleged that there was an invalid surrender in 1820, of 200 acres of land on the north shore of the Credit River.

Name: Railway Claim – Loss of Use
Status: settled through negotiation
Description: The First Nation alleged that there was an invalid expropriation of land for railway purposes in 1876, and failure to compensate for interest in lands taken.

Name: Toronto Purchase
Status: settled through negotiation in 2010
Description: Non-fulfillment of the terms of the 1805 Surrender.

Litigation
Name: Mississaugas of the New Credit – Toronto Purchase v.
Status: inactive
Court File No.: not available
Description: This concerns an 1805 surrender of land presumably by the Mississaugas of the New Credit. Documentation concerns discussions for a letter accepting settlement of the issue.

Name: Mississaugas of the New Credit First Nation v. Attorney General of Canada, Maurice Bryan Laforme, Kerri Louise King, Attorney General of Ontario
Status: active
Court File No.: CV-12-373
Description: In this matter, the Mississaugas of the New Credit First Nation seeks a declaration of fee simple interest to a parcel of land in Hagersville which lies adjacent to the Applicant's Reserve. The Applicant also seeks a declaration that the reservation of mines and minerals as

set out in the original Crown Patent issued February 18, 1884 is null and void. The Applicant asserts that this property was originally part of a larger tract of land to which the Applicant had aboriginal rights, and that this larger tract of land was sold by the Applicant to the Crown in the 18th century. The Applicant claims that in 1999, the Applicant entered into a Land Claim Settlement Agreement whereby Canada agreed that it would recommend an addition to the Applicant's reserve. The Applicant claims that following their application to the Crown to have the property added to its reserve, the Crown had concerns which prevented the completion of the Addition to Reserve process. The Crown's concerns were regarding the capacity of a First Nation to hold title to lands in fee simple, and also about a reservation clause found in the original Crown Patent whereby the rights to all mines and minerals were reserved to the Government of Ontario.

Six Nations of the Grand River
Chief William (Bill) Kenneth Montour
1695 Chiefswood Road
PO Box 5000
Ohsweken, Ontario, N0A 1M0
Phone: (519) 445-2201 Fax: (519) 445-4208
www.sixnations.ca

Membership
Chiefs of Ontario
For more information, see 'Mississaugas of the Credit above.

Land Grant
Haldimand Proclamation of 1784 and Simcoe Patent of 1793
The Six Nations were native to an area that lies within present-day New York State and were allied with the British Crown during the American War of Independence. As compensation for lands lost as a result of the war, the Six Nations and their descendants were granted lands six miles deep on each side of the Grand River, from its mouth to its source. The granted lands were within a portion of territory that the Mississauga surrendered to the Crown in the Between The Lakes Treaty of 1784/1792 (the 1784 agreement contained a boundary description that was geographically impossible and this error was addressed and corrected in 1792).

The Simcoe Patent of 1793 confirmed the lands granted to the Six Nations by the Haldimand Proclamation; However, it included only lands within the corrected 1792 surrender and thus did not extend to the source so the Grand River. It specifies that the Six Nations can surrender and dispose of their land only to the Crown. Any other leases, sales or grants to people other than Six Nations shall be unlawful and such intruders evicted. A link to a map and additional information can be found at:
http://www.aboriginalaffairs.gov.on.ca/english/negotiate/sixnations/sixnations.asp

Specific Claims
Between 1980 and 1995, Six Nations submitted 28 specific claims to Aboriginal Affairs and Northern Development Canada under its Specific Claims Policy. These claims focus on the government's management of their lands and other assets from 1784 to the present. In March 1995, Six Nations filed a lawsuit against the Government of Canada and the Province of

Ontario, which also related to how Six Nations' lands and monies were managed by the Crown (refer to Six Nations of the Grand River Band of Indians v. HMTQ in Right of Canada and HMTQ in Right of Ontario, Court file no. 406/95 in the litigation section below for additional information). As there was significant overlap between the 28 specific claims and the claims put forward in the litigation, work on the specific claims was suspended.

Other Claims

In 1994, Six Nations submitted a claim to the Minister of Aboriginal Affairs and Northern Development Canada regarding their "right to hunt and fish," which was premised in part on the Nanfan Treaty of 1701. This Treaty (also known as the Treaty of Albany) was related to the protection of hunting and fishing rights in and around Lakes Erie, Huron and Ontario, as well as a portion of the United States. The Treaty was between representatives of the Five Nations (now the Six Nations) and John Nanfan, the acting colonial governor of New York. Six Nations were referred to the Province of Ontario for remedy, as the province has the primary responsibility for harvesting.

Litigation

Name: Six Nations of the Grand River Band of Indians v. HMTQ in Right of Canada and HMTQ in Right of Ontario - Superior Court of Justice
Status: active
Court File No.: 406/95
Description: The Plaintiffs claim an accounting of all Six Nations' assets including money and real property held in trust by the Crown for the benefit of the Six Nations since 1784. The Plaintiff seeks a declaration by the Court that the Defendants are in breach of their fiduciary duties towards the Plaintiff, and are liable for replacing all assets or the value of all assets found to be missing, with compound interest. The allegation of repeated breaches of fiduciary duty is supported by examples of breaches, between 1784 and 1970, that can be separataed into 14 discrete claims.

Name: Thahoketoteh of Kanekota v. HMTQ
Status: active
Court File No.: T-1396-12
Description: In this claim, the Plaintiff seeks, among other things, the removal of alleged non-native squatters from Lot 1 Concession 11, Clearview Township, Simcoe County. He alleges that the Crown has not respected the Royal Proclamation of 1784 and he also seeks compensation from other parties, such as the Canadian Hydro Developers, Inc. and Enbridge Gas, for their alleged illegal involvement in the area.

Name: Thahoketoteh of Kanekota v. HMTQ
Status: active (November 2012)
Court File No.: T-2007-12
Description: In this action, the Plaintiff alleges that the Defendant Canada has allowed federal and provincial law to apply to a tract of land described in the *Haldimand Proclamation of 1784* in violation of an alleged British Order in Council dating from 1704, the *Royal Proclamation of 1763*, ss. 90, 91(24) and 109 of the *Constitution Act, 1867* and an alleged Canadian Order in Council relating to disallowance, dating from 1875. The Plaintiff particularly alleges that Canada has violated its duty in allowing the *Indian Act*, the *Supreme Court Act* and the *Ontario Public Lands Act* to apply to the Haldimand Tract. The Plaintiff seeks as relief a declaration that Canada has the duty not to allow the application of federal or provincial law to the Haldimand Tract except by a treaty in compliance with the *Royal Proclamation of 1763* with any dispute resolved by a Standing Royal Committee constituted under the alleged Order In Council of

1704. The Plaintiff seeks to have the declaration described above determined under Rule 220(1)(a) of the Federal Courts Rules, and in writing under Rule 369.

Name: Six Nations Elected Council on its own behalf and on behalf of the Six Nations of the Grand River v. The Corporation of the City of Brantford
Status: active
Court File No.: CV-08-361454
Description: The Plaintiffs seek various declarations pertaining to Ontario and/or the City of Brantford's constitutional duty to consult with and accommodate the Six Nations of the Grand River before considering or undertaking any planning activities and disposition of lands which could potentially affect the interests of the Six Nations of the Grand River.

Name: Aaron Detlor; the Haudenosaunee Development Institute v. the Corporation of the City of Brantford – Superior Court of Justice
Status: active
Court File No.: CV-08-356782
Description: The Applicants Aaron Detlor and the Haudenosaunee Development Institute intend to question the constitutional validity and applicability of By-laws 63-2008 and 64-2008 of the City of Brantford Municipal Code, made under the Municipal Act, 2001, S.O. 2001, c. 25. The hearing is scheduled for November 2012.

Name: King Chief ah'she hodeeheehonto v. HMTQ in Right of Canada
Status: active
Court File No.: 10-20244 JR
Description: This is a Notice of Constitutional Question which seems to involve an argument involving Six Nations that among other things relies on the Two Row Wampum Treaty and other Aboriginal and treaty rights, as protection from the jurisdictional obligation to follow Canada's laws and other obligatory requirements.

Name: Regina v. Michael Monture
Status: active
Court File No.: not available
Description: The defendant is a member of the Mohawk Nation from the Six Nations of the Grand River, and is seeking relief under section 35 of the Constitution Act, 1982. The defendant alleges that the sub-standard health facilities are infringing on and limiting his aboriginal rights, as well as preventing him from delivering contemporary health care.

Out-of-Court settlement discussions

Since 1999, the Government of Canada, the Province of Ontario and Six Nations have made several attempts to resolve the historical grievances raised in Six Nations' 1995 lawsuit (refer to Six Nations of the Grand River Band of Indians v. HMTQ in Right of Canada and HMTQ in Right of Ontario, Court file no. 406/95 in the litigation section avove for additional information) through out-of-court settlement negotiations. Information on these discussions, including the negotiation process that commenced after the occupation of the Douglas Creek Estates site in Caledonia, Ontario, can be found on the AANDC website at: http://www.aadnc-aandc.gc.ca/eng/1100100016334/1100100016335.

Unitlateral Protocol

The Six Nations of the Grand River published a unilateral consultation and accommodation policy in 2009. You may wish to review this protocol to better understand the First Nation's perspective regarding consultation and accommodation. However, the federal government is not a party to this protocol and does not endorse the content. The link to the protocol is: http://www.sixnations.ca/admConsultationAccomodationPolicy.pdf

Other Considerations

Aboriginal Rights Assertions: the Métis

The inclusion of the Métis in s.35 represents Canada's commitment to recognize and value their distinctive cultures, which can only survive if they are protected along with other Aboriginal communities. In 2003, the Supreme Court of Canada affirmed Métis rights under s.35 of the Constitution Act, 1982, in the Sault St. Marie area, in the *Powley* decision. For more information on the *Powley* decision visit the following link: www.aadnc-aandc.gc.ca/eng/1100100014419

The Office of the Federal Interlocutor for Métis and Non-Status Indians (OFI) is aware that the Métis Nation of Ontario (MNO), its regional and community councils, have asserted a Métis right to harvest in a large section of the province.

The provincial government has accommodated Métis rights on a regional basis within Métis harvesting territories identified by the MNO. These accommodations are based on credible Métis rights assertions. An interim agreement (2004) between the MNO and the Ministry of Natural Resources (MNR) recognizes the MNO's Harvest Card system. This means that Harvester's Certificate holders engage in traditional Métis harvest activities within identified Métis traditional territories across the province. For a map of Métis traditional harvesting territories visit the MNO website at: http://www.metisnation.org/harvesting/harvesting-map.aspx

The MNO maintains that Aboriginal 'rights-holders' are Métis communities which are collectively represented through the MNO and its community councils. In partnership with community councils, MNO has established a consultation process. The MNO has published regional consultation protocols on their website which offer pre-consultation stage instructions on engaging the Métis through their community councils (via the consultation committee made up of an MNO regional councilor, a community councilor representative and a Captain of the Hunt). Please note however, that this organization does not represent all Métis in Ontario.

Métis Nation of Ontario
Métis Consultation Unit is located within the MNO head office.
500 Old St. Patrick Street, Unit 3
Ottawa, Ontario, K1N 9G4
Phone: (613) 798-1488 Fax: (613) 725-4225
www.metisnation.org/home.aspx

Métis National Council
4-340 MacLaren Street,
Ottawa, Ontario, K2P 0M6
Phone: (613) 232-3216 Fax: (613) 232-4262
www.metisnation.ca

For an indication of the population in Ontario who self-identify as Métis, visit the Statistics Canada website. The Ontario map indicates populations as small as 250 up to over 2,000 within its borders.
http://geodepot.statcan.gc.ca/2006/13011619/200805130120090313011619/16181522091403090112_13011619/15140102151809070914011 2_20152001121305200919090416151 6_0503-eng.pdf

Métis Litigation in Ontario
Name: HMTQ in Right of Canada v. Michel Blais
Status: active
Court File No.: 08-213
Description: The Applicant is charged with unlawfully harvesting forest resources in a Crown forest without a license contrary to the Crown Forest Sustainability Act, 1994. The Applicant, a Métis, asserts that he is an Aboriginal person within the meaning of s. 35 of the Constitution Act, 1982 and that the alleged harvesting occurred in lands set apart for the Batchewana Band pursuant to the Robinson Treaty of 1850. He claims that the Batchewana First Nation may permit Métis persons to exercise the same Aboriginal and treaty rights as its members pursuant to this treaty.

Name: HMTQ in Right of Canada, Laurie Desautels v. Henry Wetelainen Jr.
Status: active
Court File No.: CV-08-151
Description: The defendant, Henry Wetelainen Jr., intends to question the constitutional validity of sections 28, 31 and 40 of the Crown Forest Sustainability Act (1994), S.O. 1994, c. 25 and Ontario Regulation 167/95, as amended, in relation to an act or omission of the government of Ontario. The defendant claims that he was exercising Aboriginal and treaty rights afforded by the Adhesion to Treaty 3, by harvesting wood within his traditional territory. He claims that he is a Métis/Non-Status Indian and that the imposition of payment for harvesting or use of the forest resource is an infringement and violates his constitutional rights.

Name: Ministry of Natural Resources v. Kenneth Sr. Paquette
Status: active
Court File No.: to be determined
Description: This Notice of Constitutional Question relates to a provincial prosecution involving a charge pertaining to hunting moose. The Defendant intends to assert his s. 35 right as a Métis person to hunt moose, and he also intends to seek a Charter remedy under s. 15 of the *Charter.*

Court Decisions concerning Métis in Ontario
R. v. Laurin, Lemieux, Lemieux - 2007
Court No.: ONCJ 265

Three Métis defendants were charged with fishing violations and claimed that the decision of the Ministry of Natural Resources (MNR) to prosecute them violated the terms of the Interim Agreement (2004) between the MNR and the Métis Nation of Ontario (MNO). As the defendants were indeed Harvester Card holders authorized to fish in the Mattawa/Nipissing territory, therefore, they were entitled to the exemption in the agreement.

The Court concluded that laying of charges against any valid Harvester Card holder who is harvesting in the territory designated on the card within 2 years of the 2004 agreement was a breach. The Interim Agreement itself was silent as to any geographic limitations. There was no mention of the Agreement only applying north and east of Sudbury. Further, the reliance on Harvester Cards, which explicitly contained the territorial designation of the cardholder, signified that the MNR accepted such designations for the purpose of the agreement. The Court was clear to note that this case did not make any ruling regarding the merits of any claim that the Mattawa/Nipissing area contains section 35 rights bearing Métis communities.

Provincial guidelines

Under its responsibility to promote stronger Aboriginal relationships, the Ontario Ministry of Aboriginal Affairs has produced *Draft Guidelines on Consultation with Aboriginal Peoples Related to Aboriginal Rights and Treaty Rights.* These guidelines are for use by ministries who seek input from key First Nations and Métis organizations, all Ontario First Nations and selected non-Aboriginal stakeholders. To review the guidelines, visit:
http://www.aboriginalaffairs.gov.on.ca/english/policy/draftconsultjune2006.pdf

Dianne Damman

From: Barry Trood <btrood@wellington-north.com>
Sent: November 21, 2012 10:11 AM
To: Stephen Nutt; Dianne Damman
Subject: FW: Arthur WWTP

Barry Trood
Superintendant /ORO
of Water & Sewer Services
Township of Wellington North
160 Preston St., Arthur On., N0G 1A0
519-848-5327 phone 519-848-5291 fax

From: Sandra Cooke [mailto:scooke@grandriver.ca]
Sent: Tuesday, November 20, 2012 1:54 PM
To: Barry Trood
Subject: Arthur WWTP

HI Barry,

I just received your letter regarding the Arthur WWTP EA. GRCA is interested in being a commenting agency as we do own and operate the downstream reservoir.

Also, if you require any assistance, data etc, please don't hesitate to contact me or have your consultants contact me.

Sincerely,

Sandra

Sandra Cooke, M.Sc. | Senior Water Quality Supervisor
Grand River Conservation Authority | 400 Clyde Road, Cambridge, ON N1R 5W6
Ph: (519) 621-2763 ext. 2224 | Fx: (519) 621-4945
www.grandriver.ca

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

RECEIVED NOV 26 2012

November 19, 2012

Mr. Steven Nutt
XCG Consultants Ltd.
820 Trillium Drive
Kitchener, Ontario
N2R 1K4

Dear Mr. Nutt:

Re: Notice of Commencement
Class Environmental Assessment
Arthur Wastewater Treatment Plant, Wellington North

The Ministry is in receipt of the Notice recently sent by the Township advising of the commencement of a MEA Class EA study to "examine options for increasing capacity of the WWTP" in order to accommodate anticipated growth in the Township. In keeping with the range of alternatives that will be assessed to address the problem statement, we concur that it is appropriate to be following the requirements for Schedule "C" projects.

That being the case, Schedule "C" projects require preparation of an Environmental Study Report (ESR) once the preferred design has been determined and design work has progressed to the point where the details of any environmental protection measures to be incorporated in the construction package have been finalized. A suggested outline for an ESR is presented in the MEA Class EA document. Once the ESR is finalized a Notice of Completion is issued, allowing the public at least a 30 calendar day period for documentation review and comment. You are also reminded that when concerns are raised during the public comment period, the concerned party should be consulted in an attempt to resolve the concerns. Discussions may result in the 30-day review period being exceeded. The concerned party must be advised that if discussions are unsuccessful at resolving the concerns, they can submit a Part II Order request if they have not already done so to the Minister within a further seven calendar days following the end of discussions. You may wish to make use of the Ministry's "Using Mediation in Ontario's Environmental Assessment Process" to assist in conflict resolution. This Code of Practice can be accessed at:

http://www.ene.gov.on.ca/stdprodconsume/groups/lr/@ene/@resources/documents/resource/std01_79522.pdf

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. Once identified, you are advised to provide notification directly to the Aboriginal communities who may be affected by the project and provide them with an opportunity to participate in any planned public consultation sessions and comment on the project. You may wish to make use of the Ministry's "Consultation in Ontario's Environmental Process" to assist with public consultation efforts. This Code of Practice can be accessed at:

http://www.ene.gov.on.ca/stdprodconsume/groups/lr/@ene/@resources/documents/resource/std01_79520.pdf

As you are likely aware, the Township has complied with its current approval and submits annual reports on the plant's performance. We have noted back to the Township that based on corresponding high flows into the plant during wet weather events, it suggest that this sewershed has some I&I issues which we assume will be considered as part of this EA study given that some work on this matter had been undertaken in 2009/2010. As this study progresses, it would be appropriate to involve ministry staff to assist and review technical reports (i.e. assimilative capacity studies) being undertaken to assess viability of alternatives.

Should you have any questions regarding these comments, please contact me at (905) 521-7864 or at Barbara.slattery@ontario.ca.

Thank you,

Barbara Slattery

Barbara Slattery
EA/Planning Coordinator

cc. Mr,. Barry Trood, Director, Public Works, Township of Wellington North (via email only)

UTILITIES

Wellington North Power Inc.
290 Queen Street West, PO Box 359, Mount Forest, ON N0G 2L0
Phone: 519.323.1710 Fax: 519.323.2425 E-mail: wnp@wellingtonnorthpower.com
www.wellingtonnorthpower.com

By e-mail then mail.

November 20, 2012

Township of Wellington North
PO Box 125
7490 Sideroad 7W
Kenilworth, ON N0G 2E0
Attention – Mr. Barry Trood

Subject: Response to Environmental Assessment Notification
Arthur Waste Water Treatment Plant
160 Preston Street South in Arthur

Dear Mr. Trood:

Thank you for your letter notifying Wellington North Power Inc. (WNP) of the impending Environmental Assessment at the Arthur Waste Water Treatment Plant.

In April 2012, WNP installed a 500KVA 4,160Y2400-600Y347V pad-mount transformer to service the electrical needs of this property. This installation represented a $40,000 investment by WNP in this property. Please note that any increase in electrical service capacity required for this site would be the responsibility of the owner. WNP only supplies transformation up to 500KVA.

If you would, kindly add WNP to the mailing list for this project.

Please feel free to contact me at 519-323-1710 as required.

Best Regards,

WELLINGTON NORTH POWER INC.
Matthew Aston, Manager of Operations

CC: Judy Rosebrugh, President and CEO
Wellington North Power Inc.

Stephen Nutt, M.Eng., P.Eng.
XCG Consultants Ltd.

STAKEHOLDERS

Golden Valley Farms Inc.
50 WELLS STREET, P.O. BOX 670, ARTHUR, ONTARIO N0G 1A0
PHONE (519)848-3110 FAX (519)848-3470

August 13, 2013

Reference No. 081330

Barry Trood
Superintendant /OROof Water & Sewer Services
Township of Wellington North
160 Preston St.
Arthur, ON., N0G 1A0

Dear Mr.Trood:

Re: Request for increase in Average Daily Flow (ADF) to sewer to meet Golden Valley Farms(GVF) future production demand.

Golden Valley Farms (GVF) is issuing this correspondence relative to the issue of increasing Average Daily Flow (ADF) to sanitary sewer. A letter was issued on April 4, 2013 expressing concern on ADF exceeding 181 m^3/d on three occurrences out of six month period, permitted by Township of Wellington North(Town) for GVF.

A meeting was held between the Town and the GVF on July 17, 2013 (Participants are Mr. Barry Trood from the Town, Mr. Keith Hehn from GVF, Mr. Stephen G. Nutt from XCG Environmental Engineers and Scientists consultant for the Town and Andrew Lugowski from Conestoga- Rovers & Associates consultant for GVF) to discuss lack of additional treatment capacity by Arthur WWTP and limitation on future ADF demand that GVF production plant flow would require now and in near future.

Mr. Nutt confirmed that additional flow has not been allocated to GVF in the Environmental Assessment (EA) and noted that additional flow would reduce capacity of Arthur's ICI expansion; however he also felt that it would not pose a serious problem however, it may have an impact on further final effluent criteria changes, making them more stringent. He also informed that effluent criteria for the current plant expansion is under review with Ministry of Environment (MOE) and anticipated completion of the expansion project would be end of 2016. Mr. Nutt noted that interim rerating of Arthur WWTP may be an option to explore with MOE to meet GVF's future demand. This task would be undertaken by the Town.

GVF is requesting a 15 percent increase of flow each year over next three year period, with an overall capacity to 360 m^3/day by the year of 2016. Currently, GVF operates chemically enhanced primary treatment, prior to sewer discharge. The system operates continuously producing effluent quality that is far below sewer discharge requirements. It is noted that with increased flow to the GVF's primary treatment system may decrease effluent quality comparing to current effluent quality (i.e., solids and organic loading); however GVF will continually meet sewer discharge criteria at 360 m^3/day. GVF also request's that township to review water usage and sewer discharge rate based on future water demand.

It is also imperative that GVF know what their cost structure for water and sewage will be in the future and that our costs remain competitive with surrounding municipalities. That is not currently the case as our rates far exceed any of our neighbours.

GVF takes the opportunity to thank you the township for their continuous support in business expansion and job creation. Should you have any question, please do not hesitate to contact the under signed.

Yours truly,

Golden Valley Farms

Keith Hehn, Plant Manager

XX/XX/X

Cc: Andrew Lugowski, P. Eng., Conestoga- Rovers & Associates

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

August 28, 2013 **XCG File No. 3-3167-01-01**

Township of Wellington North
7490 Sideroad 7 W.
P.O. Box 125
Kenilworth, Ontario
N0G 2E0

Attention: Mr. Barry Trood,
Water and Sewer Superintendent

Re: Golden Valley Farms Request for Additional Wastewater Flow Allocation

Dear Barry:

Following a meeting with Golden Valley Farms (GVF) and its consultant, Conestoga-Rovers & Associates (CRA), on July 17, 2013, GVF, in a letter to the Township of Wellington North dated August 13, 2013, has formally requested that additional wastewater treatment capacity be provided at the Arthur Wastewater Treatment Plant (WWTP) for its expanding operation in Arthur. Specifically, GVF has requested a 15 percent increase in wastewater flow each year over the next three-year period with an overall flow allocation of 360 m^3/d by the year 2016. The current wastewater flow allocation to GVF is 181 m^3/d. The intent of this letter is to provide guidance to the Township of Wellington North regarding the implications of granting the requested increase in wastewater flow allocation to the GVF.

1. BACKGROUND

The Township of Wellington North is currently undertaking a Schedule C Class Environmental Assessment (EA) to determine the most cost effective and environmentally sound means of increasing wastewater treatment capacity at the Arthur WWTP. Phase 2 of the Class EA has been completed with the identification of a preferred alternative that would involve expanding the existing Arthur WWTP to an average day flow (ADF) capacity of 2,300 m^3/d from the existing approved ADF capacity of 1,465 m^3/d. This expansion would provide adequate treatment capacity to meet projected residential, industrial, commercial, and institutional (ICI) growth in the service area to 2031. This future flow projection did not include any specific increase in flow from GVF beyond the existing allocation of 181 m^3/d. The preferred alternative was presented to the public at a Public Information Centre (PIC) held in Arthur on March 19, 2013.

A detailed Assimilative Capacity Study (ACS) had been undertaken to establish the level of treatment and effluent limits that would apply to an expanded Arthur WWTP with an ADF capacity of 2,300 m^3/d. The findings of the ACS were reviewed with Ministry of Environment (MOE) staff at a meeting held on July 15, 2013 and the Township is currently awaiting final comments from the MOE on the acceptability of the proposed effluent limits.

2. IMPLICATIONS OF GRANTING GVF ADDITIONAL FLOW ALLOCATION AT THE ARTHUR WWTP

The flow projections developed in XCG's Technical Memorandum "Proposed Design Flows – Arthur WWTP Class EA," dated April 29, 2013, did not include any additional flow allocation to GVF beyond the existing approved 181 m^3/d allocation. However, a projected flow of 488 m^3/d was included for an identified 28.7 ha of commercial and industrial development lands in the community. The flow allocation to these lands was based on an assumed wastewater production rate of 14 m^3/d per ha, plus an Infiltration/Inflow (I/I) allowance of 3 m^3/d per ha. The wastewater production rate assumed is at the high range of typical values for commercial development or light industrial development with little or no wet processing.

The flow allocation for new residential growth in the community to 2031 was based on the estimated current per capita flow of approximately 460 L per person per day. This per capita flow includes the contribution from existing ICI in the community, with the exception of the contribution from GVF.

The flow projection of 2,300 m^3/d to 2031 is considered conservative and is likely adequate to allow the projected residential, commercial, and industrial development in the community, as well as the increased allocation requested by GVF. If future ICI development occurs at a rate similar to the existing ICI in the community, these ICI flows will be covered by the 460 L/person.d allocated to residential development. Further, the 17 m^3/ha.d allocation is likely conservative for anticipated industrial and commercial development. If approximately 180 m^3/d of the 488 m^3/d allocation to new industrial and commercial development is allocated to GVF to meet its request for a total allocation of 360 m^3/d, there will remain about 308 m^3/d available for other industrial and commercial development, equivalent to about 10.7 m^3/d per ha. With an allowance of 3 m^3/d per ha for I/I, this amounts to 7.7 m^3/d per ha for the wastewater production from the new industrial and commercial lands. This amount is within the typical range of 7.5 to 14 m^3/d per ha for commercial and light industrial development.

At this time, it is not recommended that the future design ADF for the expanded Arthur WWTP be increased by 180 m^3/d to accommodate GVF's request for additional wastewater treatment capacity as this would necessitate revising the previous ACS to reflect the higher flow and initiating further discussions with the MOE regarding effluent limits. In addition, increasing the ADF capacity of the expanded Arthur WWTP would increase the capital costs of the plant expansion significantly. Rather, the additional allocation to GVF should be taken from the projected industrial and commercial allocation of 488 m^3/d. As new residential, industrial, and commercial development occurs in the community, the Township will need to monitor wastewater flows allotted to this new development to ensure that the design ADF of 2,300 m^3/d is not exceeded.

3. TIMING AND MAGNITUDE OF GVF WASTEWATER FLOW INCREASES

As noted previously, GVF has requested a 15 percent increase in wastewater flow each year over the next three-year period with an overall flow allocation of 360 m^3/d by the year 2016. The estimated raw sewage flow to the Arthur WWTP over the five-year period from 2008 to 2012 has averaged 1,379 m^3/d, or about 94 percent of the approved capacity of 1,465 m^3/d. In

2012, the average ADF was estimated to be 1,484 m^3/d, exceeding the approved capacity of the Arthur WWTP specified in the Certificate of Approval (C of A) for the works (C of A #3-1256-88-908). Therefore, any increase in wastewater flow from GVF prior to completion of the Class EA and expansion of the works to a higher Environmental Compliance Approval (ECA) capacity may result in the plant flow exceeding the approved capacity, potentially leading to non-compliance and possible enforcement action by MOE. Depending on the extent of construction needed to expand the existing Arthur WWTP, the additional capacity may not be approved and available before the end of 2015.

GVF, in its letter dated August 13, 2013, did not indicate if an additional wastewater flow allocation beyond 360 m^3/d may be requested after 2016. It should be noted that any increase in allocation beyond 360 m^3/d before the end of the planning period of 2031 would further reduce the allocation to new residential, commercial, and industrial development in the community.

4. Option to Re-Rate the Existing Arthur WWTP to a Higher Interim Flow

At the July 17 meeting with GVF, the opportunity to re-rate the Arthur WWTP to a higher interim flow to accommodate a near term increase in wastewater flows from GVF was discussed. Previous studies at the plant suggest that a flow increase up to about 1,800 m^3/d might be accommodated in the existing plant without major construction. If the potential to re-rate the plant is confirmed, this interim increase could become the first stage in the expansion and incorporated in the Class EA. Depending on what, if any, upgrades would be needed to accommodate the higher interim flow, approval for the increased flow might be obtained early in 2014 when the Class EA is completed, allowing some increase in GVF flows at that time.

Incorporating an interim flow increase into the Class EA will increase the scope of the Class EA and require a more detailed analysis of the capacity of the existing works and identification of what upgrades, if any, would be needed to accommodate the higher flow. In addition, further discussion with the MOE would be required to establish the level of treatment and effluent limits that would apply to the plant at the interim re-rated capacity.

5. Closure

I trust, Barry, that this provides sufficient guidance to the Township as it considers the request from GVF for additional wastewater flow allocation in the expanded Arthur WWTP. I would be pleased to meet with you and others at the Township to provide any additional clarification. Please feel free to contact me at your convenience.

Yours very truly,
XCG CONSULTANTS LTD.

Stephen G. Nutt, M.Eng., P.Eng.
Senior Consultant

January 3,2013

Barry Trood
Water & Sewer Superintendent
Township of Wellington North

Stephen Nutt
Consultant Project Manager
XCG Consultants Ltd.

RE: SEWAGE ALLOCATIONS REQUIRED

Just an update to give you Gentlemen a heads-up on our development plans for the next phase of our "Eastridge Landing" subdivision in Arthur.

Our Planner, Nancy Shoemaker of B.S.R.D. in Guelph, has been in discussion with the County of Wellington Planning Department for the past 6 months, and will be submitting our Phase 3 Draft Plan sometime in January 2013. This next phase will consist of 103 proposed lots which will include a mix of single detached homes, semis and townhomes.

At this point in time we would like to inform you of our future needs for adequate sewage allocations, so that we can proceed with servicing of our next phase. We anticipate that the proposed draft plan will be split into 2 phases with the first servicing being 47 lots which could take place as soon as late 2013 or early 2014.

As you are probably aware, our "Eastridge Landing" site has progressed steadily over the last 5 years and to date we have seen the construction of 31 new homes take place, which has contributed over $ 320,000.00 in municipal development charges to the Township of Wellington North.

We look forward to working with the Township of Wellington North on the future phases of this site, and we wish to be kept informed on the progress of your current Environmental Assessment for the Arthur Waste Water Treatment Plant.

Sincerely

James Coffey   Dave Martin

Cc: Darren Jones
Ray Tout
Lori Heinbuch

Dianne Damman

From: Dianne Damman <ddamman@kw.igs.net>
Sent: November 27, 2012 1:30 PM
To:
Cc: 'Barry Trood'; 'Stephen Nutt'; 'Lorna Neely'
Subject: RE: environmental assessment Arthur treatment plant

Mr. Stack:

Thank you very much for your e-mail to Barry Trood. I am responding on Mr. Trood's behalf. We appreciate you taking the time to submit your note to us. There will be two public information centres that will be held through the course of the Class EA study. You are on the project mailing list and will receive notification of the dates and locations for these public meetings. We look forward to meeting you at these information centres. In the meantime, if you have any items that you would like to bring to our attention, please feel free to provide them.

Thank you again for your interest in the study.

Sincerely,

Dianne C. Damman

Dianne Damman, M.A., M.C.I.P., R.P.P.
D.C. Damman and Associates

From: D Stack
Sent: Tuesday, November 27, 2012 8:52 AM
To: Barry Trood
Subject: environmental assessment Arthur treatment plant

Barry - I would be interested in being part of the study - information and meetings.

Contact info: Dave Stack

Thanks, Dave Stack

November 26, 2012

RE: Municipal Class Environmental Assessment
Arthur Wastewater Treatment Plant
Notice of Commencement

Dear: Mr. Barry Trood

Thank you for your advice on commencement of this study to increase the capacity of the wastewater treatment facilities in Arthur. I definitely want to be involved and kept informed of this Environmental Study process.

As part of the process to site new wastewater treatment facilities, the deficiencies of the existing storage lagoons must be addressed. During the past ten or more years the field adjacent to the existing lagoons could not be worked because of the surface wetness of the area. The surface wetness in this field results from two sources.

Surface run-off from the berm, and
Leakage when the lagoon is full.

A number of years ago I brought this to the attention of the municipality. Some minor repairs were done on the northeast corner of the lagoon. This work resulted in no change to the site conditions.

The visible deficiencies of the site, that I am aware of, are the following.

No buffer to contain surface run-off from the site,
No ditch to catch leakage from the lagoon
No monitoring to determine if there is leakage
No adequate fencing to control site access

A study for increasing the capacity of the system must address concerns with the existing wastewater treatment facilities.

T. A. Normet

Dianne Damman

From: Stephen Nutt <StephenN@xcg.com>
Sent: November 29, 2012 10:05 AM
To:
Cc: Dianne Damman; btrood@wellington-north.com
Subject: Arthur Wastewater Treatment Plant

Dear Mr. Normet

Thank you very much for your e-mail. The Notice of Commencement has been posted on the Township's web site at http://www.wellington-north.com/public-notices/. Additional project notices and information will be posted as the study progresses.

Please continue to send any correspondence to Barry Trood and myself. Please note that my e-mail address is stephen@xcg.com.

Thank you for your interest in the study.

Sincerely,

Stephen Nutt

Stephen G. Nutt, M.Eng., P.Eng.
Senior Consultant
XCG Consultants Ltd.

From: Tom Normet
Sent: November 27, 2012 7:58 PM
To: ddamman@kw.igs.net
Subject: RE: Arthur Wastewater Treatment Plant

Thank you for your reply. I went to the Wellington-North web site, as indicated in the letter, for more information on the study and discovered that there was none that I could find on the web site.

My e-mail was sent to a Stephen Nutt as well as Mr. Trood. The stephen@xeg.com e-mail address came up with a delayed delivery. Does this mean he did not receive it? Is it important that he does receive it?

If he should get a copy would you please forward it to him.

Your name and the kw.igs.net did not appear in the letter sent by Mr. Trood. To whom should I address further communications on this Class EA?

Tom Normet

From: ddamman@kw.igs.net
To:
CC: btrood@wellington-north.com
Subject: Arthur Wastewater Treatment Plant
Date: Tue, 27 Nov 2012 12:20:31 -0500

From: Dianne Damman [mailto:ddamman@kw.igs.net]
Sent: November 27, 2012 12:18 PM
To:
Cc: 'Barry Trood'; Stephen Nutt; Lorna Neely
Subject: RE: Arthur Wastewater Treatment Plant

Mr. and Mrs. Normet:

Thank you very much for your e-mail to Barry Trood. I am responding on Mr. Trood's behalf. We appreciate you taking the time to submit your comments to us. There will be two public information centres that will be held through the course of the Class EA study. You are on the project mailing list and will receive notification of the dates and locations for these public meetings. We look forward to meeting you at these information centres. In the meantime, if you have any further items that you would like to bring to our attention, please feel free to provide them.

Thank you again for your interest in the study.

Sincerely,

Dianne C. Damman

Dianne Damman, M.A., M.C.I.P., R.P.P.
D.C. Damman and Associates

From: Tom Normet
Sent: Monday, November 26, 2012 3:36 PM
To: Barry Trood; stephen@xeg.com
Cc: Katie Normet
Subject: Arthur Wastewater Treatment Plant
Importance: High

Attached are my initial concerns and comments.

Tom Normet

Dianne Damman

From: Stephen Nutt <StephenN@xcg.com>
Sent: November 21, 2012 10:47 AM
To: Ben & Tracy Austin
Cc: btrood@wellington-north.com; Dianne Damman; Lorna Neely
Subject: RE: CLASS ENVIRONMENTAL ASSESSMENT ARTHUR WASTEWATER TREATMENT PLANT

Mr. and Mrs. Austin:

Thank you very much for your e-mail to Barry Trood and myself. We appreciate you taking the time to submit your comments to us. There will be two public information centres that will be held through the course of the Class EA study. You are on the project mailing list and will receive notification of the dates and locations for these public meetings. We look forward to meeting you at these information centres. In the meantime, if you have any further items that you would like to bring to our attention, please feel free to provide them.

Thank you again for your interest in the study.

Sincerely,

Stephen Nutt

Stephen G. Nutt, M.Eng., P.Eng.
Senior Consultant
XCG Consultants Ltd.

From: Ben & Tracy Austin
Sent: Tuesday, November 20, 2012 6:33 PM
To: btrood@wellington-north.com; Stephen Nutt
Subject: CLASS ENVIRONMENTAL ASSESSMENT ARTHUR WASTEWATER TREATMENT PLANT

Mr Trood, Mr Nutt,

I saw the public notice of an environmental assessment for an expansion of the water treatment plant in Arthur. I wanted to express my concern at any such expansion, and would like to inquire as to what consultations will be taken with the public before any expansion would happen. I live on Duke street, and on warmer days, when the wind is blowing in a north easterly direction we already experience a fowl odor from the treatment plant. Also, before you suggest the smell is All Treats farm, its not, the days we notice a smell, the rest of the town is fine, when All treats are cycling their "crop" the entire town reeks. My concern is really 3 fold;

1. What studies / facts are available for the odours we are smelling. I'd like to ensure their is no ill side effects, as my children's safety is my paramount concern. Im also concerned of any run off from the plant to the river behind it, as my son likes to go fishing back there.
2. What would be done to prevent any odours from the surrounding houses if an expansion were to take place. Right know, it is occasional, how to we prevent this from being regular or permanent?

3. Resale value of my home. I hate to jump right away to money, but its a very real concern. If an expansion were to take place and a smell was always present my house value would drop, and I could quickly find myself in a situation where my mortgage is worth more then the value of the house. I dont want to see this happen.

If your not able to answer or address these question, please let me know whom I could direct these questions too.

Thank you,
Benjarmin R. Austin

I-7

ABORIGINAL CONSULTATION

– NOTICE OF COMMENCEMENT LETTERS

– NOTICE OF PUBLIC INFORMATION CENTRE # 1 LETTERS

– NOTICE OF PUBLIC INFORMATION CENTRE # 2 LETTERS

– NOTICE OF PUBLIC INFORMATION CENTRE # 3 LETTERS

– NOTICE OF COMPLETION LETTERS

NOTICE OF COMMENCEMENT

Township of Wellington North

P.O. Box 125 • 7490 Sideroad 7 W • Kenilworth • ON • N0G 2E0

November 16, 2012

Mississaugas of the New Credit First Nation
Ms. Margaret Sault
RR #6, 468 New Credit Road
Hagersville, ON N0A 1H0

RE: Municipal Class Environmental Assessment
Arthur Wastewater Treatment Plant
Notice of Commencement

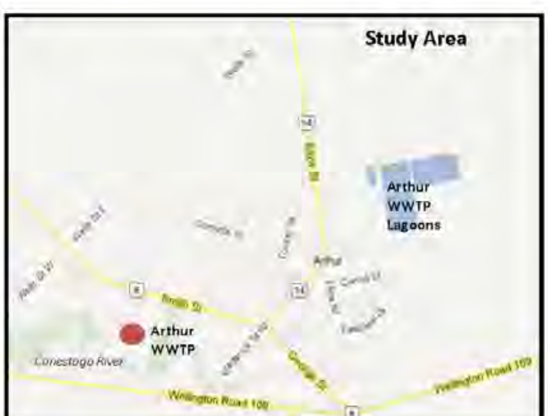
Dear Ms. Margaret Sault,

The Arthur Wastewater Treatment Plant (WWTP) is owned and operated by the Township of Wellington North (the Township). The Township has initiated a Class Environmental Assessment (EA) to examine options for increasing the capacity of the WWTP.

The Arthur WWTP consists of an extended aeration facility complete with effluent filtration and aerobic digestion and conventional lagoons for seasonal effluent storage. The rated capacity of the facility is 1,465 m^3/day expressed as an annual average flow.

Current flows, combined with development commitments, have resulted in a situation where there is limited capacity for future growth. The goal of the study is to examine alternatives for increasing the treatment capacity at the Arthur WWTP, and to determine a preferred alternative.

The map below shows the approximate limits of the study.



Map courtesy of Google Maps

The study is being undertaken as a Schedule C project in accordance with the requirements of the Municipal Class Environmental Assessment (EA) (Municipal Engineers Association, June 2000, as amended in 2007 and 2011).

The purpose of this letter is to advise you of the commencement of this study. The Township of Wellington North has retained XCG Consultants Ltd. and R.J. Burnside & Associates Ltd. to undertake the study. Please see attached for a Notice of Commencement that will be published in the local newspaper to advise the general public of the project.

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 not want to receive further notifications regarding the study. If this is the case, we would appreciate you advising us in writing. We would appreciate written responses no later than **December16, 2012**.

Two Public Information Centres (PICs) will be scheduled during the study to provide background information, to present the evaluation of alternative solutions and the recommended preferred alternative solution, and to present the recommended preferred design concept. Details of the PICs will be published at a future date.

Information on the Arthur WWTP Class EA study will be posted on the Township's web site at: http://www.wellington-north.com.

If you have any questions or would like further information about the study, please contact the undersigned by phone at 519-848-5327 or by e-mail at btrood@wellington-north.com. Thank you very much for your interest in the study.

Sincerely,

Mr. Barry Trood
Water and Sewer Superintendent

Cc: Mr. Stephen Nutt, XCG Consultants Ltd.

Township of Wellington North

P.O. Box 125 • 7490 Sideroad 7 W • Kenilworth • ON • N0G 2E0

November 16, 2012

Six Nations of the Grand River
Mr. Lonny Bomberry, Director
Land and Resources Department
P.O. Box 5000
2498 Chiefswood Road
Ohsweken, ON N0A 1M0

RE: Municipal Class Environmental Assessment
Arthur Wastewater Treatment Plant
Notice of Commencement

Dear Mr. Lonny Bomberry,

The Arthur Wastewater Treatment Plant (WWTP) is owned and operated by the Township of Wellington North (the Township). The Township has initiated a Class Environmental Assessment (EA) to examine options for increasing the capacity of the WWTP.

The Arthur WWTP consists of an extended aeration facility complete with effluent filtration and aerobic digestion and conventional lagoons for seasonal effluent storage. The rated capacity of the facility is 1,465 m^3/day expressed as an annual average flow.

Current flows, combined with development commitments, have resulted in a situation where there is limited capacity for future growth. The goal of the study is to examine alternatives for increasing the treatment capacity at the Arthur WWTP, and to determine a preferred alternative.

The map below shows the approximate limits of the study.

Map courtesy of Google Maps

Tel 519-848-3620 Toll Free 1-866-848-3620 Fax 519-848-3228
www.wellington-north.com township@wellington-north.com

The study is being undertaken as a Schedule C project in accordance with the requirements of the Municipal Class Environmental Assessment (EA) (Municipal Engineers Association, June 2000, as amended in 2007 and 2011).

The purpose of this letter is to advise you of the commencement of this study. The Township of Wellington North has retained XCG Consultants Ltd. and R.J. Burnside & Associates Ltd. to undertake the study. Please see attached for a Notice of Commencement that will be published in the local newspaper to advise the general public of the project.

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 not want to receive further notifications regarding the study. If this is the case, we would appreciate you advising us in writing. We would appreciate written responses no later than **December16, 2012**.

Two Public Information Centres (PICs) will be scheduled during the study to provide background information, to present the evaluation of alternative solutions and the recommended preferred alternative solution, and to present the recommended preferred design concept. Details of the PICs will be published at a future date.

Information on the Arthur WWTP Class EA study will be posted on the Township's web site at: http://www.wellington-north.com.

If you have any questions or would like further information about the study, please contact the undersigned by phone at 519-848-5327 or by e-mail at btrood@wellington-north.com. Thank you very much for your interest in the study.

Sincerely,

Mr. Barry Trood
Water and Sewer Superintendent

Cc: Mr. Stephen Nutt, XCG Consultants Ltd.

Township of Wellington North

P.O. Box 125 • 7490 Sideroad 7 W • Kenilworth • ON • N0G 2E0

November 16, 2012

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

RE: Municipal Class Environmental Assessment
Arthur Wastewater Treatment Plant
Notice of Commencement

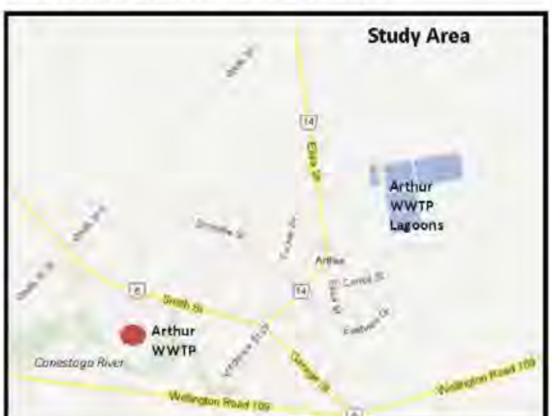
Dear Mr. Paul General,

The Arthur Wastewater Treatment Plant (WWTP) is owned and operated by the Township of Wellington North (the Township). The Township has initiated a Class Environmental Assessment (EA) to examine options for increasing the capacity of the WWTP.

The Arthur WWTP consists of an extended aeration facility complete with effluent filtration and aerobic digestion and conventional lagoons for seasonal effluent storage. The rated capacity of the facility is 1,465 m^3/day expressed as an annual average flow.

Current flows, combined with development commitments, have resulted in a situation where there is limited capacity for future growth. The goal of the study is to examine alternatives for increasing the treatment capacity at the Arthur WWTP, and to determine a preferred alternative.

The map below shows the approximate limits of the study.



Map courtesy of Google Maps

The study is being undertaken as a Schedule C project in accordance with the requirements of the Municipal Class Environmental Assessment (EA) (Municipal Engineers Association, June 2000, as amended in 2007 and 2011).

The purpose of this letter is to advise you of the commencement of this study. The Township of Wellington North has retained XCG Consultants Ltd. and R.J. Burnside & Associates Ltd. to undertake the study. Please see attached for a Notice of Commencement that will be published in the local newspaper to advise the general public of the project.

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 not want to receive further notifications regarding the study. If this is the case, we would appreciate you advising us in writing. We would appreciate written responses no later than **December16, 2012**.

Two Public Information Centres (PICs) will be scheduled during the study to provide background information, to present the evaluation of alternative solutions and the recommended preferred alternative solution, and to present the recommended preferred design concept. Details of the PICs will be published at a future date.

Information on the Arthur WWTP Class EA study will be posted on the Township's web site at: http://www.wellington-north.com.

If you have any questions or would like further information about the study, please contact the undersigned by phone at 519-848-5327 or by e-mail at btrood@wellington-north.com. Thank you very much for your interest in the study.

Sincerely,

Mr. Barry Trood
Water and Sewer Superintendent

Cc: Mr. Stephen Nutt, XCG Consultants Ltd.

Township of Wellington North

P.O. Box 125 • 7490 Sideroad 7 W • Kenilworth • ON • N0G 2E0

November 16, 2012

Six Nations Haudenosaunee Confederacy Council
Mr. Leroy Hill
Secretary
Haudenosaunee Resource Centre
2634 6th Line
RR # 2
Ohsweken, ON N0A 1M0

RE: Municipal Class Environmental Assessment
Arthur Wastewater Treatment Plant
Notice of Commencement

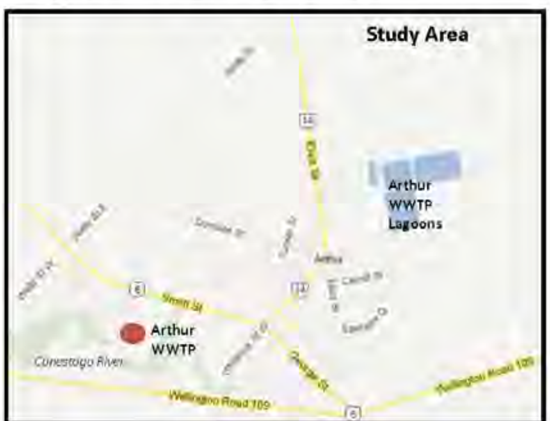
Dear Mr. Leroy Hill,

The Arthur Wastewater Treatment Plant (WWTP) is owned and operated by the Township of Wellington North (the Township). The Township has initiated a Class Environmental Assessment (EA) to examine options for increasing the capacity of the WWTP.

The Arthur WWTP consists of an extended aeration facility complete with effluent filtration and aerobic digestion and conventional lagoons for seasonal effluent storage. The rated capacity of the facility is 1,465 m^3/day expressed as an annual average flow.

Current flows, combined with development commitments, have resulted in a situation where there is limited capacity for future growth. The goal of the study is to examine alternatives for increasing the treatment capacity at the Arthur WWTP, and to determine a preferred alternative.

The map below shows the approximate limits of the study.



Map courtesy of Google Maps

The study is being undertaken as a Schedule C project in accordance with the requirements of the Municipal Class Environmental Assessment (EA) (Municipal Engineers Association, June 2000, as amended in 2007 and 2011).

The purpose of this letter is to advise you of the commencement of this study. The Township of Wellington North has retained XCG Consultants Ltd. and R.J. Burnside & Associates Ltd. to undertake the study. Please see attached for a Notice of Commencement that will be published in the local newspaper to advise the general public of the project.

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 not want to receive further notifications regarding the study. If this is the case, we would appreciate you advising us in writing. We would appreciate written responses no later than **December16, 2012**.

Two Public Information Centres (PICs) will be scheduled during the study to provide background information, to present the evaluation of alternative solutions and the recommended preferred alternative solution, and to present the recommended preferred design concept. Details of the PICs will be published at a future date.

Information on the Arthur WWTP Class EA study will be posted on the Township's web site at: http://www.wellington-north.com.

If you have any questions or would like further information about the study, please contact the undersigned by phone at 519-848-5327 or by e-mail at btrood@wellington-north.com. Thank you very much for your interest in the study.

Sincerely,

Mr. Barry Trood
Water and Sewer Superintendent

Cc: Mr. Stephen Nutt, XCG Consultants Ltd.

NOTICE OF PUBLIC INFORMATION CENTRE # 1

Township of Wellington North

P.O. Box 125 • 7490 Sideroad 7 W • Kenilworth • ON • N0G 2E0

March 6, 2013

Mississaugas of the New Credit First Nation
Ms. Margaret Sault
RR #6, 468 New Credit Road
Hagersville, ON N0A 1H0

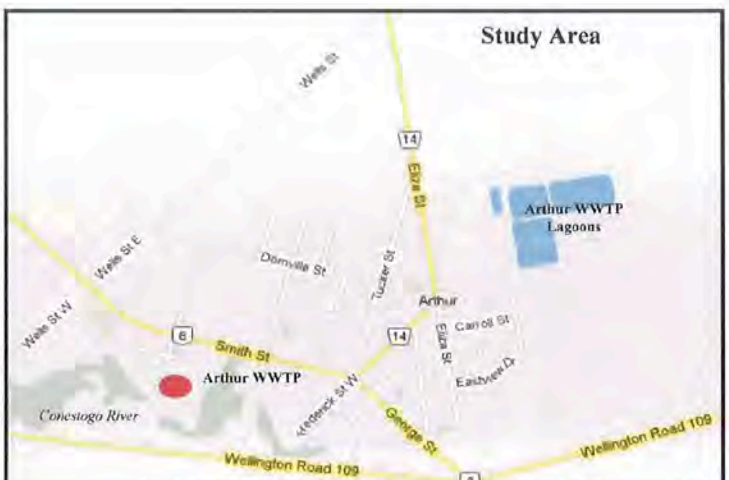
RE: Municipal Class Environmental Assessment
Arthur Wastewater Treatment Plant
Notice of Public Information Centre # 1

Dear Ms. Margaret Sault,

The Arthur Wastewater Treatment Plant (WWTP) is owned and operated by the Township of Wellington North (the Township). The Township has initiated a Class Environmental Assessment (EA) to examine options for increasing the capacity of the WWTP.

The Arthur WWTP consists of an extended aeration facility complete with effluent filtration and aerobic digestion and conventional lagoons for seasonal effluent storage. The rated capacity of the facility is 1,465 m^3/day expressed as an annual average flow.

The map below illustrates the location of the Arthur WWTP.



Map courtesy of Google Maps

Current flows, combined with development commitments, have resulted in a situation where there is limited capacity for future growth. The goal of the study is to examine alternatives for increasing the treatment capacity at the Arthur WWTP, and to determine a preferred alternative.

The study is being undertaken as a Schedule C project in accordance with the requirements of the Municipal Class Environmental Assessment (EA) (Municipal Engineers Association, June 2000, as amended in 2007 and 2011).

A Public Information Centre (PIC) has been scheduled to present and receive comments on the project, alternative solutions and the recommended preferred solution for increasing the capacity of the WWTP. The PIC will be held as follows:

Tuesday, March 19, 2013
5:00 PM to 7:00 PM
Arthur Community Centre, 158 Domville Street
Arthur, Ontario

Information on the Arthur WWTP Class EA study will be posted on the Township's web site at: http://www.wellington-north.com. The information presented at this PIC will be available on this web site after March 19, 2013.

If you have any questions or would like further information about the study, please contact the undersigned by phone at 519-848-5327 (Toll Free: 1-866-848-3620) or by e-mail at btrood@wellington-north.com. Thank you very much for your interest in the study.

Sincerely,

BTrood

Mr. Barry Trood
Water and Sewer Superintendent

Cc. Mr. Stephen Nutt, XCG Consultants Ltd.

Township of Wellington North

P.O. Box 125 • 7490 Sideroad 7 W • Kenilworth • ON • N0G 2E0

March 6, 2013

Six Nations of the Grand River
Mr. Lonny Bomberry, Director
Land and Resources Department
P.O. Box 5000
2498 Chiefswood Road
Ohsweken, ON N0A 1M0

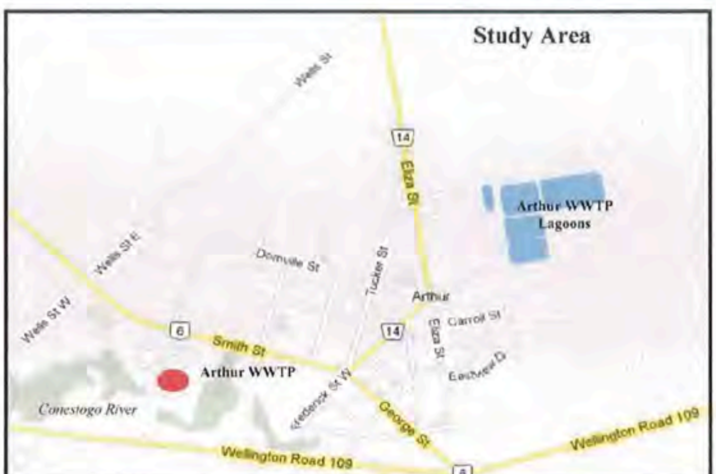
RE: Municipal Class Environmental Assessment
Arthur Wastewater Treatment Plant
Notice of Public Information Centre # 1

Dear Mr. Lonny Bomberry,

The Arthur Wastewater Treatment Plant (WWTP) is owned and operated by the Township of Wellington North (the Township). The Township has initiated a Class Environmental Assessment (EA) to examine options for increasing the capacity of the WWTP.

The Arthur WWTP consists of an extended aeration facility complete with effluent filtration and aerobic digestion and conventional lagoons for seasonal effluent storage. The rated capacity of the facility is 1,465 m^3/day expressed as an annual average flow.

The map below illustrates the location of the Arthur WWTP.



Map courtesy of Google Maps

Tel 519-848-3620 Toll Free 1-866-848-3620 Fax 519-848-3228
www.wellington-north.com township@wellington-north.com

Current flows, combined with development commitments, have resulted in a situation where there is limited capacity for future growth. The goal of the study is to examine alternatives for increasing the treatment capacity at the Arthur WWTP, and to determine a preferred alternative.

The study is being undertaken as a Schedule C project in accordance with the requirements of the Municipal Class Environmental Assessment (EA) (Municipal Engineers Association, June 2000, as amended in 2007 and 2011).

A Public Information Centre (PIC) has been scheduled to present and receive comments on the project, alternative solutions and the recommended preferred solution for increasing the capacity of the WWTP. The PIC will be held as follows:

Tuesday, March 19, 2013
5:00 PM to 7:00 PM
Arthur Community Centre, 158 Domville Street
Arthur, Ontario

Information on the Arthur WWTP Class EA study will be posted on the Township's web site at: http://www.wellington-north.com. The information presented at this PIC will be available on this web site after March 19, 2013.

If you have any questions or would like further information about the study, please contact the undersigned by phone at 519-848-5327 (Toll Free: 1-866-848-3620) or by e-mail at btrood@wellington-north.com. Thank you very much for your interest in the study.

Sincerely,

BTrood

Mr. Barry Trood
Water and Sewer Superintendent

Cc. Mr. Stephen Nutt, XCG Consultants Ltd.

Township of Wellington North

P.O. Box 125 • 7490 Sideroad 7 W • Kenilworth • ON • N0G 2E0

March 6, 2013

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

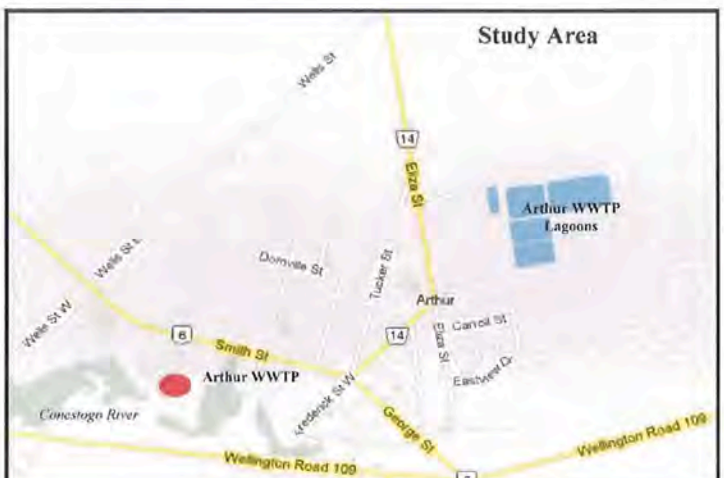
RE: Municipal Class Environmental Assessment
Arthur Wastewater Treatment Plant
Notice of Public Information Centre # 1

Dear Mr. Paul General,

The Arthur Wastewater Treatment Plant (WWTP) is owned and operated by the Township of Wellington North (the Township). The Township has initiated a Class Environmental Assessment (EA) to examine options for increasing the capacity of the WWTP.

The Arthur WWTP consists of an extended aeration facility complete with effluent filtration and aerobic digestion and conventional lagoons for seasonal effluent storage. The rated capacity of the facility is 1,465 m^3/day expressed as an annual average flow.

The map below illustrates the location of the Arthur WWTP.



Map courtesy of Google Maps

Tel 519-848-3620 Toll Free 1-866-848-3620 Fax 519-848-3228
www.wellington-north.com township@wellington-north.com

Current flows, combined with development commitments, have resulted in a situation where there is limited capacity for future growth. The goal of the study is to examine alternatives for increasing the treatment capacity at the Arthur WWTP, and to determine a preferred alternative.

The study is being undertaken as a Schedule C project in accordance with the requirements of the Municipal Class Environmental Assessment (EA) (Municipal Engineers Association, June 2000, as amended in 2007 and 2011).

A Public Information Centre (PIC) has been scheduled to present and receive comments on the project, alternative solutions and the recommended preferred solution for increasing the capacity of the WWTP. The PIC will be held as follows:

Tuesday, March 19, 2013
5:00 PM to 7:00 PM
Arthur Community Centre, 158 Domville Street
Arthur, Ontario

Information on the Arthur WWTP Class EA study will be posted on the Township's web site at: http://www.wellington-north.com. The information presented at this PIC will be available on this web site after March 19, 2013.

If you have any questions or would like further information about the study, please contact the undersigned by phone at 519-848-5327 (Toll Free: 1-866-848-3620) or by e-mail at btrood@wellington-north.com. Thank you very much for your interest in the study.

Sincerely,

BTrood

Mr. Barry Trood
Water and Sewer Superintendent

Cc. Mr. Stephen Nutt, XCG Consultants Ltd.

Township of Wellington North

P.O. Box 125 • 7490 Sideroad 7 W • Kenilworth • ON • N0G 2E0

March 6, 2013

Six Nations Haudenosaunee Confederacy Council
Mr. Leroy Hill
Secretary
Haudenosaunee Resource Centre
2634 6th Line
RR # 2
Ohsweken, ON N0A 1M0

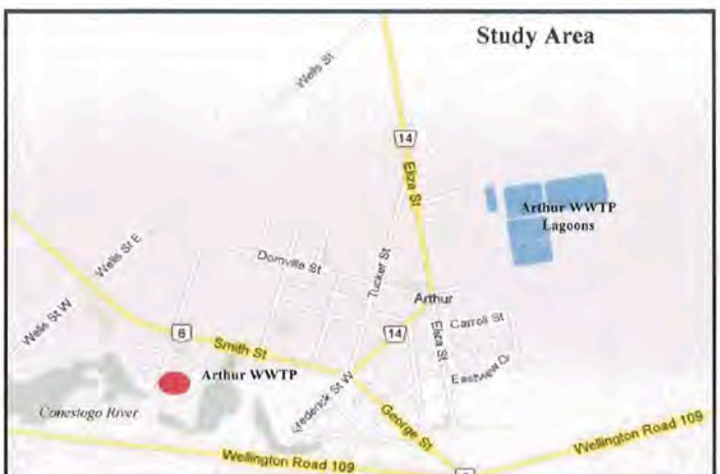
RE: Municipal Class Environmental Assessment
Arthur Wastewater Treatment Plant
Notice of Public Information Centre # 1

Dear Mr. Leroy Hill,

The Arthur Wastewater Treatment Plant (WWTP) is owned and operated by the Township of Wellington North (the Township). The Township has initiated a Class Environmental Assessment (EA) to examine options for increasing the capacity of the WWTP.

The Arthur WWTP consists of an extended aeration facility complete with effluent filtration and aerobic digestion and conventional lagoons for seasonal effluent storage. The rated capacity of the facility is 1,465 m^3/day expressed as an annual average flow.

The map below illustrates the location of the Arthur WWTP.



Map courtesy of Google Maps

Current flows, combined with development commitments, have resulted in a situation where there is limited capacity for future growth. The goal of the study is to examine alternatives for increasing the treatment capacity at the Arthur WWTP, and to determine a preferred alternative.

The study is being undertaken as a Schedule C project in accordance with the requirements of the Municipal Class Environmental Assessment (EA) (Municipal Engineers Association, June 2000, as amended in 2007 and 2011).

A Public Information Centre (PIC) has been scheduled to present and receive comments on the project, alternative solutions and the recommended preferred solution for increasing the capacity of the WWTP. The PIC will be held as follows:

Tuesday, March 19, 2013
5:00 PM to 7:00 PM
Arthur Community Centre, 158 Domville Street
Arthur, Ontario

Information on the Arthur WWTP Class EA study will be posted on the Township's web site at: http://www.wellington-north.com. The information presented at this PIC will be available on this web site after March 19, 2013.

If you have any questions or would like further information about the study, please contact the undersigned by phone at 519-848-5327 (Toll Free: 1-866-848-3620) or by e-mail at btrood@wellington-north.com. Thank you very much for your interest in the study.

Sincerely,

BTrood

Mr. Barry Trood
Water and Sewer Superintendent

Cc. Mr. Stephen Nutt, XCG Consultants Ltd.

NOTICE OF PUBLIC INFORMATION CENTRE # 2

Township of Wellington North

P.O. Box 125 • 7490 Sideroad 7 W • Kenilworth • ON • N0G 2E0

May 28, 2014

Mississuagas of the New Credit First Nation
Ms. Margaret Sault
R R # 6
468 New Credit Road
Hagersville, ON N0A 1H0

RE: Municipal Class Environmental Assessment
Arthur Wastewater Treatment Plant
Notice of Public Information Centre # 2

Dear Ms. Sault,

The Arthur Wastewater Treatment Plant (WWTP) is owned and operated by the Township of Wellington North (the Township). The Township has initiated a Class Environmental Assessment (EA) to examine options for increasing the capacity of the WWTP.

The Arthur WWTP consists of an extended aeration facility complete with effluent filtration and aerobic digestion and conventional lagoons for seasonal effluent storage. The rated capacity of the facility is 1,465 m^3/day expressed as an annual average flow.

The map below illustrates the location of the Arthur WWTP.

Map courtesy of Google Maps

Current flows, combined with development commitments, have resulted in a situation where there is limited capacity for future growth. The goal of the study is to examine alternatives for

Tel 519-848-3620 Toll Free 1-866-848-3620 Fax 519-848-3228
www.wellington-north.com township@wellington-north.com

increasing the treatment capacity at the Arthur WWTP, and to determine a preferred design alternative.

The study is being undertaken as a Schedule C project in accordance with the requirements of the Municipal Class Environmental Assessment (EA) (Municipal Engineers Association, June 2000, as amended in 2007 and 2011).

A Public Information Centre (PIC) has been scheduled to present and receive comments on the project, alternative design concepts and the recommended preferred design concept for increasing the capacity of the WWTP. The PIC will be held as follows:

Tuesday, June 10, 2014
6:00 PM to 8:00 PM
Arthur Community Centre, 158 Domville Street
Arthur, Ontario

Information on the Arthur WWTP Class EA study will be posted on the Township's web site at: http://www.wellington-north.com. The information presented at this PIC will be available on this web site after June 10, 2014.

If you have any questions or would like further information about the study, please contact the undersigned by phone at 519-848-5327 (Toll Free: 1-866-848-3620) or by e-mail at btrood@wellington-north.com. Thank you very much for your interest in the study.

Sincerely,

Mr. Barry Trood
Water and Sewer Superintendent

Cc: Mr. Stephen Nutt, XCG Consultants Ltd.

Tel 519-848-3620 Toll Free 1-866-848-3620 Fax 519-848-3228
www.wellington-north.com township@wellington-north.com

Township of Wellington North

P.O. Box 125 • 7490 Sideroad 7 W • Kenilworth • ON • N0G 2E0

May 28, 2014

Six Nations of the Grand River
Mr. Lonny Bomberry, Director
Land and Resources Department
PO Box 5000
2498 Chiefswood Road
Ohsweken, ON N0A 1M0

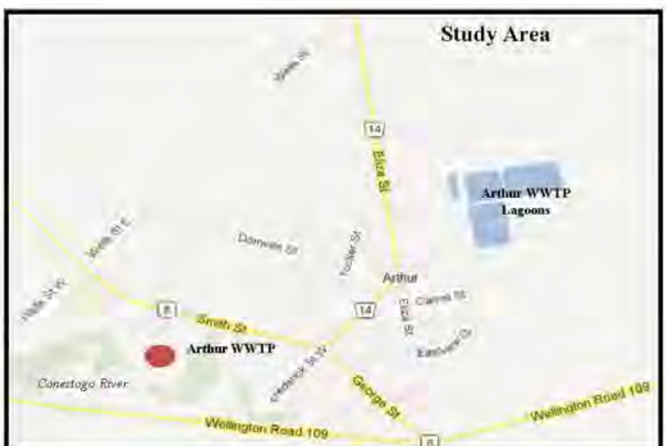
RE: Municipal Class Environmental Assessment
Arthur Wastewater Treatment Plant
Notice of Public Information Centre # 2

Dear Mr. Bomberry,

The Arthur Wastewater Treatment Plant (WWTP) is owned and operated by the Township of Wellington North (the Township). The Township has initiated a Class Environmental Assessment (EA) to examine options for increasing the capacity of the WWTP.

The Arthur WWTP consists of an extended aeration facility complete with effluent filtration and aerobic digestion and conventional lagoons for seasonal effluent storage. The rated capacity of the facility is 1,465 m^3/day expressed as an annual average flow.

The map below illustrates the location of the Arthur WWTP.



Map courtesy of Google Maps

Current flows, combined with development commitments, have resulted in a situation where there is limited capacity for future growth. The goal of the study is to examine alternatives for

Tel 519-848-3620 Toll Free 1-866-848-3620 Fax 519-848-3228
www.wellington-north.com township@wellington-north.com

increasing the treatment capacity at the Arthur WWTP, and to determine a preferred design alternative.

The study is being undertaken as a Schedule C project in accordance with the requirements of the Municipal Class Environmental Assessment (EA) (Municipal Engineers Association, June 2000, as amended in 2007 and 2011).

A Public Information Centre (PIC) has been scheduled to present and receive comments on the project, alternative design concepts and the recommended preferred design concept for increasing the capacity of the WWTP. The PIC will be held as follows:

Tuesday, June 10, 2014
6:00 PM to 8:00 PM
Arthur Community Centre, 158 Domville Street
Arthur, Ontario

Information on the Arthur WWTP Class EA study will be posted on the Township's web site at: http://www.wellington-north.com. The information presented at this PIC will be available on this web site after June 10, 2014.

If you have any questions or would like further information about the study, please contact the undersigned by phone at 519-848-5327 (Toll Free: 1-866-848-3620) or by e-mail at btrood@wellington-north.com. Thank you very much for your interest in the study.

Sincerely,

Mr. Barry Trood
Water and Sewer Superintendent

Cc: Mr. Stephen Nutt, XCG Consultants Ltd.

Tel 519-848-3620 Toll Free 1-866-848-3620 Fax 519-848-3228
www.wellington-north.com township@wellington-north.com

Township of Wellington North

P.O. Box 125 • 7490 Sideroad 7 W • Kenilworth • ON • N0G 2E0

May 28, 2014

Six Nations of the Grand River
Mr. Paul General, Eco-Centre Manager
Land and Resources Department
Six Nations Council
PO Box 5000
2676 Fourth Line Road
Ohsweken, ON N0A 1M0

RE: Municipal Class Environmental Assessment
Arthur Wastewater Treatment Plant
Notice of Public Information Centre # 2

Dear Mr. General,

The Arthur Wastewater Treatment Plant (WWTP) is owned and operated by the Township of Wellington North (the Township). The Township has initiated a Class Environmental Assessment (EA) to examine options for increasing the capacity of the WWTP.

The Arthur WWTP consists of an extended aeration facility complete with effluent filtration and aerobic digestion and conventional lagoons for seasonal effluent storage. The rated capacity of the facility is 1,465 m^3/day expressed as an annual average flow.

The map below illustrates the location of the Arthur WWTP.

Map courtesy of Google Maps

Tel 519-848-3620 Toll Free 1-866-848-3620 Fax 519-848-3228
www.wellington-north.com township@wellington-north.com

increasing the treatment capacity at the Arthur WWTP, and to determine a preferred design alternative.

The study is being undertaken as a Schedule C project in accordance with the requirements of the Municipal Class Environmental Assessment (EA) (Municipal Engineers Association, June 2000, as amended in 2007 and 2011).

A Public Information Centre (PIC) has been scheduled to present and receive comments on the project, alternative design concepts and the recommended preferred design concept for increasing the capacity of the WWTP. The PIC will be held as follows:

Tuesday, June 10, 2014
6:00 PM to 8:00 PM
Arthur Community Centre, 158 Domville Street
Arthur, Ontario

Information on the Arthur WWTP Class EA study will be posted on the Township's web site at: http://www.wellington-north.com. The information presented at this PIC will be available on this web site after June 10, 2014.

If you have any questions or would like further information about the study, please contact the undersigned by phone at 519-848-5327 (Toll Free: 1-866-848-3620) or by e-mail at btrood@wellington-north.com. Thank you very much for your interest in the study.

Sincerely,

Mr. Barry Trood
Water and Sewer Superintendent

Cc: Mr. Stephen Nutt, XCG Consultants Ltd.

Tel 519-848-3620 Toll Free 1-866-848-3620 Fax 519-848-3228
www.wellington-north.com township@wellington-north.com

Township of Wellington North

P.O. Box 125 • 7490 Sideroad 7 W • Kenilworth • ON • N0G 2E0

May 28, 2014

Six Nations Haudenosaunee Confederacy Council
Mr. Leroy Hill, Secretary
Haudenosaunee Resource Centre
2634 6th Line
R R # 2
Ohsweken, ON N0A 1M0

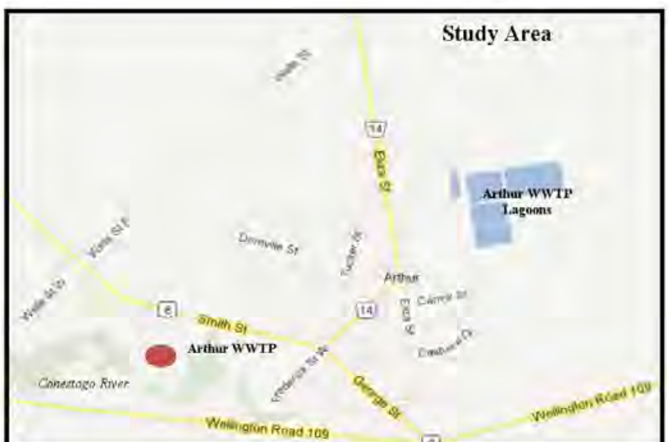
RE: Municipal Class Environmental Assessment
Arthur Wastewater Treatment Plant
Notice of Public Information Centre # 2

Dear Mr. Hill,

The Arthur Wastewater Treatment Plant (WWTP) is owned and operated by the Township of Wellington North (the Township). The Township has initiated a Class Environmental Assessment (EA) to examine options for increasing the capacity of the WWTP.

The Arthur WWTP consists of an extended aeration facility complete with effluent filtration and aerobic digestion and conventional lagoons for seasonal effluent storage. The rated capacity of the facility is 1,465 m^3/day expressed as an annual average flow.

The map below illustrates the location of the Arthur WWTP.



Map courtesy of Google Maps

Current flows, combined with development commitments, have resulted in a situation where there is limited capacity for future growth. The goal of the study is to examine alternatives for

Tel 519-848-3620 Toll Free 1-866-848-3620 Fax 519-848-3228
www.wellington-north.com township@wellington-north.com

increasing the treatment capacity at the Arthur WWTP, and to determine a preferred design alternative.

The study is being undertaken as a Schedule C project in accordance with the requirements of the Municipal Class Environmental Assessment (EA) (Municipal Engineers Association, June 2000, as amended in 2007 and 2011).

A Public Information Centre (PIC) has been scheduled to present and receive comments on the project, alternative design concepts and the recommended preferred design concept for increasing the capacity of the WWTP. The PIC will be held as follows:

Tuesday, June 10, 2014
6:00 PM to 8:00 PM
Arthur Community Centre, 158 Domville Street
Arthur, Ontario

Information on the Arthur WWTP Class EA study will be posted on the Township's web site at: http://www.wellington-north.com. The information presented at this PIC will be available on this web site after June 10, 2014.

If you have any questions or would like further information about the study, please contact the undersigned by phone at 519-848-5327 (Toll Free: 1-866-848-3620) or by e-mail at btrood@wellington-north.com. Thank you very much for your interest in the study.

Sincerely,

Mr. Barry Trood
Water and Sewer Superintendent

Cc: Mr. Stephen Nutt, XCG Consultants Ltd.

Tel 519-848-3620 Toll Free 1-866-848-3620 Fax 519-848-3228
www.wellington-north.com township@wellington-north.com

NOTICE OF PUBLIC INFORMATION CENTRE # 3

Township of Wellington North

P.O. Box 125 • 7490 Sideroad 7 W • Kenilworth • ON • N0G 2E0

March 16, 2016

Margaret Sault
Mississaugas of the New Credit First Nation
RR #6, 468 New Credit Road
Hagersville, ON N0A 1H0

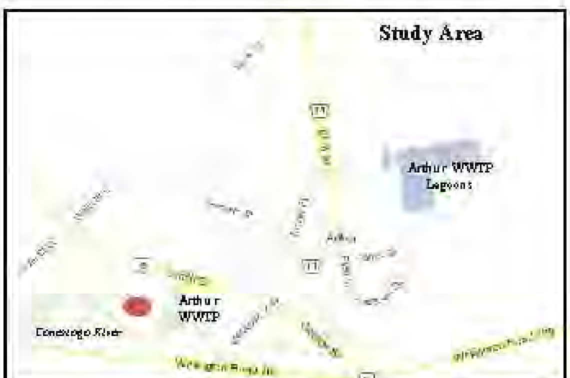
RE: Municipal Class Environmental Assessment
Arthur Wastewater Treatment Plant
Notice of Public Information Centre # 3

Dear Ms. Sault:

The Arthur Wastewater Treatment Plant (WWTP) is owned and operated by the Township of Wellington North (the Township). The Township is undertaking a Class Environmental Assessment (EA) to examine options for increasing the capacity of the WWTP.

The Arthur WWTP consists of an extended aeration facility complete with effluent filtration and aerobic digestion and conventional lagoons for seasonal effluent storage. The rated capacity of the facility is 1,465 m^3/day expressed as an annual average flow.

The map below illustrates the location of the Arthur WWTP.



Map courtesy of Google Maps

The study is being undertaken as a Schedule C project in accordance with the requirements of the Municipal Class Environmental Assessment (EA) (Municipal Engineers Association, June 2000, as amended in 2007, 2011 and 2015).

Tel 519-848-3620 Toll Free 1-866-848-3620 Fax 519-848-3228
www.wellington-north.com township@wellington-north.com

Current flows, combined with development commitments, have resulted in a situation where there is limited capacity for future growth. The study has examined alternatives for increasing the treatment capacity at the Arthur WWTP, and has identified a recommended preferred design.

Two Public Information Centres (PICs) have been held to date. At PIC # 2 (June 2014), alternative design concepts for the expansion of the WWTP were presented, along with a recommended preferred design concept. Subsequent to PIC # 2, new information on wastewater flows currently received at the WWTP resulted in a need to re-examine the implementation of the preferred design concept, as well as evaluating the sewage pumping stations (SPSs) servicing the WWTP.

A third PIC has been scheduled to present and receive comments on the phasing of the expansion of the WWTP, options for the management of biosolids at the WWTP and the recommended preferred option for biosolids management, as well as information on the SPSs.

The PIC will be held as follows:

Wednesday, March 30, 2016
6:00 PM to 8:00 PM
Arthur Community Centre (Upper Hall), 158 Domville Street
Arthur, Ontario

Information on the Arthur WWTP Class EA study will be posted on the Township's web site at: http://www.wellington-north.com. The information presented at this PIC will be available on this web site after March 30, 2016.

If you have any questions or would like further information about the study, please contact the undersigned by phone at 519-848-3620, ext. 31 (Toll Free: 1-866-848-3620) or by e-mail at maston@wellington-north.com. Thank you very much for your interest in the study.

Sincerely,

Mr. Matthew Aston
Director of Public Works

Cc: Ms. Melody Johnson, XCG Consulting Limited

Township of Wellington North
P.O. Box 125 • 7490 Sideroad 7 W • Kenilworth • ON • N0G 2E0

March 16, 2016

Lonny Bomberry
Six Nations of the Grand River, Land and Resources Department
P.O. Box 5000, 2498 Chiefswood Road
Ohsweken, ON N0A 1M0

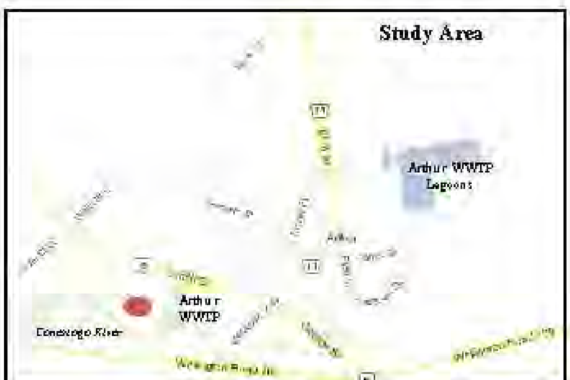
RE: Municipal Class Environmental Assessment
Arthur Wastewater Treatment Plant
Notice of Public Information Centre # 3

Dear Mr. Bomberry:

The Arthur Wastewater Treatment Plant (WWTP) is owned and operated by the Township of Wellington North (the Township). The Township is undertaking a Class Environmental Assessment (EA) to examine options for increasing the capacity of the WWTP.

The Arthur WWTP consists of an extended aeration facility complete with effluent filtration and aerobic digestion and conventional lagoons for seasonal effluent storage. The rated capacity of the facility is 1,465 m^3/day expressed as an annual average flow.

The map below illustrates the location of the Arthur WWTP.



Map courtesy of Google Maps

The study is being undertaken as a Schedule C project in accordance with the requirements of the Municipal Class Environmental Assessment (EA) (Municipal Engineers Association, June 2000, as amended in 2007, 2011 and 2015).

Tel 519-848-3620 Toll Free 1-866-848-3620 Fax 519-848-3228
www.wellington-north.com township@wellington-north.com

Current flows, combined with development commitments, have resulted in a situation where there is limited capacity for future growth. The study has examined alternatives for increasing the treatment capacity at the Arthur WWTP, and has identified a recommended preferred design.

Two Public Information Centres (PICs) have been held to date. At PIC # 2 (June 2014), alternative design concepts for the expansion of the WWTP were presented, along with a recommended preferred design concept. Subsequent to PIC # 2, new information on wastewater flows currently received at the WWTP resulted in a need to re-examine the implementation of the preferred design concept, as well as evaluating the sewage pumping stations (SPSs) servicing the WWTP.

A third PIC has been scheduled to present and receive comments on the phasing of the expansion of the WWTP, options for the management of biosolids at the WWTP and the recommended preferred option for biosolids management, as well as information on the SPSs.

The PIC will be held as follows:

Wednesday, March 30, 2016
6:00 PM to 8:00 PM
Arthur Community Centre (Upper Hall), 158 Domville Street
Arthur, Ontario

Information on the Arthur WWTP Class EA study will be posted on the Township's web site at: http://www.wellington-north.com. The information presented at this PIC will be available on this web site after March 30, 2016.

If you have any questions or would like further information about the study, please contact the undersigned by phone at 519-848-3620, ext. 31 (Toll Free: 1-866-848-3620) or by e-mail at maston@wellington-north.com. Thank you very much for your interest in the study.

Sincerely,

Mr. Matthew Aston
Director of Public Works

Cc: Ms. Melody Johnson, XCG Consulting Limited

Township of Wellington North

P.O. Box 125 • 7490 Sideroad 7 W • Kenilworth • ON • N0G 2E0

March 16, 2016

Paul General
Six Nations of the Grand River, Land and Resources Department, Six Nations Council
P.O. Box 5000, 2676 Fourth Line Road
Ohsweken, ON N0A 1M0

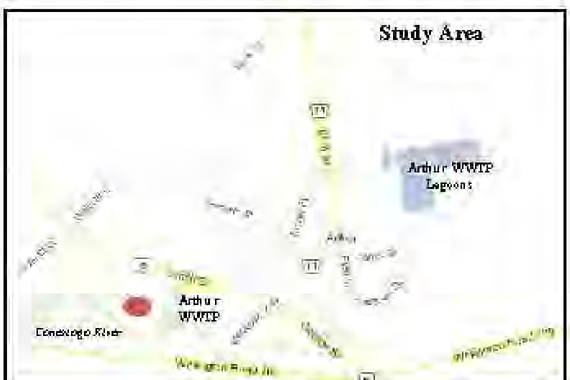
RE: Municipal Class Environmental Assessment
Arthur Wastewater Treatment Plant
Notice of Public Information Centre # 3

Dear Mr. General:

The Arthur Wastewater Treatment Plant (WWTP) is owned and operated by the Township of Wellington North (the Township). The Township is undertaking a Class Environmental Assessment (EA) to examine options for increasing the capacity of the WWTP.

The Arthur WWTP consists of an extended aeration facility complete with effluent filtration and aerobic digestion and conventional lagoons for seasonal effluent storage. The rated capacity of the facility is 1,465 m^3/day expressed as an annual average flow.

The map below illustrates the location of the Arthur WWTP.



Map courtesy of Google Maps

The study is being undertaken as a Schedule C project in accordance with the requirements of the Municipal Class Environmental Assessment (EA) (Municipal Engineers Association, June 2000, as amended in 2007, 2011 and 2015).

Current flows, combined with development commitments, have resulted in a situation where there is limited capacity for future growth. The study has examined alternatives for increasing the treatment capacity at the Arthur WWTP, and has identified a recommended preferred design.

Two Public Information Centres (PICs) have been held to date. At PIC # 2 (June 2014), alternative design concepts for the expansion of the WWTP were presented, along with a recommended preferred design concept. Subsequent to PIC # 2, new information on wastewater flows currently received at the WWTP resulted in a need to re-examine the implementation of the preferred design concept, as well as evaluating the sewage pumping stations (SPSs) servicing the WWTP.

A third PIC has been scheduled to present and receive comments on the phasing of the expansion of the WWTP, options for the management of biosolids at the WWTP and the recommended preferred option for biosolids management, as well as information on the SPSs.

The PIC will be held as follows:

Wednesday, March 30, 2016
6:00 PM to 8:00 PM
Arthur Community Centre (Upper Hall), 158 Domville Street
Arthur, Ontario

Information on the Arthur WWTP Class EA study will be posted on the Township's web site at: http://www.wellington-north.com. The information presented at this PIC will be available on this web site after March 30, 2016.

If you have any questions or would like further information about the study, please contact the undersigned by phone at 519-848-3620, ext. 31 (Toll Free: 1-866-848-3620) or by e-mail at maston@wellington-north.com. Thank you very much for your interest in the study.

Sincerely,

Mr. Matthew Aston
Director of Public Works

Cc: Ms. Melody Johnson, XCG Consulting Limited

Township of Wellington North

P.O. Box 125 • 7490 Sideroad 7 W • Kenilworth • ON • N0G 2E0

March 16, 2016

Leroy Hill
Six Nations Haudenosaunee Confederacy Council, Haudenosaunee Resource Centre
2634 6th Line, RR # 2
Ohsweken, ON N0A 1M0

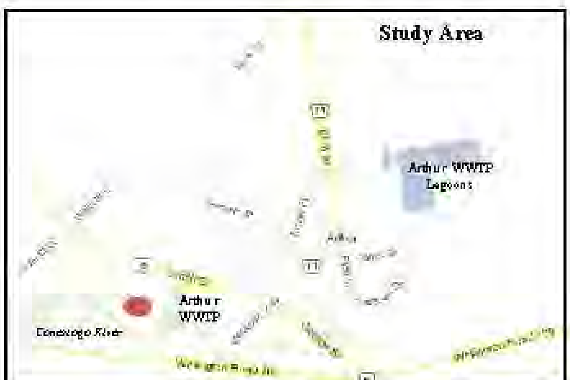
RE: Municipal Class Environmental Assessment
Arthur Wastewater Treatment Plant
Notice of Public Information Centre # 3

Dear Mr. Hill:

The Arthur Wastewater Treatment Plant (WWTP) is owned and operated by the Township of Wellington North (the Township). The Township is undertaking a Class Environmental Assessment (EA) to examine options for increasing the capacity of the WWTP.

The Arthur WWTP consists of an extended aeration facility complete with effluent filtration and aerobic digestion and conventional lagoons for seasonal effluent storage. The rated capacity of the facility is 1,465 m^3/day expressed as an annual average flow.

The map below illustrates the location of the Arthur WWTP.



Map courtesy of Google Maps

The study is being undertaken as a Schedule C project in accordance with the requirements of the Municipal Class Environmental Assessment (EA) (Municipal Engineers Association, June 2000, as amended in 2007, 2011 and 2015).

Tel 519-848-3620 Toll Free 1-866-848-3620 Fax 519-848-3228
www.wellington-north.com township@wellington-north.com

Current flows, combined with development commitments, have resulted in a situation where there is limited capacity for future growth. The study has examined alternatives for increasing the treatment capacity at the Arthur WWTP, and has identified a recommended preferred design.

Two Public Information Centres (PICs) have been held to date. At PIC # 2 (June 2014), alternative design concepts for the expansion of the WWTP were presented, along with a recommended preferred design concept. Subsequent to PIC # 2, new information on wastewater flows currently received at the WWTP resulted in a need to re-examine the implementation of the preferred design concept, as well as evaluating the sewage pumping stations (SPSs) servicing the WWTP.

A third PIC has been scheduled to present and receive comments on the phasing of the expansion of the WWTP, options for the management of biosolids at the WWTP and the recommended preferred option for biosolids management, as well as information on the SPSs.

The PIC will be held as follows:

Wednesday, March 30, 2016
6:00 PM to 8:00 PM
Arthur Community Centre (Upper Hall), 158 Domville Street
Arthur, Ontario

Information on the Arthur WWTP Class EA study will be posted on the Township's web site at: http://www.wellington-north.com. The information presented at this PIC will be available on this web site after March 30, 2016.

If you have any questions or would like further information about the study, please contact the undersigned by phone at 519-848-3620, ext. 31 (Toll Free: 1-866-848-3620) or by e-mail at maston@wellington-north.com. Thank you very much for your interest in the study.

Sincerely,

Mr. Matthew Aston
Director of Public Works

Cc: Ms. Melody Johnson, XCG Consulting Limited

NOTICE OF COMPLETION

Township of Wellington North
P.O. Box 125 • 7490 Sideroad 7 W • Kenilworth • ON • N0G 2E0

August 17, 2016

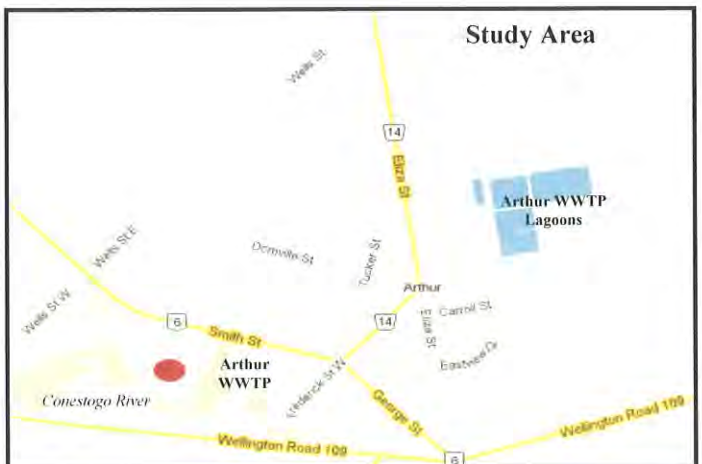
Mr. Paul General
Six Nations of the Grand River
Land and Resources Deparment
PO Box 5000
2676 Fourth Line Road
Oshweken, ON N0A 1M0

RE: Municipal Class Environmental Assessment
Arthur Wastewater Treatment Plant
Notice of Completion

Dear Mr. General;

The Arthur Wastewater Treatment Plant (WWTP) is owned and operated by the Township of Wellington North (the Township). The Township has undertaken a Class Environmental Assessment (EA) to examine options for increasing the capacity of the WWTP.

The map below illustrates the location of the Arthur WWTP.



Map courtesy of Google Maps

Current flows, combined with development commitments, have resulted in a situation where there is limited capacity for future growth. The study has examined alternatives for increasing the treatment capacity at the Arthur WWTP, and has identified a recommended preferred design.

The study has been undertaken as a Schedule C project, in accordance with the requirements of the Municipal Class Environmental Assessment (EA) (Municipal Engineers Association, June 2000, as amended in 2007, 2011 and 2015). The study has completed Phases 1 to 4 of the Municipal Class EA process. Three Public Information Centres (PICs) were held to present information about the project and to receive comments on the project.

Based on the study findings and input from regulatory agencies, stakeholders and the public, the preferred alternative is to expand the existing Arthur WWTP, on the existing WWTP property, to service existing

and proposed community growth. The expansion will be achieved through the twinning of the existing package treatment plant.

The preferred alternative will be constructed over two phases with Phase 1 providing the capacity for existing wastewater flows and Phase 2 providing the capacity for future growth to the year 2031. This work will include upgrades to the forcemain connecting the Arthur WWTP to the seasonal storage lagoons. No upgrades or expansion to the Wells St. sewage pumping station is required. However, the Frederick St. sewage pumping station will be expanded to provide the additional capacity required to service projected growth in the pumping station catchment area. In addition, the preferred biosolids management option for Phase 1 is off-site disposal at the Regional Lystek Facility in Dundalk, Ontario.

An Environmental Study Report (ESR) which documents the study process and findings has been prepared and is available for review on the Township's web site at: http://www.wellington-north.com.

The ESR is also available for viewing during regular office hours at the following location between August 17, 2016 and September 23, 2016:

Township of Wellington North
Clerk's Office
7490 Sideroad 7 West
Kenilworth, ON N0G 2E0

Phone: 519-848-3620
Toll Free: 1-866-848-3620
Office Hours: Monday to Friday - 8:30 a.m. to 4:30 p.m.

Please provide written comments on the ESR to Mr. Matthew Aston, Township of Wellington North by September 23, 2016, at the address provided below.

If concerns regarding this project cannot be resolved through discussion with the Township, a person or party may request that the Ontario Minister of the Environment and Climate Change (Minister) make an order (referred to as Part II Order) for the project to comply with Part II of the Ontario *Environmental Assessment Act*, which addresses individual environmental assessments. A request for a Part II Order must be received by the Minister no later than September 23, 2016 at the following address:

Minister of the Environment and Climate Change
77 Wellesley St. West, 11th Floor
Toronto, ON M7A 2T5

The request to the Minister must be copied to the Township's Director of Public Works. If no request is received, the Township intends to proceed with the design and construction of the WWTP expansion, as outlined in the ESR.

If you have any questions or would like further information about the study, please contact the undersigned by phone at 519-848-3620, ext. 31 (Toll Free: 1-866-848-3620) or by e-mail at maston@wellington-north.com. Thank you very much for your interest in the study.

Sincerely,

-
- Mr. Matthew Aston
- Director of Public Works

cc: Mr. Graham Seggewiss, XCG Consulting Limited

Township of Wellington North

P.O. Box 125 • 7490 Sideroad 7 W • Kenilworth • ON • N0G 2E0

August 17, 2016

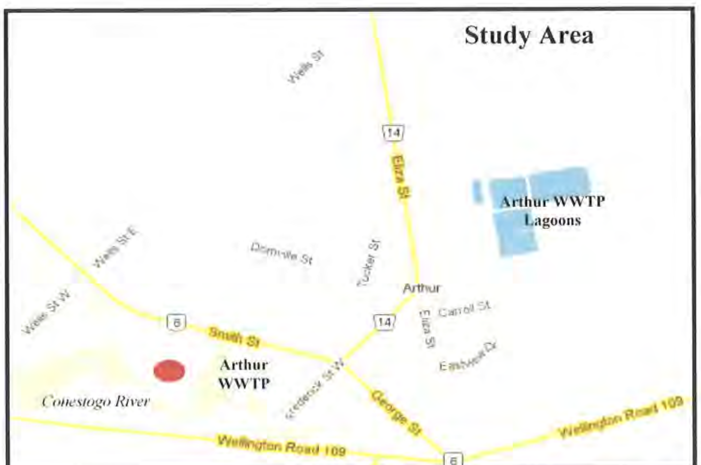
Mr. Lonny Bomberry
Six nations of the Grand River
Land and Resources Department
PO Box 5000
2498 Chiefswood Road
Oshweken, ON N0A 1M0

RE: Municipal Class Environmental Assessment
Arthur Wastewater Treatment Plant
Notice of Completion

Dear Mr. Bomberry;

The Arthur Wastewater Treatment Plant (WWTP) is owned and operated by the Township of Wellington North (the Township). The Township has undertaken a Class Environmental Assessment (EA) to examine options for increasing the capacity of the WWTP.

The map below illustrates the location of the Arthur WWTP.



Map courtesy of Google Maps

Current flows, combined with development commitments, have resulted in a situation where there is limited capacity for future growth. The study has examined alternatives for increasing the treatment capacity at the Arthur WWTP, and has identified a recommended preferred design.

The study has been undertaken as a Schedule C project, in accordance with the requirements of the Municipal Class Environmental Assessment (EA) (Municipal Engineers Association, June 2000, as amended in 2007, 2011 and 2015). The study has completed Phases 1 to 4 of the Municipal Class EA process. Three Public Information Centres (PICs) were held to present information about the project and to receive comments on the project.

Based on the study findings and input from regulatory agencies, stakeholders and the public, the preferred alternative is to expand the existing Arthur WWTP, on the existing WWTP property, to service existing

and proposed community growth. The expansion will be achieved through the twinning of the existing package treatment plant.

The preferred alternative will be constructed over two phases with Phase 1 providing the capacity for existing wastewater flows and Phase 2 providing the capacity for future growth to the year 2031. This work will include upgrades to the forcemain connecting the Arthur WWTP to the seasonal storage lagoons. No upgrades or expansion to the Wells St. sewage pumping station is required. However, the Frederick St. sewage pumping station will be expanded to provide the additional capacity required to service projected growth in the pumping station catchment area. In addition, the preferred biosolids management option for Phase 1 is off-site disposal at the Regional Lystek Facility in Dundalk, Ontario.

An Environmental Study Report (ESR) which documents the study process and findings has been prepared and is available for review on the Township's web site at: http://www.wellington-north.com.

The ESR is also available for viewing during regular office hours at the following location between August 17, 2016 and September 23, 2016:

Township of Wellington North
Clerk's Office
7490 Sideroad 7 West
Kenilworth, ON N0G 2E0

Phone: 519-848-3620
Toll Free: 1-866-848-3620
Office Hours: Monday to Friday - 8:30 a.m. to 4:30 p.m.

Please provide written comments on the ESR to Mr. Matthew Aston, Township of Wellington North by September 23, 2016, at the address provided below.

If concerns regarding this project cannot be resolved through discussion with the Township, a person or party may request that the Ontario Minister of the Environment and Climate Change (Minister) make an order (referred to as Part II Order) for the project to comply with Part II of the Ontario *Environmental Assessment Act*, which addresses individual environmental assessments. A request for a Part II Order must be received by the Minister no later than September 23, 2016 at the following address:

Minister of the Environment and Climate Change
77 Wellesley St. West, 11th Floor
Toronto, ON M7A 2T5

The request to the Minister must be copied to the Township's Director of Public Works. If no request is received, the Township intends to proceed with the design and construction of the WWTP expansion, as outlined in the ESR.

If you have any questions or would like further information about the study, please contact the undersigned by phone at 519-848-3620, ext. 31 (Toll Free: 1-866-848-3620) or by e-mail at maston@wellington-north.com. Thank you very much for your interest in the study.

Sincerely,

- Mr. Matthew Aston
- Director of Public Works

cc: Mr. Graham Seggewiss, XCG Consulting Limited

Township of Wellington North

P.O. Box 125 • 7490 Sideroad 7 W • Kenilworth • ON • N0G 2E0

August 17, 2016

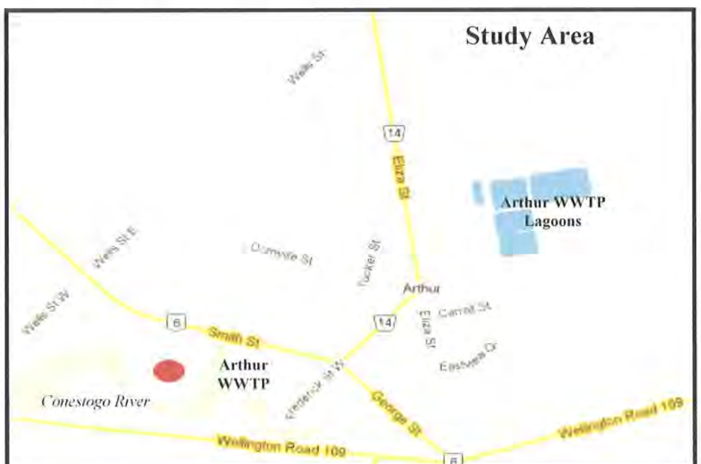
Mr. Leroy Hill
Six Nations Haudenosaunee Confederacy Council
Haudenosaunee Resource Centre
R R # 2
2634 6th Line
Oshweken, ON N0A 1M0

RE: Municipal Class Environmental Assessment
Arthur Wastewater Treatment Plant
Notice of Completion

Dear Mr. Hill;

The Arthur Wastewater Treatment Plant (WWTP) is owned and operated by the Township of Wellington North (the Township). The Township has undertaken a Class Environmental Assessment (EA) to examine options for increasing the capacity of the WWTP.

The map below illustrates the location of the Arthur WWTP.



Map courtesy of Google Maps

Current flows, combined with development commitments, have resulted in a situation where there is limited capacity for future growth. The study has examined alternatives for increasing the treatment capacity at the Arthur WWTP, and has identified a recommended preferred design.

The study has been undertaken as a Schedule C project, in accordance with the requirements of the Municipal Class Environmental Assessment (EA) (Municipal Engineers Association, June 2000, as amended in 2007, 2011 and 2015). The study has completed Phases 1 to 4 of the Municipal Class EA process. Three Public Information Centres (PICs) were held to present information about the project and to receive comments on the project.

Based on the study findings and input from regulatory agencies, stakeholders and the public, the preferred alternative is to expand the existing Arthur WWTP, on the existing WWTP property, to service existing

and proposed community growth. The expansion will be achieved through the twinning of the existing package treatment plant.

The preferred alternative will be constructed over two phases with Phase 1 providing the capacity for existing wastewater flows and Phase 2 providing the capacity for future growth to the year 2031. This work will include upgrades to the forcemain connecting the Arthur WWTP to the seasonal storage lagoons. No upgrades or expansion to the Wells St. sewage pumping station is required. However, the Frederick St. sewage pumping station will be expanded to provide the additional capacity required to service projected growth in the pumping station catchment area. In addition, the preferred biosolids management option for Phase 1 is off-site disposal at the Regional Lystek Facility in Dundalk, Ontario.

An Environmental Study Report (ESR) which documents the study process and findings has been prepared and is available for review on the Township's web site at: http://www.wellington-north.com.

The ESR is also available for viewing during regular office hours at the following location between August 17, 2016 and September 23, 2016:

Township of Wellington North
Clerk's Office
7490 Sideroad 7 West
Kenilworth, ON N0G 2E0

Phone: 519-848-3620
Toll Free: 1-866-848-3620
Office Hours: Monday to Friday - 8:30 a.m. to 4:30 p.m.

Please provide written comments on the ESR to Mr. Matthew Aston, Township of Wellington North by September 23, 2016, at the address provided below.

If concerns regarding this project cannot be resolved through discussion with the Township, a person or party may request that the Ontario Minister of the Environment and Climate Change (Minister) make an order (referred to as Part II Order) for the project to comply with Part II of the Ontario *Environmental Assessment Act*, which addresses individual environmental assessments. A request for a Part II Order must be received by the Minister no later than September 23, 2016 at the following address:

Minister of the Environment and Climate Change
77 Wellesley St. West, 11th Floor
Toronto, ON M7A 2T5

The request to the Minister must be copied to the Township's Director of Public Works. If no request is received, the Township intends to proceed with the design and construction of the WWTP expansion, as outlined in the ESR.

If you have any questions or would like further information about the study, please contact the undersigned by phone at 519-848-3620, ext. 31 (Toll Free: 1-866-848-3620) or by e-mail at maston@wellington-north.com. Thank you very much for your interest in the study.

Sincerely,

- Mr. Matthew Aston
- Director of Public Works

cc: Mr. Graham Seggewiss, XCG Consulting Limited

Township of Wellington North

P.O. Box 125 • 7490 Sideroad 7 W • Kenilworth • ON • N0G 2E0

August 17, 2016

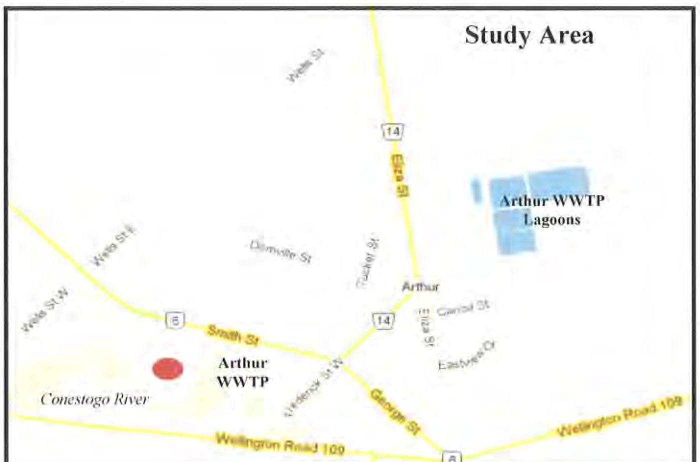
Ms. Margaret Sault
Mississauga of the New Credit First Nation
R R # 6
468 New Credit Road
Hagersville, ON N0A 1H0

RE: Municipal Class Environmental Assessment
Arthur Wastewater Treatment Plant
Notice of Completion

Dear Ms. Sault;

The Arthur Wastewater Treatment Plant (WWTP) is owned and operated by the Township of Wellington North (the Township). The Township has undertaken a Class Environmental Assessment (EA) to examine options for increasing the capacity of the WWTP.

The map below illustrates the location of the Arthur WWTP.



Map courtesy of Google Maps

Current flows, combined with development commitments, have resulted in a situation where there is limited capacity for future growth. The study has examined alternatives for increasing the treatment capacity at the Arthur WWTP, and has identified a recommended preferred design.

The study has been undertaken as a Schedule C project, in accordance with the requirements of the Municipal Class Environmental Assessment (EA) (Municipal Engineers Association, June 2000, as amended in 2007, 2011 and 2015). The study has completed Phases 1 to 4 of the Municipal Class EA process. Three Public Information Centres (PICs) were held to present information about the project and to receive comments on the project.

Based on the study findings and input from regulatory agencies, stakeholders and the public, the preferred alternative is to expand the existing Arthur WWTP, on the existing WWTP property, to service existing and proposed community growth. The expansion will be achieved through the twinning of the existing package treatment plant.

Tel 519-848-3620 Toll Free 1-866-848-3620 Fax 519-848-3228
www.wellington-north.com township@wellington-north.com

The preferred alternative will be constructed over two phases with Phase 1 providing the capacity for existing wastewater flows and Phase 2 providing the capacity for future growth to the year 2031. This work will include upgrades to the forcemain connecting the Arthur WWTP to the seasonal storage lagoons. No upgrades or expansion to the Wells St. sewage pumping station is required. However, the Frederick St. sewage pumping station will be expanded to provide the additional capacity required to service projected growth in the pumping station catchment area. In addition, the preferred biosolids management option for Phase 1 is off-site disposal at the Regional Lystek Facility in Dundalk, Ontario.

An Environmental Study Report (ESR) which documents the study process and findings has been prepared and is available for review on the Township's web site at: http://www.wellington-north.com.

The ESR is also available for viewing during regular office hours at the following location between August 17, 2016 and September 23, 2016:

Township of Wellington North
Clerk's Office
7490 Sideroad 7 West
Kenilworth, ON N0G 2E0

Phone: 519-848-3620
Toll Free: 1-866-848-3620
Office Hours: Monday to Friday - 8:30 a.m. to 4:30 p.m.

Please provide written comments on the ESR to Mr. Matthew Aston, Township of Wellington North by September 23, 2016, at the address provided below.

If concerns regarding this project cannot be resolved through discussion with the Township, a person or party may request that the Ontario Minister of the Environment and Climate Change (Minister) make an order (referred to as Part II Order) for the project to comply with Part II of the Ontario *Environmental Assessment Act*, which addresses individual environmental assessments. A request for a Part II Order must be received by the Minister no later than September 23, 2016 at the following address:

Minister of the Environment and Climate Change
77 Wellesley St. West, 11th Floor
Toronto, ON M7A 2T5

The request to the Minister must be copied to the Township's Director of Public Works. If no request is received, the Township intends to proceed with the design and construction of the WWTP expansion, as outlined in the ESR.

If you have any questions or would like further information about the study, please contact the undersigned by phone at 519-848-3620, ext. 31 (Toll Free: 1-866-848-3620) or by e-mail at maston@wellington-north.com. Thank you very much for your interest in the study.

Sincerely,

-
- Mr. Matthew Aston
- Director of Public Works

cc: Mr. Graham Seggewiss, XCG Consulting Limited

I-8

NOTICE OF COMPLETION

- *NEWSPAPER AD*
- *EXAMPLE LETTERS*

7490 Sideroad 7 W. PO Box 125
Kenilworth, Ontario, N0G 2E0
www.wellington-north.com

519.848.3620
1.866.848.3620 519.848.3228

NOTICE OF COMPLETION

CLASS ENVIRONMENTAL ASSESSMENT
ARTHUR WASTEWATER TREATMENT PLANT

The Arthur Wastewater Treatment Plant (WWTP) is owned and operated by the Township of Wellington North (the Township). The Township has undertaken a Class Environmental Assessment (EA) to examine options for increasing the capacity of the WWTP.

The Arthur WWTP consists of an extended aeration facility complete with effluent filtration and aerobic digestion and conventional lagoons for seasonal effluent storage. The rated capacity of the facility is 1,465 m3/day expressed as an annual average flow.

Current flows, combined with development commitments, have resulted in a situation where there is limited capacity for future growth. The study has examined alternatives for increasing the treatment capacity at the Arthur WWTP, and has identified a recommended preferred design.

Map courtesy of Google Maps

The study has been undertaken as a Schedule C project in accordance with the requirements of the Municipal Class Environmental Assessment (EA) (Municipal Engineers Association, June 2000, as amended in 2007, 2011 and 2015). The study has completed Phases 1 to 4 of the Municipal Class EA process. Three Public Information Centres (PICs) were held to present information about the project and to receive comments on the project.

Based on the study findings and input from regulatory agencies, stakeholders and the public, the preferred alternative is to expand the existing Arthur WWTP, on the existing WWTP property, to service existing and proposed community growth. The expansion will be achieved through the twinning of the existing package treatment plant.

The preferred alternative will be constructed over two phases with Phase 1 providing the capacity for existing wastewater flows and Phase 2 providing the capacity for future growth to the year 2031. This work will include upgrades to the forcemain connecting the Arthur WWTP to the seasonal storage lagoons. No upgrades or expansion to the Wells St. sewage pumping station is required. However, the Frederick St. sewage pumping station will be expanded to provide the additional capacity required to service projected growth in the pumping station catchment area. In addition, the preferred biosolids management option for Phase 1 is off-site disposal at the Regional Lystek Facility in Dundalk, Ontario.

An Environmental Study Report (ESR) which documents the study process and findings has been prepared and is available for review on the Township's web site at: http://www.wellington-north.com.

The ESR is also available for viewing during regular office hours at the following location between August 17, 2016 and September 23, 2016:

Township of Wellington North
Clerk's Office
7490 Sideroad 7 West
Kenilworth, ON N0G 2E0

Phone: 519-848-3620
Toll Free: 1-866-848-3620
Office Hours: Monday to Friday - 8:30 a.m. to 4:30 p.m.

Please provide written comments on the ESR to Mr. Matthew Aston, Township of Wellington North by September 23, 2016, at the address provided below. You may also contact him (as follows) if you have any questions or comments, or wish to obtain more information on the study:

Mr. Matthew Aston
Director of Public Works
Township of Wellington North
7490 Sideroad 7 West
P.O. Box 125, Kenilworth, ON N0G 2E0

Phone: 519-848-3620, ext. 31
E-mail: maston@wellington-north.com

Mr. Graham Seggewiss
XCG Consulting Limited
2620 Bristol Circle, Suite 300
Oakville, ON L6H 6Z7

Phone: 905-829-8880, ext. 4224
E-mail: graham.seggewiss@xcg.com

All comments and information received from individuals, stakeholder groups and agencies regarding this study are being collected to assist the Township 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 referred to Mr. Matthew Aston.

If concerns regarding this project cannot be resolved through discussion with the Township, a person or party may request that the Ontario Minister of the Environment and Climate Change (Minister) make an order (referred to as Part II Order) for the project to comply with Part II of the Ontario Environmental Assessment Act, which addresses individual environmental assessments. A request for a Part II Order must be received by the Minister no later than September 23, 2016 at the following address:

Minister of the Environment and Climate Change
77 Wellesley St. West, 11th Floor
Toronto, ON M7A 2T5

The request to the Minister must be copied to the Township's Director of Public Works. If no request is received, the Township intends to proceed with the design and construction of the WWTP expansion, as outlined in the ESR.

This notice first issued on August 17, 2016.

Published in: Arthur Enterprise News – August 17 and 24, 2016
Wellington Advertiser – August 19 and 26, 2016

Township of Wellington North

P.O. Box 125 • 7490 Sideroad 7 W • Kenilworth • ON • N0G 2E0

August 17, 2016

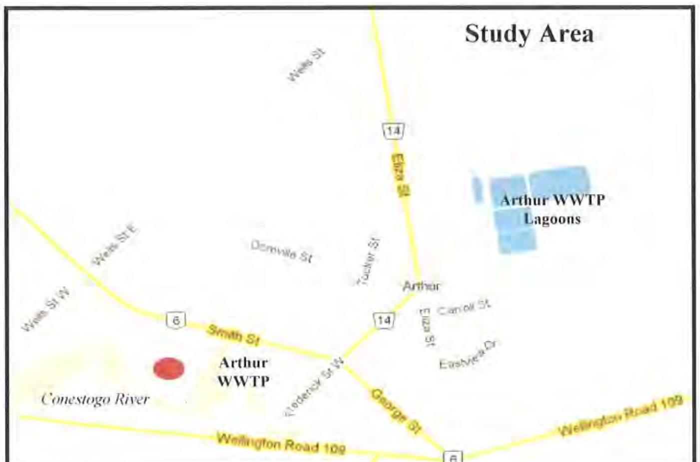
Mr. Ken Cornelisse
Ministry of Natural Resources and Forestry
Guelph District Office
1 Stone Road West
Guelph, ON N1G 4Y2

RE: Municipal Class Environmental Assessment
Arthur Wastewater Treatment Plant
Notice of Completion

Dear Mr. Cornelisse;

The Arthur Wastewater Treatment Plant (WWTP) is owned and operated by the Township of Wellington North (the Township). The Township has undertaken a Class Environmental Assessment (EA) to examine options for increasing the capacity of the WWTP.

The map below illustrates the location of the Arthur WWTP.



Map courtesy of Google Maps

Current flows, combined with development commitments, have resulted in a situation where there is limited capacity for future growth. The study has examined alternatives for increasing the treatment capacity at the Arthur WWTP, and has identified a recommended preferred design.

The study has been undertaken as a Schedule C project, in accordance with the requirements of the Municipal Class Environmental Assessment (EA) (Municipal Engineers Association, June 2000, as amended in 2007, 2011 and 2015). The study has completed Phases 1 to 4 of the Municipal Class EA process. Three Public Information Centres (PICs) were held to present information about the project and to receive comments on the project.

Based on the study findings and input from regulatory agencies, stakeholders and the public, the preferred alternative is to expand the existing Arthur WWTP, on the existing WWTP property, to service existing

and proposed community growth. The expansion will be achieved through the twinning of the existing package treatment plant.

The preferred alternative will be constructed over two phases with Phase 1 providing the capacity for existing wastewater flows and Phase 2 providing the capacity for future growth to the year 2031. This work will include upgrades to the forcemain connecting the Arthur WWTP to the seasonal storage lagoons. No upgrades or expansion to the Wells St. sewage pumping station is required. However, the Frederick St. sewage pumping station will be expanded to provide the additional capacity required to service projected growth in the pumping station catchment area. In addition, the preferred biosolids management option for Phase 1 is off-site disposal at the Regional Lystek Facility in Dundalk, Ontario.

An Environmental Study Report (ESR) which documents the study process and findings has been prepared and is available for review on the Township's web site at: http://www.wellington-north.com.

The ESR is also available for viewing during regular office hours at the following location between August 17, 2016 and September 23, 2016:

Township of Wellington North
Clerk's Office
7490 Sideroad 7 West
Kenilworth, ON N0G 2E0

Phone: 519-848-3620
Toll Free: 1-866-848-3620
Office Hours: Monday to Friday - 8:30 a.m. to 4:30 p.m.

Please provide written comments on the ESR to Mr. Matthew Aston, Township of Wellington North by September 23, 2016, at the address provided below.

If concerns regarding this project cannot be resolved through discussion with the Township, a person or party may request that the Ontario Minister of the Environment and Climate Change (Minister) make an order (referred to as Part II Order) for the project to comply with Part II of the Ontario *Environmental Assessment Act*, which addresses individual environmental assessments. A request for a Part II Order must be received by the Minister no later than September 23, 2016 at the following address:

Minister of the Environment and Climate Change
77 Wellesley St. West, 11th Floor
Toronto, ON M7A 2T5

The request to the Minister must be copied to the Township's Director of Public Works. If no request is received, the Township intends to proceed with the design and construction of the WWTP expansion, as outlined in the ESR.

If you have any questions or would like further information about the study, please contact the undersigned by phone at 519-848-3620, ext. 31 (Toll Free: 1-866-848-3620) or by e-mail at maston@wellington-north.com. Thank you very much for your interest in the study.

Sincerely,

- Mr. Matthew Aston
- Director of Public Works

cc: Mr. Graham Seggewiss, XCG Consulting Limited

Township of Wellington North
P.O. Box 125 • 7490 Sideroad 7 W • Kenilworth • ON • N0G 2E0

August 17, 2016

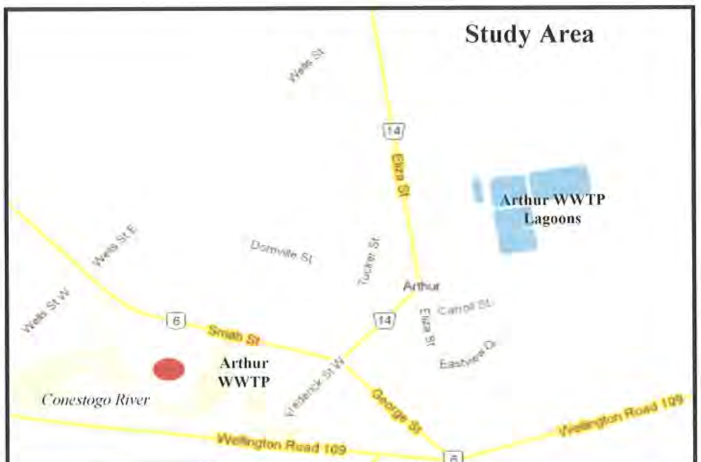
Mark Anderson
Grand River Conservation Authority
400 Clyde Road, P.O. Box 729
Cambridge, ON N1R 5W6

RE: Municipal Class Environmental Assessment
Arthur Wastewater Treatment Plant
Notice of Completion

Dear Mr. Anderson;

The Arthur Wastewater Treatment Plant (WWTP) is owned and operated by the Township of Wellington North (the Township). The Township has undertaken a Class Environmental Assessment (EA) to examine options for increasing the capacity of the WWTP.

The map below illustrates the location of the Arthur WWTP.



Map courtesy of Google Maps

Current flows, combined with development commitments, have resulted in a situation where there is limited capacity for future growth. The study has examined alternatives for increasing the treatment capacity at the Arthur WWTP, and has identified a recommended preferred design.

The study has been undertaken as a Schedule C project, in accordance with the requirements of the Municipal Class Environmental Assessment (EA) (Municipal Engineers Association, June 2000, as amended in 2007, 2011 and 2015). The study has completed Phases 1 to 4 of the Municipal Class EA process. Three Public Information Centres (PICs) were held to present information about the project and to receive comments on the project.

Based on the study findings and input from regulatory agencies, stakeholders and the public, the preferred alternative is to expand the existing Arthur WWTP, on the existing WWTP property, to service existing and proposed community growth. The expansion will be achieved through the twinning of the existing package treatment plant.

The preferred alternative will be constructed over two phases with Phase 1 providing the capacity for existing wastewater flows and Phase 2 providing the capacity for future growth to the year 2031. This work will include upgrades to the forcemain connecting the Arthur WWTP to the seasonal storage lagoons. No upgrades or expansion to the Wells St. sewage pumping station is required. However, the Frederick St. sewage pumping station will be expanded to provide the additional capacity required to service projected growth in the pumping station catchment area. In addition, the preferred biosolids management option for Phase 1 is off-site disposal at the Regional Lystek Facility in Dundalk, Ontario.

An Environmental Study Report (ESR) which documents the study process and findings has been prepared and is available for review on the Township's web site at: http://www.wellington-north.com.

The ESR is also available for viewing during regular office hours at the following location between August 17, 2016 and September 23, 2016:

Township of Wellington North
Clerk's Office
7490 Sideroad 7 West
Kenilworth, ON N0G 2E0

Phone: 519-848-3620
Toll Free: 1-866-848-3620
Office Hours: Monday to Friday - 8:30 a.m. to 4:30 p.m.

Please provide written comments on the ESR to Mr. Matthew Aston, Township of Wellington North by September 23, 2016, at the address provided below.

If concerns regarding this project cannot be resolved through discussion with the Township, a person or party may request that the Ontario Minister of the Environment and Climate Change (Minister) make an order (referred to as Part II Order) for the project to comply with Part II of the Ontario *Environmental Assessment Act*, which addresses individual environmental assessments. A request for a Part II Order must be received by the Minister no later than September 23, 2016 at the following address:

Minister of the Environment and Climate Change
77 Wellesley St. West, 11th Floor
Toronto, ON M7A 2T5

The request to the Minister must be copied to the Township's Director of Public Works. If no request is received, the Township intends to proceed with the design and construction of the WWTP expansion, as outlined in the ESR.

If you have any questions or would like further information about the study, please contact the undersigned by phone at 519-848-3620, ext. 31 (Toll Free: 1-866-848-3620) or by e-mail at maston@wellington-north.com. Thank you very much for your interest in the study.

Sincerely,

-
- Mr. Matthew Aston
- Director of Public Works

cc: Mr. Graham Seggewiss, XCG Consulting Limited

Township of Wellington North
P.O. Box 125 • 7490 Sideroad 7 W • Kenilworth • ON • N0G 2E0

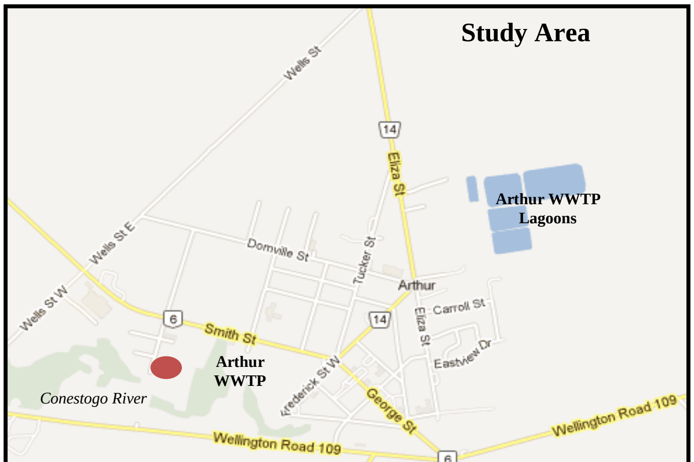
August 17, 2016

RE: Municipal Class Environmental Assessment
Arthur Wastewater Treatment Plant
Notice of Completion

Dear Resident / Property Owner:

The Arthur Wastewater Treatment Plant (WWTP) is owned and operated by the Township of Wellington North (the Township). The Township has undertaken a Class Environmental Assessment (EA) to examine options for increasing the capacity of the WWTP.

The map below illustrates the location of the Arthur WWTP.



Map courtesy of Google Maps

Current flows, combined with development commitments, have resulted in a situation where there is limited capacity for future growth. The study has examined alternatives for increasing the treatment capacity at the Arthur WWTP, and has identified a recommended preferred design.

The study has been undertaken as a Schedule C project, in accordance with the requirements of the Municipal Class Environmental Assessment (EA) (Municipal Engineers Association, June 2000, as amended in 2007, 2011 and 2015). The study has completed Phases 1 to 4 of the Municipal Class EA process. Three Public Information Centres (PICs) were held to present information about the project and to receive comments on the project.

Based on the study findings and input from regulatory agencies, stakeholders and the public, the preferred alternative is to expand the existing Arthur WWTP, on the existing WWTP property, to service existing and proposed community growth. The expansion will be achieved through the twinning of the existing package treatment plant.

The preferred alternative will be constructed over two phases with Phase 1 providing the capacity for existing wastewater flows and Phase 2 providing the capacity for future growth to the year 2031. This work will include upgrades to the forcemain connecting the Arthur WWTP to the seasonal storage lagoons. No upgrades or expansion to the Wells St. sewage pumping station is required. However, the Frederick St. sewage pumping station will be expanded to provide the additional capacity required to service projected growth in the pumping station catchment area. In addition, the preferred biosolids management option for Phase 1 is off-site disposal at the Regional Lystek Facility in Dundalk, Ontario.

An Environmental Study Report (ESR) which documents the study process and findings has been prepared and is available for review on the Township's web site at:
http://www.wellington-north.com.

The ESR is also available for viewing during regular office hours at the following location between August 17, 2016 and September 23, 2016:

Township of Wellington North
Clerk's Office
7490 Sideroad 7 West
Kenilworth, ON N0G 2E0

Phone: 519-848-3620
Toll Free: 1-866-848-3620
Office Hours: Monday to Friday - 8:30 a.m. to 4:30 p.m.

Please provide written comments on the ESR to Mr. Matthew Aston, Township of Wellington North by September 23, 2016, at the address provided below.

If concerns regarding this project cannot be resolved through discussion with the Township, a person or party may request that the Ontario Minister of the Environment and Climate Change (Minister) make an order (referred to as Part II Order) for the project to comply with Part II of the Ontario *Environmental Assessment Act*, which addresses individual environmental assessments. A request for a Part II Order must be received by the Minister no later than September 23, 2016 at the following address:

Minister of the Environment and Climate Change
77 Wellesley St. West, 11th Floor
Toronto, ON M7A 2T5

The request to the Minister must be copied to the Township's Director of Public Works. If no request is received, the Township intends to proceed with the design and construction of the WWTP expansion, as outlined in the ESR.

If you have any questions or would like further information about the study, please contact the undersigned by phone at 519-848-3620, ext. 31 (Toll Free: 1-866-848-3620) or by e-mail at maston@wellington-north.com. Thank you very much for your interest in the study.

Sincerely,

Mr. Matthew Aston
Director of Public Works

cc: Mr. Graham Seggewiss, XCG Consulting Limited

APPENDIX J
CULTURAL HERITAGE IMPACT ASSESSMENT REPORT

LRA HERITAGE
52 Dewson St., Unit 2
Toronto, ON
M6H 1G6

Arthur Wastewater Treatment Plant
Cultural Heritage Impact Assessment Report
160 Preston St., Village of Arthur, Township of Wellington North, Ontario.
August 15th, 2014

Prepared for:

TOWNSHIP OF WELLINGTON NORTH
P.O. Box 125, 7490 Sideroad 7 W Kenilworth, Ontario N0G 3E0

Delivered to:

Stephen Nutt, M.Eng., P.Eng.
Senior Consultant
XCG CONSULTANTS LTD.
Suite 300, 2620 Bristol Circle Oakville, Ontario L6H 6Z7

Prepared By:

LRA HERITAGE

Lauren Archer, Heritage Consultant
51 Dewson St., Unit 2, Toronto, Ontario, M6H 1G6

Executive Summary

LRA Heritage was retained by XCG Consultants Ltd., on the behalf of The Township of Wellington North (the Township) to prepare a Cultural Heritage Impact Assessment (CHIA) report for the Arthur Wastewater Treatment Plant (WWTP) located at 160 Preston St. in the Village of Arthur, Township of Wellington North, Ontario.

To meet the servicing requirements of future growth in the service area, the Township has decided to explore the expansion of the Arthur WWTP beyond its existing rated capacity. This project has been identified as a Schedule C activity under the Municipal Class Environmental Assessment (Class EA) process.

The Arthur WWTP is not listed or designated under the Ontario Heritage Act, nor has it been identified by the Township of Wellington North as a property of interest. Due to the proximity of the property to the Conestogo River, a tributary of the Grand River, which has been designated a Canadian Heritage River, a CHIA is required as a part of the Class EA process.

In 1994, the Grand River and its major tributaries, the Nith, Conestogo, Speed and Eramosa rivers, were designated as Canadian Heritage Rivers for their cultural heritage and recreational values. The Grand River was the first non-wilderness river to be designated, as well as the first river to include the tributaries in the designation. The nomination was accepted because of the abundant nationally significant human heritage and recreational features associated with the river.

Through an evaluation of the property using Ontario Regulation 9/06 it has been determined that the property does not have sufficient cultural heritage value to warrant designation. Additionally, the property does not qualify as a significant cultural heritage landscape, apart from its relationship to the Conestogo River. There are no heritage resources identified in the Grand River heritage river inventory within the Arthur WWTP site. As a result, there is no legislative reason from a cultural heritage perspective that the Arthur WWTP cannot be expanded.

The primary heritage concern for the expansion of the Arthur WWTP is the potential impacts to the cultural heritage values of the Grand River. The expansion of the Arthur WWTP could potentially impact the recreational use of the site by affecting the use of the Arthur River Trails, which opened on September 14th, 2013 and are used by the community year-round for walking, bird watching, snowshoeing and cross country skiing.

A review of the proposed design alternatives indicates that no negative impacts to the recreational use of the site are anticipated, however, special consideration should be given during the detailed design phase of any future expansion of the Arthur WWTP. It is recommended that the recreational trail use of the site be considered in the design process, and that the long-term use of the site as a trail, and for nature and scenic appreciation be maintained in accordance with *The Grand Strategy: a shared management plan for the Grand River watershed*.

1.0 Study Purpose and Approach

LRA Heritage was retained by XCG Consultants Ltd., on the behalf of The Township of Wellington North (the Township) to prepare a Cultural Heritage Impact Assessment (CHIA) report for the Arthur Wastewater Treatment Plant (WWTP) located at 160 Preston St. in the Village of Arthur, Township of Wellington North, Ontario.

To meet the servicing requirements of future growth in the service area, the Arthur WWTP may need to be expanded beyond its existing rated capacity. The Township has decided to proceed to determine the most cost effective, environmentally sound and sustainable approach to upgrade the Arthur WWTP to provide servicing to a design year of 2031. This project has been identified as a Schedule C activity under the Municipal Class Environmental Assessment (Class EA) process.

The Arthur WWTP is not listed or designated under the Ontario Heritage Act, nor has it been identified by the Township of Wellington North as a property of interest. Due to the proximity of the property to the Conestogo River, a tributary of the Grand River, which has been designated a Canadian Heritage River, a CHIA is required as a part of the Class EA process.

This CHIA is a study to evaluate the potential impact of the proposed alternatives for the expansion of the Arthur WWTP on cultural heritage resources, and to make recommendations for an overall approach to the conservation of the heritage values of the potential resources.

The principal objectives of this CHIA are:

- to review the relevant legislative and policy framework of the property;
- to prepare an historical summary of the development of the property through the review of both primary and secondary sources as well as historical mapping;
- to conduct a survey of the cultural heritage landscapes and built heritage resources found within and adjacent to the property;
- to identify cultural heritage landscapes and built heritage resources within the property through the evaluation of the property against the criteria within Regulation 9/06, and using Ministry of Tourism, Culture and Sport Info Sheet #2: Cultural Heritage Landscapes (A part of Heritage Resources in the Land Use Planning Process (2006)) to identify and assess potential Cultural Heritage Landscapes;
- to identify potential impacts and sensitivities to change to cultural heritage landscapes and built heritage resources within the study area; and
- to make general mitigation recommendations for the implementation of the proposed alternatives.

A site visit was carried out on Wednesday July 30th, 2014, by Lauren Archer. All photographs, unless otherwise noted, were taken by LRA Heritage on the date of the site visit. Barry Trood, Water & Sewer Superintendent, Water & Sewer Department, Township of Wellington North was consulted during the site visit. Stephen G. Nutt, M.Eng., P.Eng., Senior Consultant, XCG Consultants Ltd. consulted with regards to the Class EA and proposed alternatives.

Map 1: Location Map - Arthur Wastewater Treatment Plant (WWTP) 160 Preston St. in the Village of Arthur, Township of Wellington North, Ontario.

52 Dewson St., Unit 2
Toronto, ON
M6H 1G6

Map 2: Context Map - Village of Arthur, Township of Wellington North, Ontario within the Grand River Watershed

2.0 Legislative and Policy Framework Review

The need for the identification, evaluation, management and conservation of Ontario's heritage is an essential component of environmental assessment and municipal planning in Ontario. This priority is reflected in the legislative and policy framework that guides municipal planning processes in Ontario.

2.1 Environmental Assessment Act (EAA)

An environmental assessment provides the decision making process to promote good environmental planning in Ontario by assessing the potential effects and benefits of certain activities on the environment. This process is defined by and finds its authority in the Environmental Assessment Act (EAA). The purpose of the EAA is to provide for the protection, conservation, and effective management of Ontario's environment.

The EAA applies to all public activities. This includes projects originating from Ontario ministries and agencies, municipalities, public utilities, and Conservation Authorities. Projects subject to the EAA are typically infrastructure developments including public roads and highways, transit facilities, waste management facilities, electrical generation and transmission facilities, and flood protection works. The analysis throughout the study process addresses EAA, subsection 1(c), which defines “environment” to include:

> *“...cultural conditions that influence the life of humans or a community”;*
> *as well as,*
>
> *“any building, structure, machine or other device or thing made by humans”.*

Infrastructure work and its associated construction activities may potentially affect cultural heritage resources in a number of ways. The effects may include displacement through removal or demolition and/or disruption by the introduction of physical, visual, audible or atmospheric elements that are not in keeping with the character of the cultural heritage resources and/or their setting.

2.1.1 Municipal Class Environmental Assessment (MCEA)

The Municipal Class Environmental Assessment (October 2000, as amended in 2007 and 2011) defines the procedure whereby municipalities can comply with the requirements of the EAA. It identifies potential positive and negative effects of projects such as road improvements, facility expansions or to facilitate a new service. The process includes an evaluation of impacts on the natural and social environment including cultural heritage. The MCEA applies to municipal infrastructure projects including roads, water and wastewater projects.

Since projects undertaken by municipalities can vary in their environmental impact, such projects are classified in terms of schedules. Schedule 'A' generally includes normal or emergency operational and maintenance activities where the environmental effects are usually minimal, and therefore, these projects are pre-approved. Schedule 'B' generally includes improvements and minor expansions to existing facilities where there is the potential for some adverse environmental impacts, and therefore, the municipality is required to proceed through a screening process including consultation with those who may be affected. Schedule 'C' generally includes the construction of new facilities and major expansions to existing facilities, and these projects, proceed through a five phased environmental assessment planning process.

The expansion of the Arthur WWTP has been identified as a Schedule C activity under the Municipal Class Environmental Assessment (Class EA) process.

Part C.1.1 (4) for Municipal Water and Wastewater Projects states:

Cultural heritage resources include built heritage, cultural heritage landscapes, and marine and other archaeological sites. The Minister of Tourism, Culture and Sport (MTCS) is responsible for the administration of the Ontario Heritage Act and is responsible for determining policies, priorities and programs for the conservation, protection and preservation of Ontario's heritage, which includes cultural heritage landscapes, built heritage and archaeological resources. MTCS has released a series of resource guides on the Ontario Heritage Act, entitled the Ontario Heritage Tool Kit.

Section C.1.1 (4) states:

Significant cultural heritage and archaeological resources features should be avoided where possible. Where they cannot be avoided, then effects should be minimized where possible, and every effort made to mitigate adverse impacts, in accordance with provincial and municipal policies and procedures. Cultural heritage features should be identified early in the process in order to determine significant features and potential impacts.

Section C.1.1 (4) defines built heritage resources and cultural heritage landscapes as follows:

***Built heritage resources** means one or more significant buildings, structures, monuments, installations or remains associated with architectural, cultural, social, political, economic or military history and identified as being important to a community. These resources may be identified through designation or heritage conservation* *easement under the Ontario Heritage Act, or listed by local, provincial or federal jurisdictions.*

***Cultural heritage landscape** means a defined geographical area of heritage significance which has been modified by human activities and is valued by a community. It involves grouping(s) of individual heritage features such as structures, spaces, archaeological sites, and natural elements, which together form a significant type of heritage form, distinctive from that of its constituent elements or parts. Examples may include, but are not limited to, heritage conservation districts designated under the Ontario Heritage Act; and villages, parks, gardens, battlefields, mainstreets and neighbourhoods, cemeteries, trailways, and industrial complexes of cultural heritage value.*

2.2 Canadian Heritage Rivers System

Canadian Heritage River System (CHRS) was established in 1984 with the mandate to conserve nationally significant rivers. The CHRS operates under existing federal, provincial, and municipal legislative/policy frameworks as a secretariat under Parks Canada.

The objective of the Canadian Heritage Rivers designation is to foster the protection of outstanding examples of major river environments in Canada as Canadian Heritage Rivers, and to encourage public understanding, appreciation, and enjoyment of their human and natural heritage.

In 1994 the Grand River and its major tributaries, the Nith, Conestogo, Speed and Eramosa rivers, were designated as Canadian Heritage Rivers for their cultural heritage and recreational values. The Grand River was the first non-wilderness river to be designated, as well as the first river to include the tributaries in the designation.

The Grand Strategy for Managing the Grand River as a Canadian Heritage River has been recognized by the Canadian Heritage Rivers Board the management plan for the cultural heritage and recreational values of the Grand River. This plan indicates how long-term management is to be carried out in order to ensure the conservation and interpretation of natural, cultural and recreational resources. The Grand Strategy was created through a participatory approach which engaged watershed residents and raised awareness of the river's cultural and recreational assets.

2.3 Standards and Guidelines for the Conservation of Historic Places in Canada

The Standards and Guidelines for the Conservation of Historic Places in Canada (The Standards and Guidelines) is a federal, provincial and territorial collaborative document intended to provide sound, practical guidance to achieve good conservation practice across Canada. The Standards and Guidelines establish a consistent Canadian set of conservation principles and guidelines to conserve Canada's historic places. The Standards and Guidelines offer results-oriented guidance for sound decision-making when planning for, intervening on, and using historic places.

On February 25, 2011, the Government of Canada launched the second edition of the Standards and Guidelines for the Conservation of Historic Places in Canada. The second edition expands and clarifies the information contained in the original 2003 edition, including addressing cultural landscapes and improving the guidance provided for engineering works.

2.4 Ontario Legislation and Policy

2.4.1 Ontario Heritage Act (OHA)

Within Ontario, the conservation of cultural heritage resources is a matter of provincial interest. The Ontario Heritage Act came into force in 1975, and gives municipalities and the provincial government powers to preserve the cultural heritage of Ontario.

Properties in Ontario can be designated under the *Ontario Heritage Act (2005)* as having cultural heritage value or interest. Different types of designation with varying levels of protection, are available, including listing on a municipal register, pursuant to Section 27 of the Ontario Heritage Act, individual designation under Part IV, and designation as a Heritage Conservation District under Part V. Heritage easements and maintenance agreements can also be established under the authority of the Ontario Heritage Act.

Properties designated after 2005 must be evaluated against Ontario Regulation 9/06 to determine cultural heritage value or interest. In addition, a Statement of Cultural Heritage Value or Interest, or similar, must be prepared to articulate the cultural heritage value of the property and identify heritage attributes that support those values. Designations are enacted at the local or municipal level.

2.4.2 Provincial Policy Statement (PPS)

The Provincial Policy Statement (PPS) is the statement of the Ontario government's policies on land use planning. It applies to the entire province and provides clear policy direction on land use planning to promote strong communities, a strong economy, and a clean and healthy environment.

The Provincial Policy Statement states in Section 2.6.1 that a decision of a council of a municipality in respect of the exercise of any authority that affects a planning matter *"shall be consistent with"* the following statement on cultural heritage resources:

52 Dewson St., Unit 2
Toronto, ON
M6H 1G6

"Significant built heritage resources and significant cultural heritage landscapes shall be conserved."

The PPS defines cultural heritage landscapes as, *"a grouping(s) of individual heritage features such as structures, spaces, archaeological sites and natural elements, which together form a significant type of heritage form, distinctive from that of its constituent elements or parts."* Significant cultural heritage resources are resources, *"that are valued for the important contribution they make to our understanding of the history of a place, an event, or a people."*

The PPS also defines conserved as, *"the identification, protection, use and/or management of cultural heritage and archaeological resources in such a way that their heritage values, attributes and integrity are retained. This may be addressed through a conservation plan or heritage impact assessment."*

2.4.3 Ministry of Tourism Culture and Sport (MTCS)

The Ontario Ministry of Tourism, Culture and Sport (MTCS) is responsible for the conservation, protection and preservation of Ontario's cultural heritage resources.

Section 2 of the OHA charges the Minister with the responsibility to:

"...determine policies, priorities and programs for the conservation, protection and preservation of the heritage of Ontario."

Planning and approval authorities are directed by the MTCS to consider heritage resources when making planning decisions, as cultural heritage resources may be impacted adversely by both public and private land development. MTCS describes heritage buildings and structures, cultural heritage landscapes and archaeological resources as cultural heritage resources.

The MTCS uses a rolling 40-year rule to identify potential properties of cultural heritage values and interest as part of the Environment Assessment process. The MTCS also recognizes the Canadian Heritage Rivers System and identifies properties within and adjacent to those identified in the river heritage register as potential properties of cultural heritage values and interest. (See Appendix C)

2.5 Wellington County Official Plan

The Wellington County Official Plan is intended to give direction to the physical development of Wellington County, its local municipalities and to support the long term protection of County resources. Wellington County is a community of almost 90,000 people living in an area of over

1,000 square miles. The County Official Plan guides how land in the County should be used and addresses issues such as:

- Where new housing, industry, offices and shops will be located;
- What services like roads, water, sewers and parks will be needed;
- When, and in what order, parts of your community will grow; and
- How and when important resources will be protected, including natural and cultural heritage resources.

Part 4.1 of the Wellington County Official Plan addresses cultural heritage resources. It states:

> *Cultural heritage resources form an important and in many cases highly visible part of the community fabric. These resources are a source of civic pride for the residents, a benefit to the local economy through tourism, and are important to our understanding of the settlement of the County. The policies of this Plan, in conjunction with the Ontario Heritage Act, provide a framework for the protection and enhancement of cultural heritage resources in Wellington.*
>
> ***Built Heritage***
>
> *Wellington has a rich history reflected in many buildings and structures, either individually or in groups, which are considered to be architecturally or historically significant to the community, county, province or country.*
>
> ***Cultural Heritage Landscapes***
>
> *Cultural heritage landscapes involve groupings of individual heritage features such as structures, spaces, archaeological sites, and natural elements which together form a larger area of heritage value. The identification, listing, evaluation and protection of cultural heritage landscapes is an ongoing process. The Canadian Heritage Rivers Board has designated the Grand River and its valleylands as a Canadian Heritage River.*

Part 4.1.5 f) outlines policy direction, and states:

> *The County recognizes the important cultural significance of the Grand River as a Canadian Heritage River, and the need to conserve its inherent values.*

3.0 Overview of the Property

The Arthur Wastewater Treatment Plant (WWTP) is located at 160 Preston Street, in the Village of Arthur, Township of Wellington North, Wellington County, Ontario, Canada. The legal description is Part of Park Lot 4, North of Catherine Street, Crown Survey, Village of Arthur. The assessment roll number is 23 52 000 020 8600. The property is 10.5 acres (4.25 hectares) in size. The existing Arthur WWTP was built in 1989 and is under consideration for expansion.

The site is situated on a slope adjacent to the Conestogo River, a major tributary of the Grand River system, draining the western half of the watershed with the Nith River. The topography of the site can be generally described as hilly, sloping down to the river bank. Two trails of the Arthur River Trail are situated around the Arthur WWTP property, the River Trail and the Perfume Trail.

3.1 Summary of Historical Development

The Village of Arthur is located about 40 kilometers northwest of Guelph, on the Conestogo River, along the Canadian Pacific Railway, and at the junction of Highway 6 and Wellington Road 109. The Village of Arthur was first surveyed in 1841 by John McDonald, and officially surveyed in 1846 by D.B. Papineau. Arthur was incorporated as a village in 1872, at which time some additional land, surveyed by C.J. Wheelock was annexed. In 1851, a post office was opened and the first church and school were organized. Development was further encouraged in 1872 when a station of the Toronto, Grey and Bruce Railway was opened. In 1897, Arthur was one of the first villages in Ontario to be served by a power transmission line.

The establishment of saw and gristmills along the Conestogo River sparked growth in the community, in addition to it’s central location. By the early 1900s Arthur had flour, wollen, planing, shingle and flax mills. Arthur was a busy milling centre where area farmers carried their grain to the mills in the village and bartered for goods at the village stores.

The Village of Arthur, Township of Arthur, the Township of West Luther and the Town of Mount Forest, were amalgamated into the Corporation of the Township of Wellington North on January 1st, 1999.

The Arthur WWTP property was first sold as a part of a 17 ½ acre parcel from the Crown to Samuel Small as Park Lot No. 4, North of Catherine Street on September 16th, 1854. In 1872 the property was subdivided into the North Part, consisting of 10 ½ acres and the South Part, consisting of 7 acres. The Arthur WWTP property, located on the South Part property, adjacent to the Conestogo River, was sold to James B. Wales. His sons, James and Arthur Wales inherited the property after his death in 1898. The property was utilized as agricultural land. No structures appear on any of the Historical Atlas mapping.

52 Dewson St., Unit 2
Toronto, ON
M6H 1G6

Map 3: County of Wellington Historical Atlas Map, 1906, Village of Arthur, Park Lot 4 North of Catherine.

In 1971 the property was still in use as agricultural land. Aerial photography of the area shows no visible structures on the property.

Figure 1: Aerial Photography, County of Wellington Archives, 1971

52 Dewson St., Unit 2
Toronto, ON
M6H 1G6

Preston Street did not extend to the property and the road right of way was not developed until it was required to build the Arthur WWTP.

Map 4: Arthur, plan of the village, 1970. County of Wellington Archives.

The property was sold to the Corporation of the Village of Arthur on November 30th, 1988 by Constance (Wallsworth) Doyle for use as the future Arthur Wastewater Treatment Plant.

52 Dewson St., Unit 2
Toronto, ON
M6H 1G6

3.2 Description of the Arthur Wastewater Treatment Plant

The Arthur Wastewater Treatment Plant (WWTP) provides tertiary treatment for wastewater generated in the Village of Arthur. The plant is operated under Ministry of the Environment (MOE) Certificate of Approval (CofA) No. 3-1256-88-908 issued August 9, 1990. The plant is owned by the Township of Wellington North and operated by the Ontario Clean Water Agency (OCWA).

The Arthur WWTP was built on the site in 1989 and was commissioned in 1990. The Arthur WWTP is located on a property at the southern end of Preston Street. A driveway extends from the road to the wastewater treatment facilities, which are set at in a clearing at the centre of the property, on a small hill above the Conestogo River. The property is covered in scrub grass and low brush, with a reforested area at the east end of the property.

The wastewater treatment facilities are enclosed by a chain link fence with barbed wire. The surface of the enclosed area is paved with pockets of grassy vegetation. Poured concrete features on the site include the large circular aeration tank, chemical storage facilities, and effluent treatment facility. The main access gate is located at the northwest end of the site, where the driveway is located. A paved parking lot is found on the west end of the site.

Figure 2: View of Arthur WWTP from Preston Street, looking South East.

The Arthur WWTP was constructed for the purpose of providing sewage treatment facilities, and as a result, the structures erected on the site are utilitarian with few notable elements and are not remarkable from a physical or design perspective.

A single storey administrative building acts as the location of the electrical and mechanical systems of the Arthur WWTP, as well as office space for the administration of the site. The structure is clad in tan coloured brick with a concrete foundation. Long horizontal aluminum windows with brown metal panels are found throughout the building and visually break up the building elevations. The roof is flat with metal parapet flashing, and metal cladding extends down the ⅓ down the administration building elevations. The northwest corner is a curved brick feature with an entrance to the building found on the north elevation. Raised brown metal lettering on the curved feature reads “Village of Arthur Water Pollution Control Plant”. A plaque commemorating the commissioning of the plant on January 4th, 1991 is found inside the main entranceway of the administration building. Poured concrete stairs and stoop are found to the rear of the administration building. Lighting is affixed to the exterior of the structure on all elevations.

During the period September 16 to April 30, effluent from the plant can be discharged to the Conestogo River if river flows are adequate. During the period of May 1 to September 15, effluent flow from the secondary treatment system of the Arthur WWTP is pumped off site to holding ponds for storage, located north east of the Village of Arthur. These lagoons are not included in this assessment, as no changes to the lagoons are proposed.

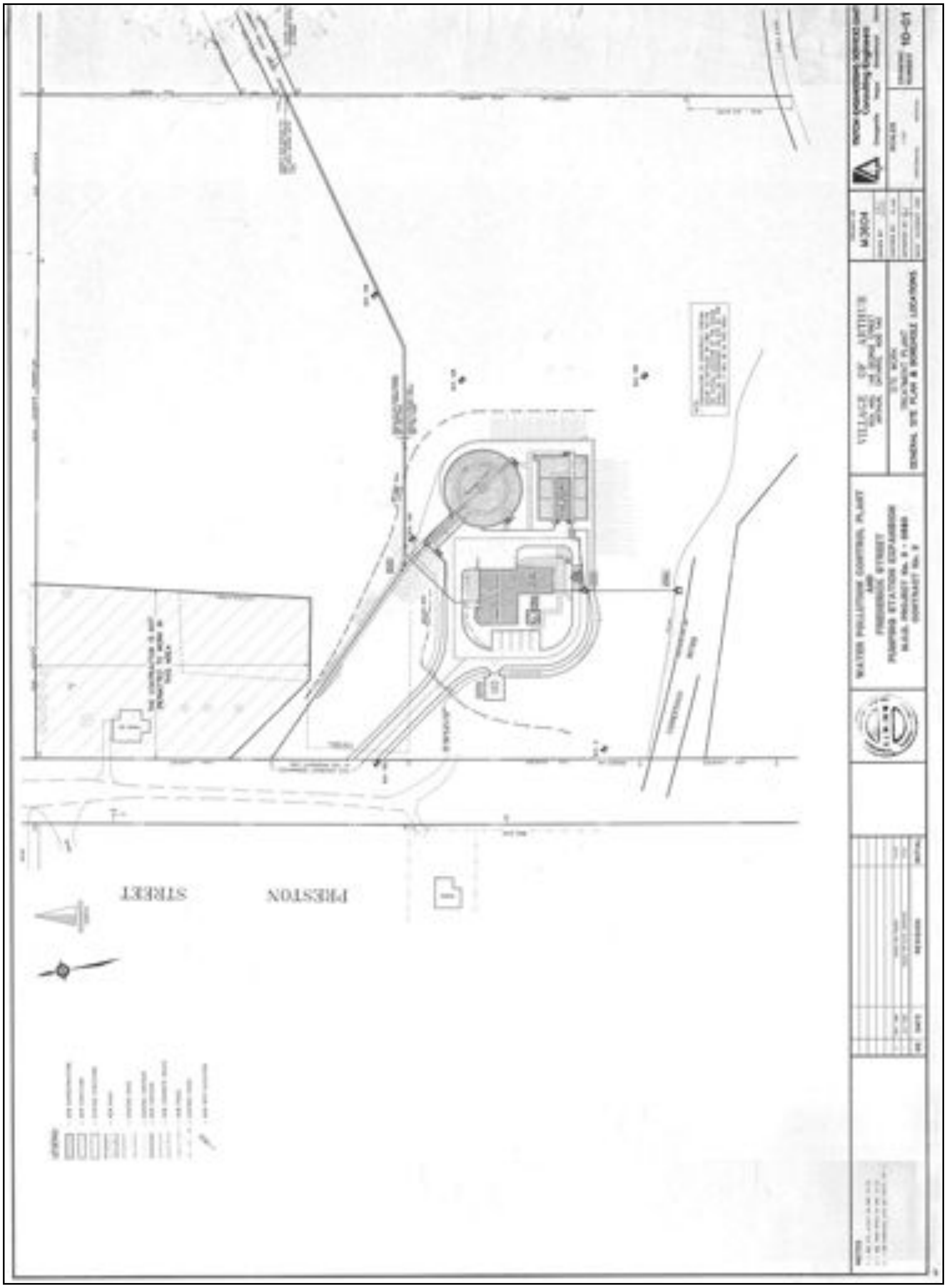


Figure 3: Site Plan of the Arthur Wastewater Treatment Plant

52 Dewson St., Unit 2
Toronto, ON
M6H 1G6

3.3 Description of Conestogo River

The Conestogo River is a river in Waterloo Region and Wellington County in Southwestern Ontario, Canada. The Conestogo River watershed drains approximately 820 km2 of the western part of the Grand River. It is in the Lake Erie Basin and joins the Grand River as a right tributary at the community of Conestogo, ON.

The watershed is largely composed of Tavistock Till, and 72% of the land area it classified as Clayey Till. The most significant hydrological feature within the Conestogo River Watershed is Conestogo Lake and Dam, which was built in 1958 for flood control and low flow augmentation.

Figure 4: View of Conestogo River from Arthur WWTP site, looking west.

Fish species in the Conestogo River river include brown trout, pike, smallmouth bass, perch, walleye and carp. The area is also a part of the Rich Tract, an area of relatively high quality habitat is the within the The Stratford Till Plain, located between Fergus and Arthur along Highway 6. It has sub-boreal plant communities and bird species uncommonly observed in the Watershed.

The beauty and cultural richness of the Grand River watershed is reflected in the names of the rivers main tributaries: the Nith, the Conestogo, the Speed and the Eramosa Rivers. It is the Grand River that inspired aboriginal poet Pauline Johnson to write her frequently anthologised The Song My Paddle Sings.

In the first half of the 20th century, many people considered the Grand River watershed to be an “open sewer”. Improvements in sewage treatment, controls on discharge of industrial pollutants into water courses and changes on the landscape have led to a significant improvement in overall quality of the Grand River and its tributaries over the past 50 years. The result has been better water quality and a revival of the Grand system as a focal point of outdoor recreation and tourism.

Figure 5: View of Conestogo River near Arthur, postcard circa 1909

Figure 6: View of Conestogo River in Arthur, Postcard circa 1911

3.4 Description of the Arthur River Trail

The Arthur River Trail, a relatively new trail in Arthur, opened on September 14th, 2013 runs directly adjacent to the wastewater treatment facility both sides of the Arthur WWTP property. The trail originates at the Lions Playground, at the north end of Arthur, past the Arthur WWTP and concludes at Wells Street in Arthur. It is three kilometers long, with two loops of about a half-kilometer long. The Meadow Trail loops around Golden Valley Farms, the Perfume Trail loops around the Arthur WWTP. The main River Trail runs directly along the south of the property, along the banks of the Conestogo River. The Perfume Trail forms a half kilometer loop with the River Trail around the Arthur WWTP.

52 Dewson St., Unit 2
Toronto, ON
M6H 1G6

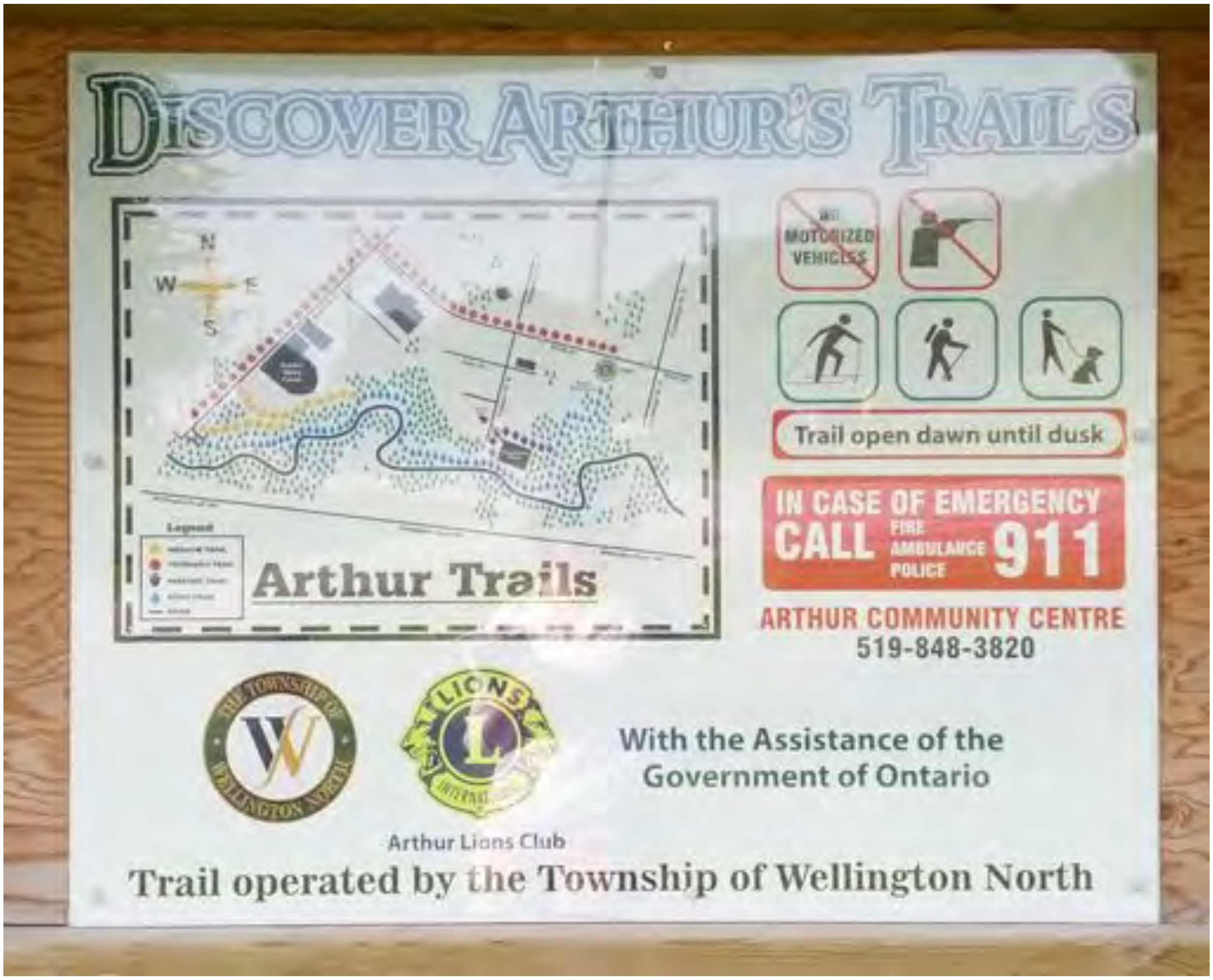


Figure 7: Discover Arthur's Trails, River Trail Map with River Trail (Blue) and Perfume Trail (Purple)

The River Trail was made possible by $25,000 in funding received from the Ministry of the Environment Great Lakes Community Guardian fund. It's development was a community volunteer driven initiative of the Arthur Lions Club, the Arthur Trails Committee and the Township of Wellington North. Members of the West Luther 4-H Club built birdhouses, erected along the trail and Wellington Heights Secondary School students built kiosks, bridges and boardwalk. The trail is intended for year round use, for walking, bird watching, snowshoeing or cross country skiing.

Figure 8: Arthur River Trail as seen from Arthur WWTP site.

4.0 Evaluation of Potential Cultural Heritage Values

4.1 Cultural Heritage Evaluation Framework

To support the amendments of the Ontario Heritage Act in 2005, the province established a set of criteria for determining if a property is worthy of protection as a “designated” heritage property. Known as Ontario Regulation 9/06, this regulation states that a property may be designated under the Ontario Heritage Act if it meets one of the three following criteria:

1) “The property has design value or physical value because it,

i) Is a rare, unique, representative or early example of a style, type, expression, material or construction method,
ii) Displays a high degree of craftsmanship or artistic merit, or
iii) Demonstrates a high degree of technical or scientific achievement.

3) The property has contextual value because it,

i) Is important in defining, maintaining or supporting the character of an area,
ii) Is physically, functionally, visually or historically linked to its surroundings, or
iii) Is a landmark." O.Reg. 9/06

This evaluation criteria has been applied to the Arthur Wastewater Treatment Plant property to determine if it has any cultural heritage value under O. Reg. 9/06 and the Ontario Heritage Act:

1) Design Value or Physical Value:

The Arthur Wastewater Treatment Plant was constructed for the purpose of providing sewage treatment facilities to the Village of Arthur in 1989. As a result, the structures erected on the site are functional and utilitarian. The property does not feature any notable elements and is not remarkable from a physical or design perspective, nor does the property display a high degree of craftsmanship.

2) Historical value or Associative Value:

The Arthur Wastewater Treatment Plant has historical or associative connections to the development of the Village of Arthur.

It is known that the property at 160 Preston Street in the Village of Arthur was first sold as a part of a 17 ½ acre parcel from the Crown to Samuel Small on September 16th, 1854. In 1872 the property was subdivided into the North Part, consisting of 10 ½ acres and the South Part, consisting of 7 acres. The property was utilized as agricultural land and was still in use as agricultural land until it was sold to the Village of Arthur for the purpose of building the Arthur WWTP. In 1989, the Arthur Wastewater Treatment Plant was constructed to service the needs of this small village community. The Arthur Wastewater Treatment Plant is the only water treatment plant in the Village of Arthur.

Although the relationship between the wastewater treatment plant and the village it services is an understood association, it is not of cultural heritage significance. While the facility is evidence of the growth and development of Arthur, the Arthur Wastewater Treatment Plant itself does not communicate this significance.

3) Contextual Value

The Arthur Wastewater Treatment Plant is functionally linked to surrounding properties though its use as a wastewater treatment plant. This alone, however, does not constitute contextual value. While the Arthur Wastewater Treatment Plant is associated with an identifiable community, it does not have cultural significance and does not define or support the character of the surrounding area. It is not, in an of itself, an important place or landmark to the local community.

This evaluation has determined that the Arthur Wastewater Treatment Plant property does not demonstrate sufficient cultural heritage value or interest for consideration for designation under O. Reg. 9/06 and.or the Ontario Heritage Act.

4.2 Cultural Heritage Landscape Evaluation

Cultural heritage landscapes are defined as key considerations for all planning applications in the Provincial Policy Statement (2005) and all planning matters *"shall be consistent with"* the policy statements issued under the Planning Act.

The PPS defines a "cultural heritage landscape" as:

> *"A defined geographical area of heritage significance that has been modified by human activities and is valued by a community. It involves a grouping(s) of heritage features such as structures, spaces, archaeological site and natural elements, which together form a significant type of heritage form, distinctive from its constituent elements or parts. Examples include, but are not limited to, heritage conservation districts designated under the Ontario Heritage Act, villages, parks, gardens, battlefields, main streets and neighbourhoods, cemeteries, trailways, and industrial complexes of heritage value."*

The Ministry of Tourism, Culture and Sport has identified three main types of cultural heritage landscapes.

The three main types of cultural heritage landscapes are:

> *"Designed landscapes: those which have been intentionally designed e.g. a planned garden or in a more urban setting, a downtown square;*
>
> *Evolved landscapes: those which have evolved through the use by people and whose activities have directly shaped the landscape or area. This can include a "continuing" landscape where human activities and uses are still on-going, or evolving e.g. residential neighbourhoods or mainstreets; or in a "relict" landscape, where even though an evolutionary process may have come to an end, the landscape remains historically significant e.g. an abandoned mine site or settlement area; and,*
>
> *Associative landscapes: those with powerful religious, artistic, or cultural associations of the natural element, as well as those with material cultural evidence e.g. a sacred site within a natural environment or a historic battlefield."*

These definitions and criteria have been applied to the Arthur Wastewater Treatment Plant property to determine if it could potentially be identified as a cultural heritage landscape.

The Arthur WWTP has been modified by human activities and the property is valued by the community for its use as a wastewater treatment plant, and for the recreational trails that run along the boundaries of the property.

Although in the previous section of this report it was determined that the property does not contain a significant grouping of heritage structures, the property does contain significant natural elements, including the Conestogo River, a tributary of the Grand River, a Canadian Heritage River. The recreational trail use and the Conestogo River natural feature, along with the siting of the wastewater treatment plan along the river form a landscape distinctive from its constituent elements or parts.

However this landscape is indistinguishable from the greater cultural heritage landscape described in the designation of the Grand River as a Canadian Heritage River, and in an of itself does not exhibit a unique potential cultural heritage value separate from that of the Grand River. Accordingly, the Arthur WWTP property can be assessed using the cultural heritage values identified in the Grand River heritage river designation.

4.3 Grand River Cultural Heritage Values

The Grand River was nominated to the Canadian Heritage Rivers System in 1990 and designated in 1994. The nomination was accepted because of the abundant nationally significant human heritage and recreational features which are associated with the river.

The outstanding heritage resources are represented by the following five themes:

- the watershed’s cultural mosaic since the mid-nineteenth century;
- the strong association of Native Peoples with the watershed for thousands of years;
- the Grand River’s industrial heritage;
- human adaptation to fluctuating river flows; and
- the many famous persons associated with the Grand River watershed.

The following five themes illustrate the range of quality recreational opportunities available in the Grand River watershed:

- water sports;
- nature/scenic appreciation;
- fishing and hunting;
- trails and corridors; and,
- human heritage appreciation.

52 Dewson St., Unit 2
Toronto, ON
M6H 1G6

4.3.1 Grand Heritage River Inventory

Part of the Canadian Heritage River designation process is to determine if there are sufficient heritage features within the area to justify national recognition. This is partially achieved through an inventory of all heritage resources within the Grand River and its tributaries. The heritage river inventory was first published in a report entitled “The Grand as a Canadian Heritage River: Occasional Paper 9” undertaken by the Heritage Resources Centre, University of Waterloo in 1989. In 2000 and 2003, the Grand River Conservation Authority revised the heritage river inventory, which is now available online.

No heritage resources, historic buildings, industrial heritage resources, heritage bridges, or river structures or any other heritage resources from the heritage river inventory are identified as being within the Arthur WWTP study area.

The Grand River heritage river inventory also includes sites associated with the Mississaugas of the New Credit and the Six Nations of the Grand River. No significant aboriginal sites are identified in the Grand River heritage river inventory for the subject area.

There are two features identified in the heritage river inventory located near the study site, both are heritage plaques located at MacPherson Park, at the corner of George Street South and Francis Street in the Village of Arthur.

The first plaque commemorates an historic event, the Founding of Arthur. It is a provincial plaque, installed in 1972 by the Archaeological and Historic Sites Board, Department of Public Records and Archives of Ontario.

52 Dewson St., Unit 2
Toronto, ON
M6H 1G6

Figure 9: Founding of Arthur Plaque. Plaque Text:

> *"Arthur, named for Arthur Wellesley, Duke of Wellington, was the southern terminus of the Garafraxa "colonisation road" to Owen Sound. Settlers arrived in 1840 but the town site was not officially surveyed until 1846. The establishment of saw and grist mills hastened growth in the community which was also the natural market centre for the area's agricultural production. In 1851 a post office was opened and the first church and school were organised. A weekly newspaper, "The Enterprise", was established and a Division Court met at Arthur. Economic development was further encouraged when, in 1872, a station of the Toronto, Grey and Bruce Railway was opened in the community. That year, Arthur was incorporated as a village."*

The second plaque commemorates a famous person, James Morrison. It is a provincial plaque, installed by the Ontario Heritage Foundation and the Ministry of Culture, Tourism and Recreation in 1994.

Figure 9: James Morrison Plaque. Plaque Text:

> *"J.J. Morrison, an influential activist in farmers' causes, lived on a farm 2 km south of Arthur. He entered politics in the early 1900s, a time when many farmers felt ignored in an increasingly urban and industrial society. Morrison became deeply involved in farm organizations and helped found the United Farmers of Ontario (UFO) and the United Farmers' Co-operative in 1914. The UFO surprised the province by winning the election of 1919. Morrison declined the premier's office in favour of E.C. Drury, but helped set and implement the government's reform agenda during its four years in office. As secretary-treasurer of the UFO until 1933, he continued to advocate cooperative effort among farmers."*

Although these plaques are associated with the Arthur WWTP in that they are both associated with the development of the Village of Arthur, neither plaques will be affected by any future expansion of the Arthur WWTP.

4.3.2 Recreational Values

The Grand River was also designated for its outstanding recreational opportunities, which include natural and human heritage appreciation best afforded by canoeing, boating, swimming, hiking and touring along the river.

The River Trails that are a part of the Arthur Wastewater Treatment Plant property are recreational uses as described by the Grand River Canadian National River designation. Any change or site alteration that maintains the existing use of the property would maintain this potential cultural heritage value.

5.0 Description of the Overall Project

To meet the servicing requirements of future growth in the service area, the Township has decided to explore the expansion of the Arthur WWTP beyond its existing rated capacity. This project has been identified as a Schedule C activity under the Municipal Class Environmental Assessment (Class EA) process.

During Phase 1 and 2 of the Class EA process, flows to the Arthur WWTP from the predicted 2031 service area were estimated and the capacity of the Conestogo River was evaluated to determine the future discharge capacity and treatment requirements. The preferred solution was determined to be expansion of the Arthur WWTP to an average day flow of 2,300 m3/d on the existing property. No land acquisition is required, and the expansion would allow for the continued use of existing plant infrastructure.

All of the alternative design concepts for expansion developed include: The provision of new headworks building with flow metering to replace the existing grit channels, comminutor and manually raked bar screen, and the provision that all existing infrastructure will be reused where possible. Several potential alternative design concepts that could meet the future servicing requirements were identified by XCG Consultants Ltd.

5.1 Proposed Alternatives

The following were investigated as potential treatment alternatives for the Arthur WWTP by XCG Consultants Ltd. in their report *Technical Memorandum Evaluation of Alternative Treatment Design Concepts Arthur WWTP CLass EA, April 29, 2014.* (See Appendix B)

Four alternative design concepts for the preferred solution were developed and evaluated:

- Alternative 1 – Provide additional clarifier capacity
- Alternative 2 – Twin the existing package treatment plant
- Alternative 3 – Integrated Fixed-film Activated Sludge (IFAS) with additional clarifier capacity
- Alternative 4 – Membrane Bioreactor (MBR)

52 Dewson St., Unit 2
Toronto, ON
M6H 1G6

Two biosolids (digested sludge) storage options were considered for each of the above alternatives:

- Option A – Liquid Biosolids Storage
- Option B – Geotextile Dewatering and Cake Storage

Detailed proposed site layouts and additional information on each of the proposed alternatives can be found in Appendix B of this report.

5.2 Preferred Alternative:

The recommended preferred design alternative identified by XCG Consultants Ltd. is Option 2, Twin Existing Package Treatment Plant and provide either Geotextile Dewatering or Liquid Biosolids Storage. The identified advantages to this alternative are that it is a known, robust and well proven treatment process, it allows for opportunities to undertake maintenance on existing plant, it allows for the continued use of existing infrastructure and it has a competitive cost. The final selection of biosolids storage option will be made during preliminary design, however, this selection is not anticipated to affect the cultural heritage of the site.

6.0 Consideration of Impacts

6.1 Built Heritage Impacts

The subject property has not been designated under Part IV or Part V of the Ontario Heritage Act, nor has it been listed on a heritage register under Section 27 of the Ontario Heritage Act. An assessment of the potential cultural heritage value of the property indicates that there isn't sufficient heritage resources within the property to warrant designation nor to identify the property as being of heritage interest. Additionally, the property is also not of interest as a cultural heritage landscape, aside from it's relationship to the Conestogo River. There are no heritage resources identified in the Grand River heritage river inventory associated with the subject property. As a result, there is no legislative reason from a cultural heritage perspective that the Arthur WWTP cannot be altered. The proposed alternatives will have no impact on any built heritage resources associated with the Arthur WWTP site.

6.2 Recreational Impacts

The Grand River was designated for its outstanding recreational opportunities, which include natural and human heritage appreciation best afforded by canoeing, boating, swimming, hiking and touring along the river.

The following two identified themes represent the recreational opportunities of significant to the heritage value of Grand River watershed associated with the use of the Arthur WWTP site:

- nature/scenic appreciation; and,
- trails and corridors;

The River Trails that are a part of the Arthur WWTP property fulfill both of these recreational uses as described by the Grand River Canadian National River designation.

The primary heritage concern for the expansion of the Arthur WWTP is the potential to impact the cultural heritage values of the Grand River. The proposed alternatives could potentially impact the recreational use of the trails running adjacent to the Arthur WWTP. The Arthur River Trail is used year-round for walking, bird watching, snowshoeing and cross country skiing.

The expansion of the Arthur WWTP could potentially impact the recreational uses of the site though the demolition or diversion of the Arthur River Trails. Any change or site alteration that maintains the existing recreational uses associated with the Arthur WWTP would conserve and support the cultural heritage values of the Grand River.

7.0 Mitigation Recommendations

Although the exact site plan and layout will be determined during the detailed design phase, it is expected that the expanded Arthur WWTP layout will be similar to those in the proposed alternatives found in Appendix B. Based on these design concepts, no negative impacts to the recreational uses and/or cultural heritage values of the Grand River are anticipated. However, special consideration to impacts to recreational uses, including trail use, and natural and scenic appreciation should be given during the detailed design phase of the expansion of the Arthur WWTP.

New construction that will have an impact on the recreational heritage attributes of the Conestogo River are to be mitigated through the design and layout of the new construction. The long-term use of the site for nature and scenic appreciation, and as a trail should be maintained, either in place or by diverting the trail along a similar path. Township of Wellington North staff are to be involved during the design and construction to ensure no unanticipated adverse impacts to the recreational uses and/or cultural heritage values of the Grand River occur.

8.0 References

Chapman, Lyman John and Donald Fulton Putnam. The Physiography of Southern Ontario. Ontario Geological Survey Special Volume 2. Ontario: Ministry of Natural Resource, 1984.

Grand River Conservation Authority (GRCA). *The Grand Strategy: a shared management plan for the Grand River watershed.* Grand River Conservation Authority: Cambridge, ON. 1996

Grand River Conservation Authority (GRCA). *Canadian Heritage Rivers System Grand River Nomination Document .* Grand River Conservation Authority: Cambridge, ON. 1990

Grand River Conservation Authority (GRCA). *Canadian Heritage Rivers System Grand River Nomination Document .* Grand River Conservation Authority: Cambridge, ON. 1990

Mika, Nick, and Helma Mika. *Places in Ontario: Their Name Origins and History, Part I,* Belleville, Ont.: Mika Pub., 1983.

Ministry of Tourism, Culture and Sport. Heritage Resources in the Land Use Planning Process. Ontario: Queen's Printer for Ontario, 2006.

Ministry of Tourism, Culture and Sport. Heritage Property Evaluation. Ontario: Queen's Printer for Ontario, 2006.

Nelson, J.G. and Pauline O'Neill *Nominating the Grand as a Canadian heritage river : a study for the Canadian Heritage Rivers Board and the Grand River Conservation Authority*, Waterloo, Ont. Heritage Resources Centre, University of Waterloo, 1990.

Legislation

Ontario Heritage Act (2005)
Municipal Act (Ontario)
Planning Act (Ontario)
Provincial Policy Statement (2005)
Regulation 9/06 of the Ontario Heritage Act
County of Wellington Official Plan

Websites

The Township of Wellington North, History of Wellington North
Access:--<http://www.wellington-north.com/about-us/history.aspx > (August 2014).

Grant River Heritage Inventory
Access: --<http://www.grandriver.ca/heritage/search.aspx> (August 2014).

Historic Event: Founding of Arthur
Access: --<http://www.grandriver.ca/heritage/Results.aspx?HIT_ID=15168> (August 2014).

Famous Person: Morrison, James
Access: --<http://www.grandriver.ca/heritage/Results.aspx?HIT_ID=15163> (August 2014).

Grand River Interactive Mapping
Access: --<http://grims.grandriver.ca/imf/imfMainMap.jsp?cmd=refresh&w=883&h=533> (August 2014).

Grand River Conservation Authority : Conestogo River
Access: --<http://www.grandriver.ca/index/document.cfm?Sec=28&Sub1=13&Sub2=0> (August 2014)

Natural Resources Canada: Conestogo River
Access--: <http://www4.rncan.gc.ca/search-place-names/unique.php?id=FASNV&output=xml> (August 2014)

Maps

County of Wellington Archives, Accession # A1976.87, Copy Print, Aerial View of Arthur, 1971

County of Wellington Archives, Abstracts, Wellington County Land Registry Collection, 1820-1958.

Cumming, Ross. Parsell, H & Co., Historical Atlas of Wellington County, 1877

Grand River Watershed Map, Grand River Conservation Authority, Cambridge, ON. 2004

Historical Atlas Publishing Company, Historical Atlas of Wellington County, 1906

J. M. Tomlinson and Associates, Accession # A1976.87.31C Arthur, Plan of the Village, 1970.

52 Dewson St., Unit 2
Toronto, ON
M6H 1G6

11.0 Appendices

Appendix A:

Additional Site Visit Images

52 Dewson St., Unit 2
Toronto, ON
M6H 1G6

Appendix A, Part One: Conestogo River

Figure 11: Conestogo River from the Arthur River Trail

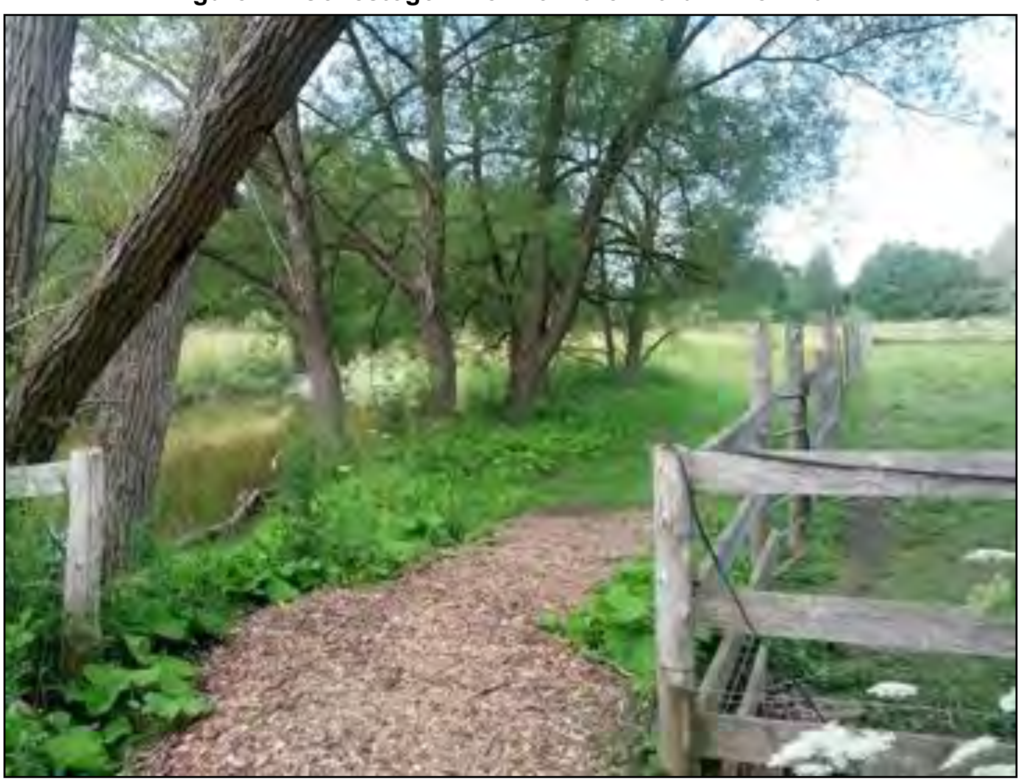


Figure 12: Conestogo River from the Arthur River Trail

Figure 12: Conestogo River from the Arthur River Trail

Appendix A, Part Two: Arthur River Trails

Figure 13: Arthur River Trail Signage adjacent to Arthur WWTP

Figure 14: Arthur River Trail looking West

Figure 15: Arthur River Trail - “Perfume Trail” adjacent to Arthur WWTP

Figure 16: Arthur River Trail "Perfume Trail"

Figure 17: Arthur River Trail Signage - "Plants and Trees in the River Valley"

52 Dewson St., Unit 2
Toronto, ON
M6H 1G6

Figure 18: Arthur River Trail South of Arthur WWTP

Appendix A, Part Three: Arthur WWTP

Figure 19: Arthur WWTP From Preston St. looking Southeast

Figure 20: Arthur WWTP From Driveway Looking Southeast

Figure 21: Arthur WWTP Entranceway Commissioning Plaque

52 Dewson St., Unit 2
Toronto, ON
M6H 1G6

Figure 22: Arthur WWTP Filtration and Treatment Buildings

Figure 23: Arthur WWTP looking North from Arthur River Trail

52 Dewson St., Unit 2
Toronto, ON
M6H 1G6

Figure 24: Arthur WWTP Looking South from Perfume Trail

Figure 25: Arthur WWTP Grounds, Treatment Facilities, Fencing with Conestogo River to the Left.

Figure 26: Arthur WWTP Grounds, Aeration Tanks and Fencing looking Towards Conestogo River

Figure 27: Arthur WWTP Grounds, Treatment Facilities, Aeration, looking Towards Conestogo River

52 Dewson St., Unit 2
Toronto, ON
M6H 1G6

Figure 28: Arthur WWTP Grounds and Treatment Facilities.

Figure 29: Arthur WWTP Grounds and Treatment Facilities.

52 Dewson St., Unit 2
Toronto, ON
M6H 1G6

11.0 Appendices

Appendix B:

Alternative Treatment Design Concepts
Arthur WWTP Class EA Conceptual Level Site Layouts

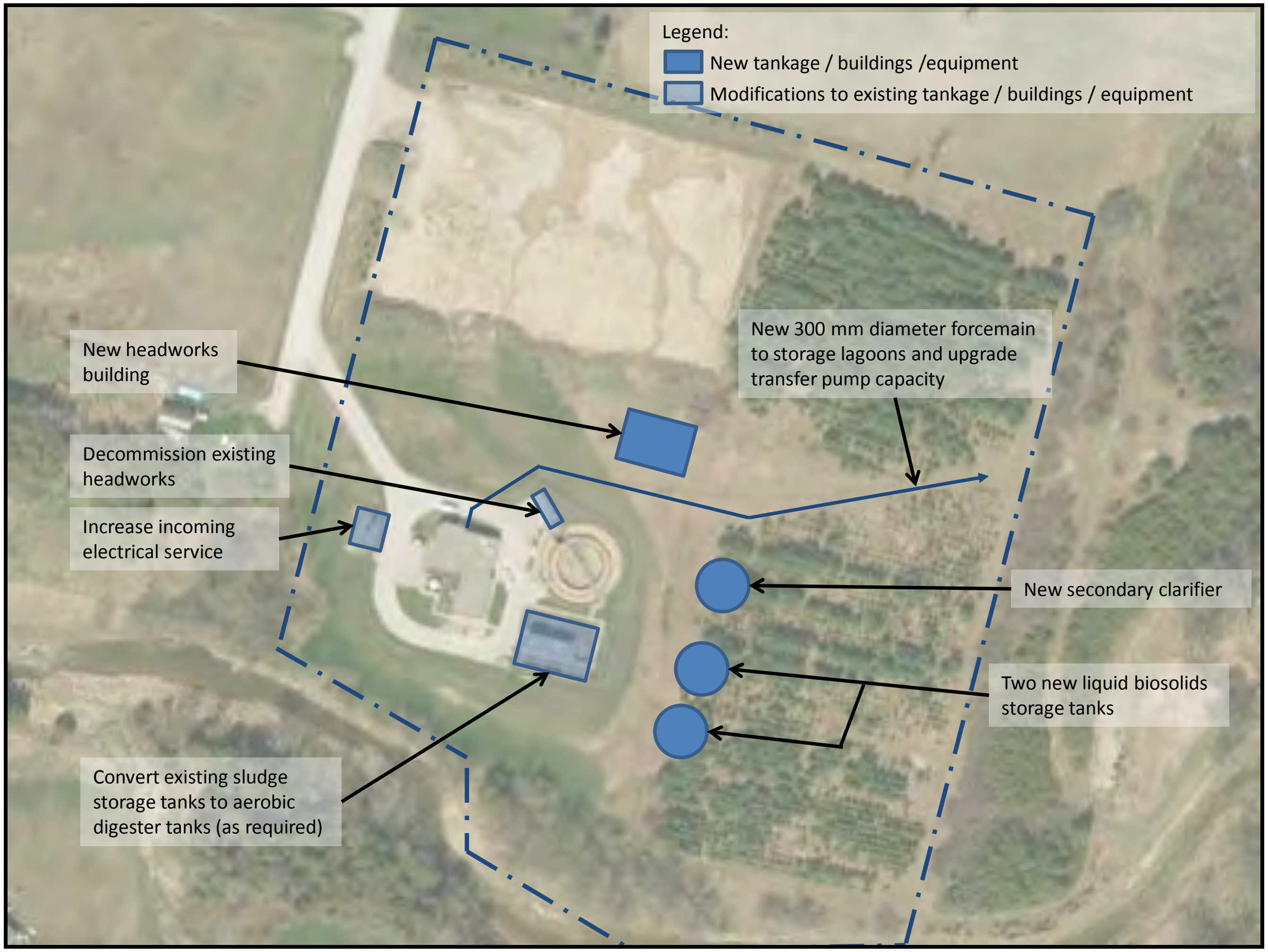


Figure A.1 Option 1A - Construct New Secondary Clarifier with new Liquid Biosolids Storage

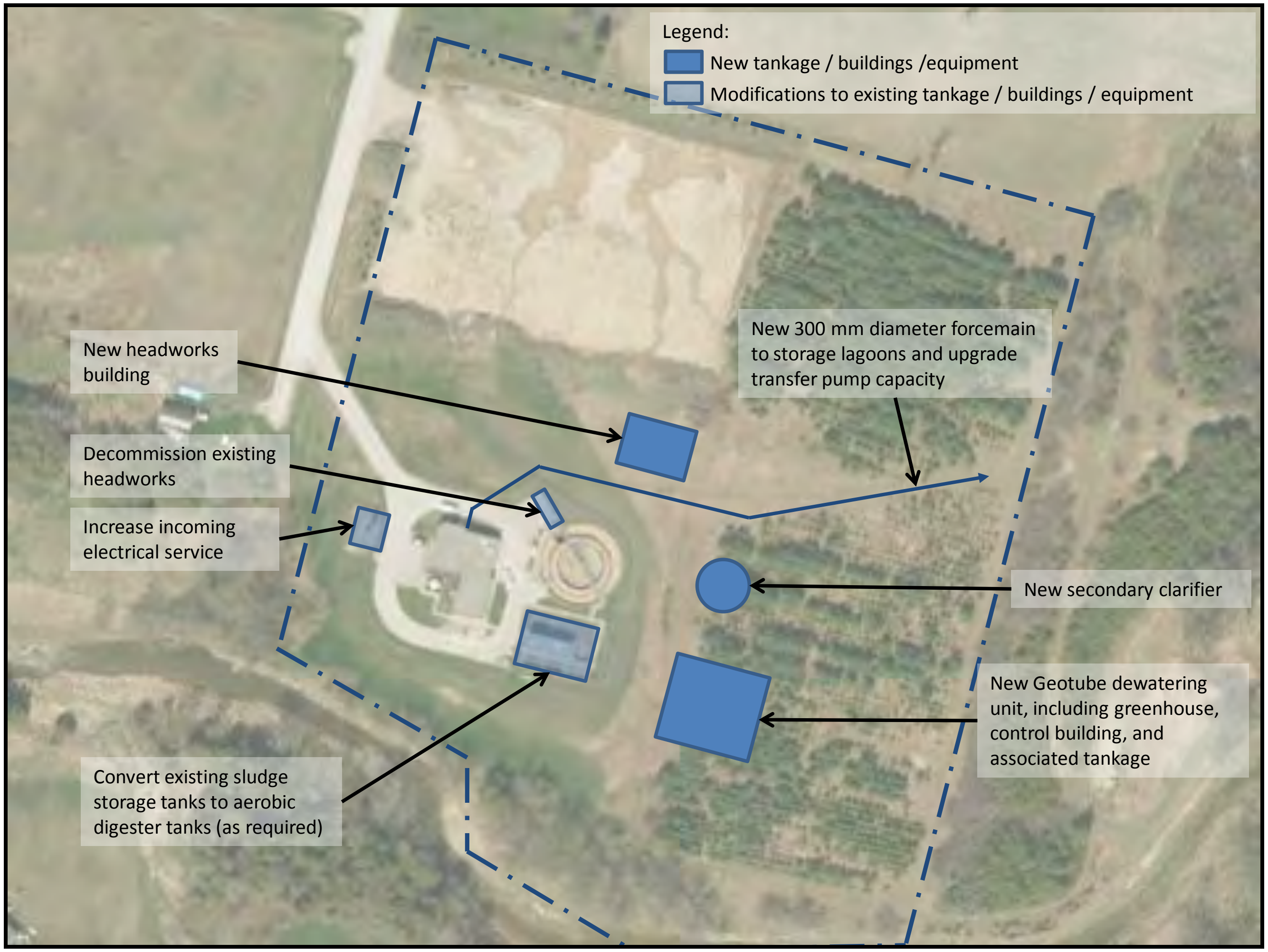


Figure A.2 Option 1B - Construct New Secondary Clarifier with new Geotextile Dewatering and Cake Storage

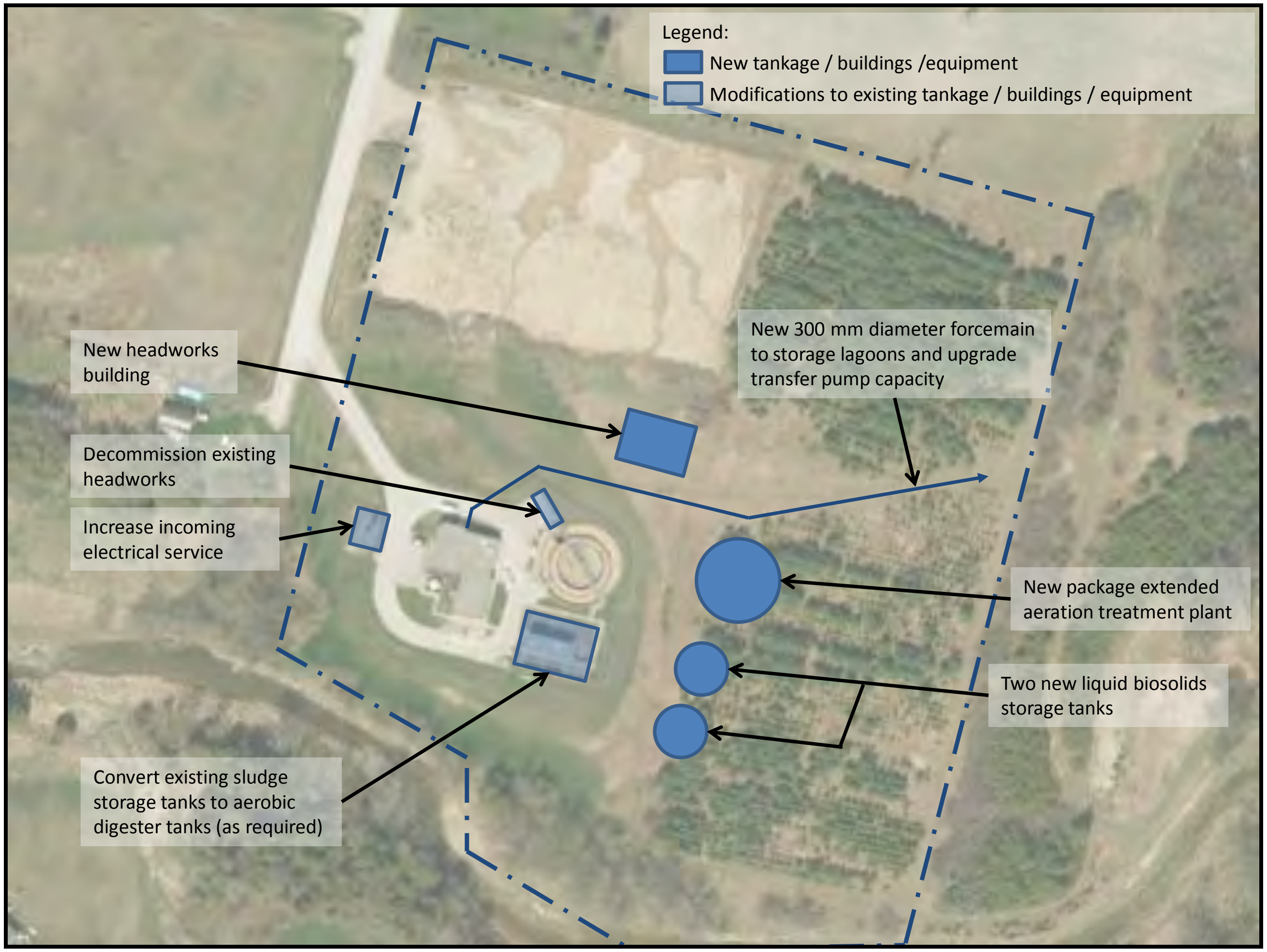


Figure A.3 Option 2A - Twin Existing EA Plant with new Liquid Biosolids Storage

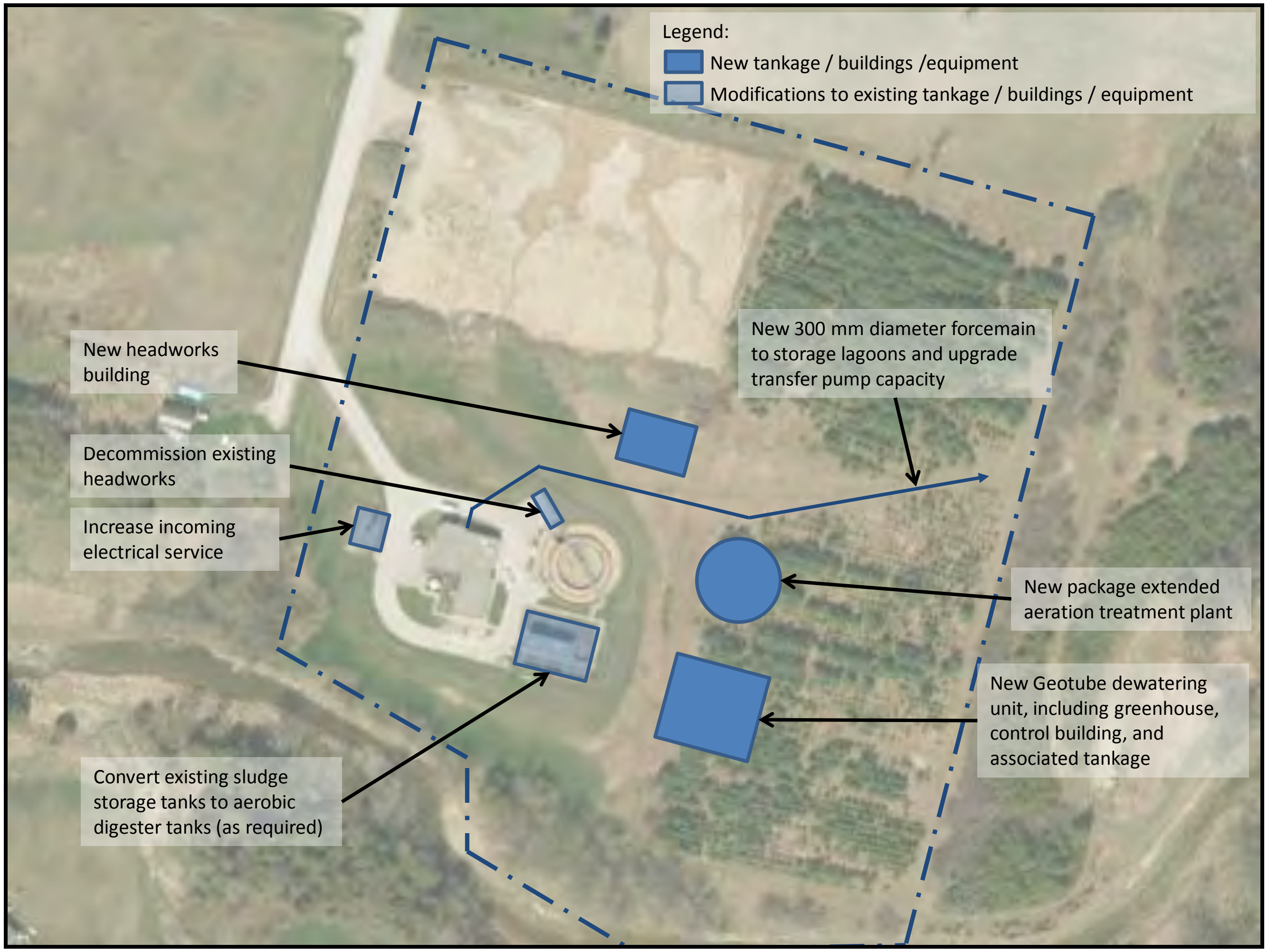


Figure A.4 Option 2B - Twin Existing EA Plant with new Geotextile Dewatering and Cake Storage

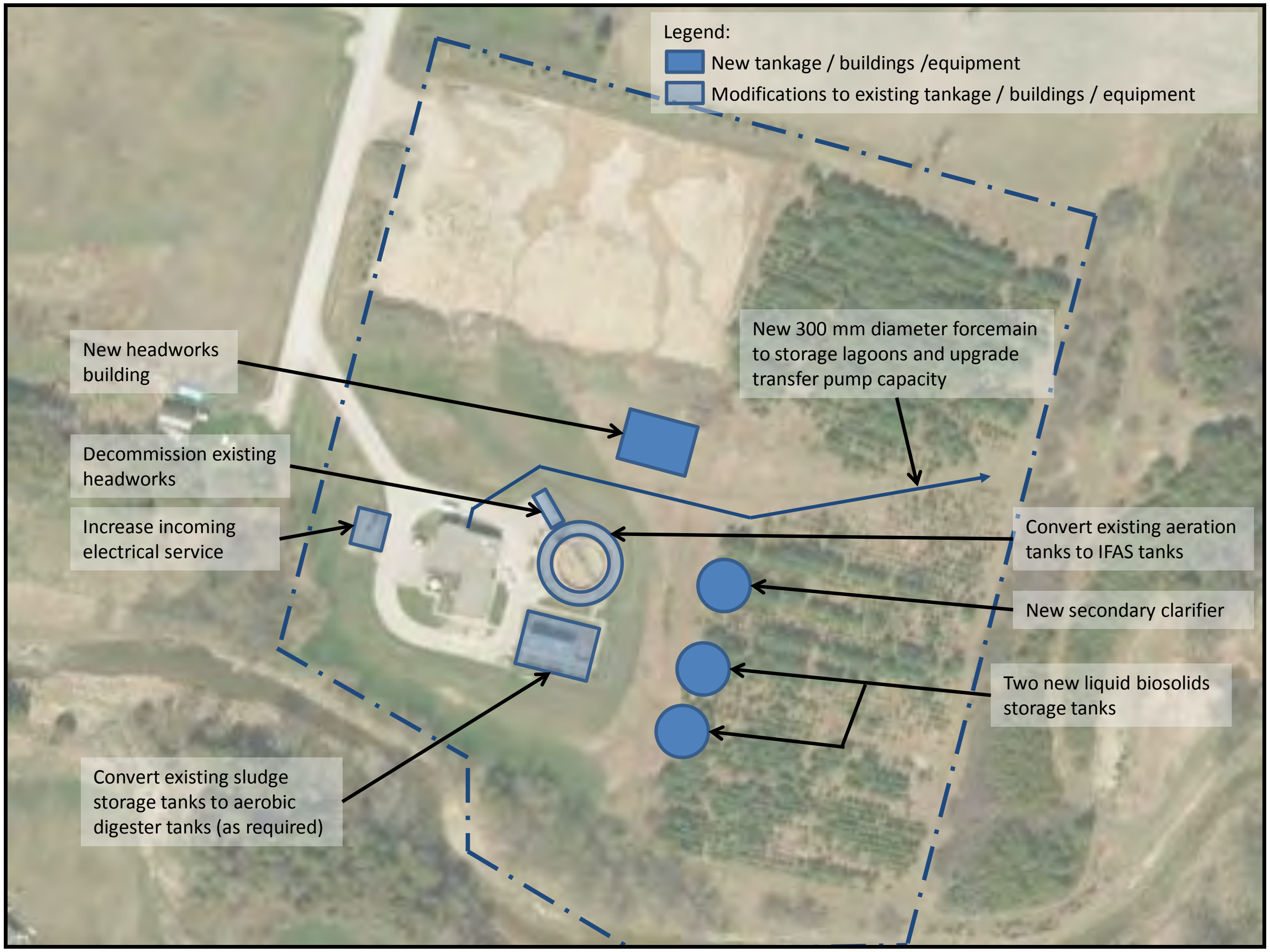


Figure A.5 Option 3A - Retrofit Existing EA to IFAS with new Liquid Biosolids Storage

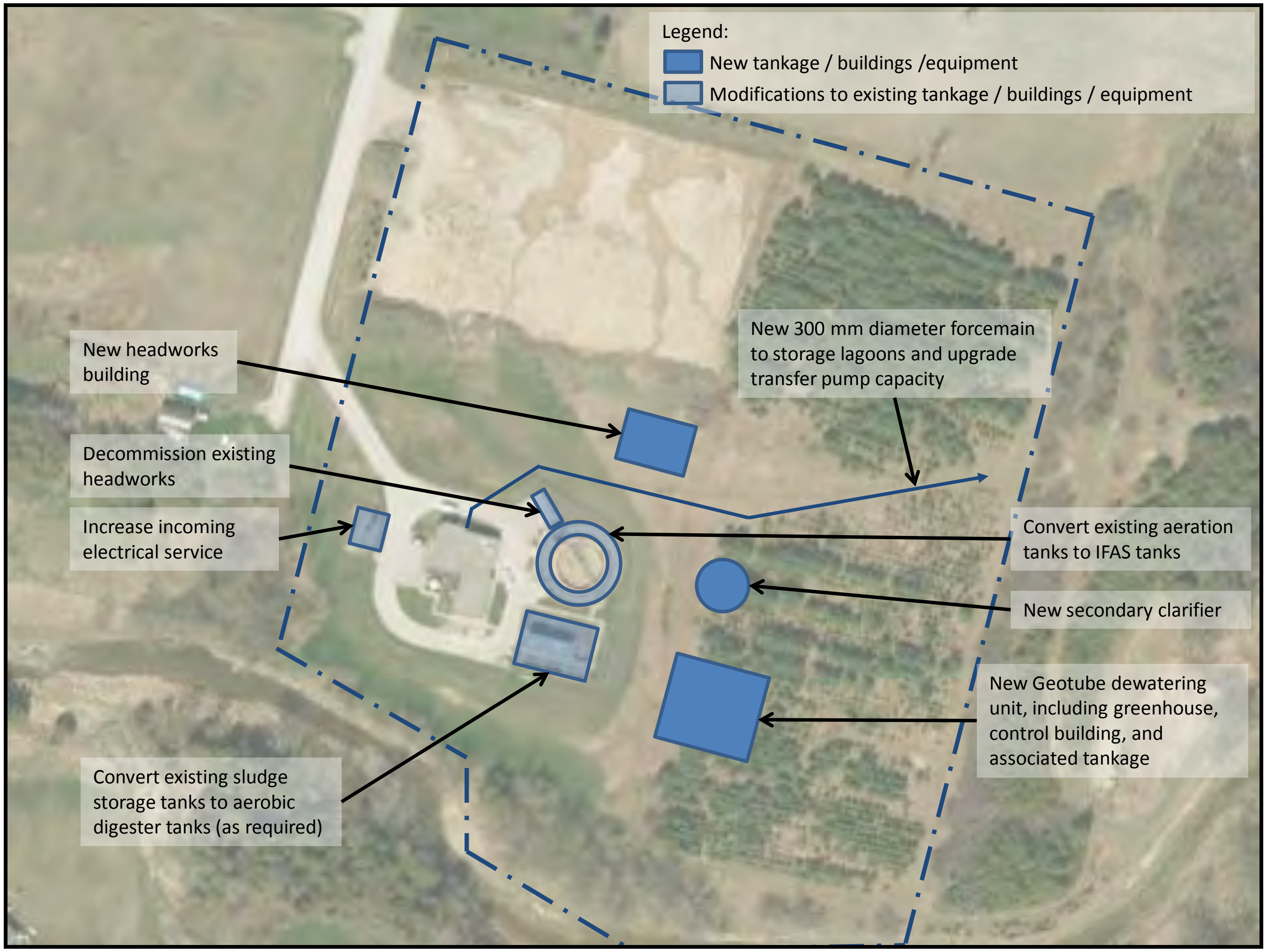


Figure A.6 Option 3B - Retrofit Existing EA to IFAS with new Geotextile Dewatering and Cake Storage

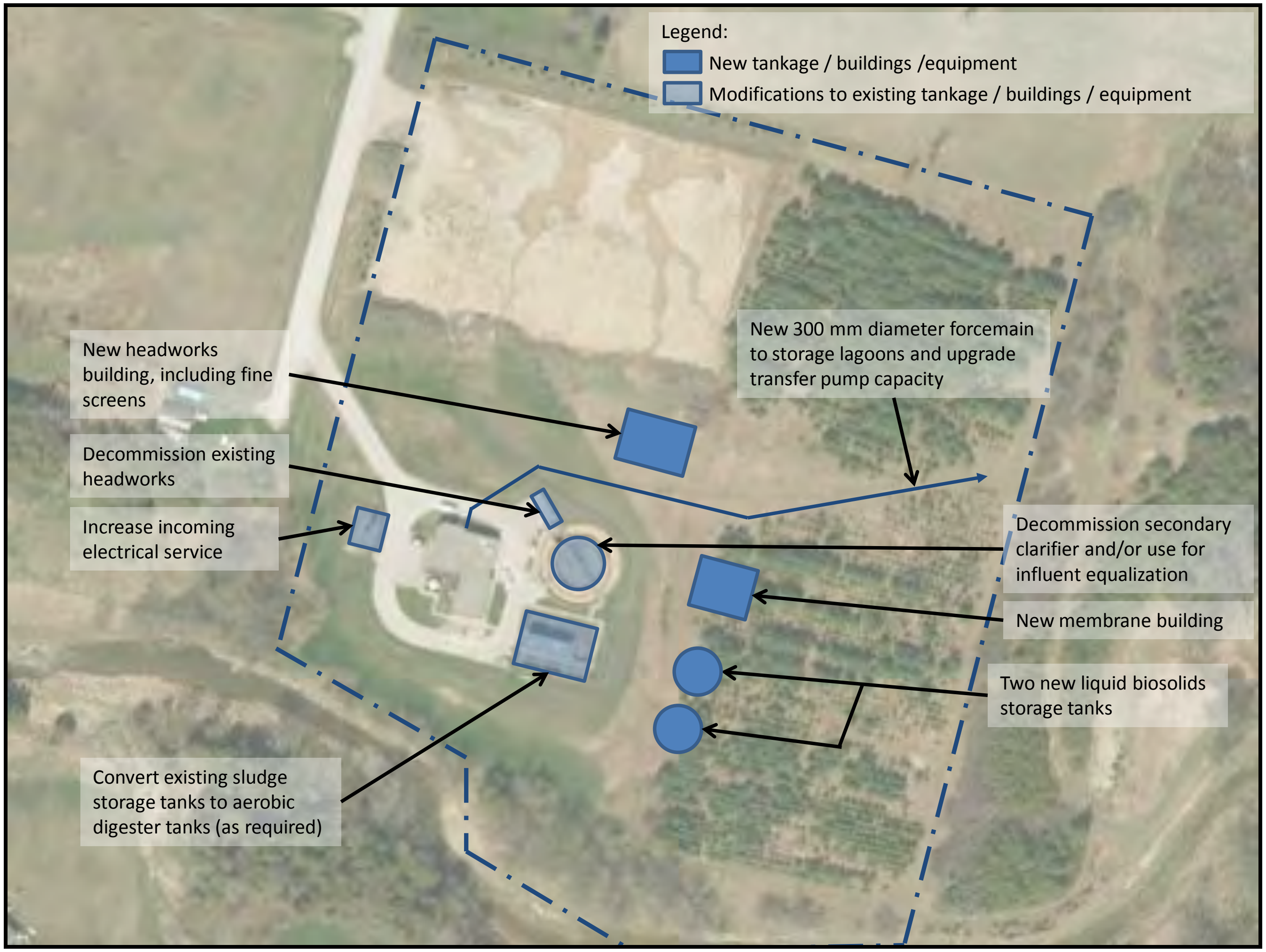


Figure A.7 Option 4A - Retrofit Existing EA to MBR with new Liquid Biosolids Storage

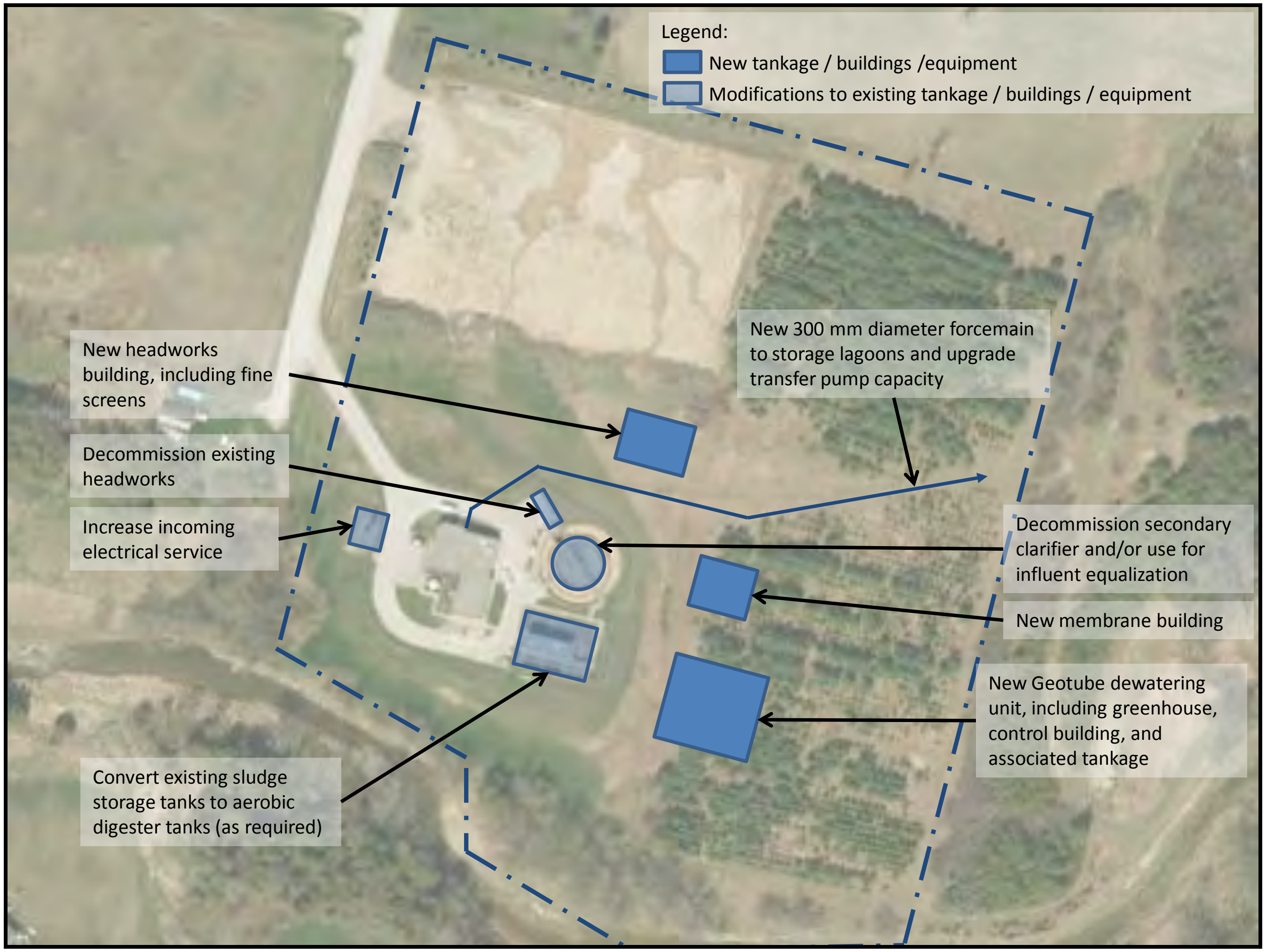


Figure A.8 Option 4B - Retrofit Existing EA to MBR with new Geotextile Dewatering and Cake Storage

52 Dewson St., Unit 2
Toronto, ON
M6H 1G6

11.0 Appendices

Appendix C

MCTS Screening for Impacts to Built Heritage and Cultural Heritage Landscapes
Check Sheet for Environmental Assessments

Screening for Impacts to Built Heritage and Cultural Heritage Landscapes

This checklist is intended to help proponents determine whether their project could affect known or potential cultural heritage resources. The completed checklist should be returned to the appropriate Heritage Planner or Heritage Advisor at the Ministry of Tourism and Culture.

Step 1 – Screening for Recognized Cultural Heritage Value

YES	NO	Unknown	
☐	☑	☐	1. Is the subject property designated or adjacent* to a property designated under the *Ontario Heritage Act*?
☐	☑	☐	2. Is the subject property listed on the municipal heritage register or a provincial register/list? (e.g. Ontario Heritage Bridge List)
☐	☑	☐	3. Is the subject property within or adjacent to a Heritage Conservation District?
☐	☑	☐	4. Does the subject property have an Ontario Heritage Trust easement or is it adjacent to such a property?
☐	☑	☐	5. Is there a provincial or federal plaque on or near the subject property?
☐	☑	☐	6. Is the subject property a National Historic Site?
☐	☑	☐	7. Is the subject property recognized or valued by an Aboriginal community?

Step 2 – Screening Potential Resources

YES	NO	Unknown	**Built heritage resources**
			1. Does the subject property or an adjacent property contain any buildings or structures **over forty years old**† that are:
☐	☑	☐	▪ Residential structures (e.g. house, apartment building, shanty or trap line shelter)
☐	☑	☐	▪ Farm buildings (e.g. barns, outbuildings, silos, windmills)
☐	☑	☐	▪ Industrial, commercial or institutional buildings (e.g. a factory, school, etc.)
☐	☑	☐	▪ Engineering works (e.g. bridges, water or communications towers, roads, water/sewer systems, dams, earthworks, etc.)
☐	☑	☐	▪ Monuments or Landmark Features (e.g. cairns, statues, obelisks, fountains, reflecting pools, retaining walls, boundary or claim markers, etc.)
☐	☑	☐	2. Is the subject property or an adjacent property associated with a known architect or builder?
☐	☑	☐	3. Is the subject property or an adjacent property associated with a person or event of historic interest?
☐	☑	☐	4. When the municipal heritage planner was contacted regarding potential cultural heritage value of the subject property, did they express interest or concern?
YES	**NO**	**Unknown**	**Cultural heritage landscapes**
			5. Does the subject property contain landscape features such as:
☐	☑	☐	▪ Burial sites and/or cemeteries
☐	☑	☐	▪ Parks or gardens
☐	☑	☐	▪ Quarries, mining, industrial or farming operations
☐	☑	☐	▪ Canals
☐	☑	☐	▪ Prominent natural features that could have special value to people (such as waterfalls, rocky outcrops, large specimen trees, caves, etc.)
☑	☐	☐	▪ Evidence of other human-made alterations to the natural landscape (such as trails, boundary or way-finding markers, mounds, earthworks, cultivation, non-native species, etc.)
☑	☐	☐	6. Is the subject property within a Canadian Heritage River watershed?
☐	☑	☐	7. Is the subject property near the Rideau Canal Corridor UNESCO World Heritage Site?
☐	☑	☐	8. Is there any evidence from documentary sources (e.g., local histories, a local recognition program, research studies, previous heritage impact assessment reports, etc.) or local knowledge or Aboriginal oral history, associating the subject property/ area with historic events, activities or persons?

Note:

If the answer is "yes" to any question in Step 1, proceed to Step 3.

The following resources can assist in answering questions in Step 1:

Municipal Clerk or Planning Department – Information on properties designated under the Ontario Heritage Act (individual properties or Heritage Conservation Districts) and properties listed on a Municipal Heritage register.

Ontario Heritage Trust – Contact the OHT directly regarding easement properties. A list of OHT plaques can be found on the website: Ontario Heritage Trust

Parks Canada – A list of National Historic Sites can be found on the website: Parks Canada

Ministry of Tourism and Culture – The Ontario Heritage Properties Database includes close to 8000 identified heritage properties. Note while this database is a valuable resource, it has not been updated since 2005, and therefore is not comprehensive or exhaustive. Ontario Heritage Properties Database

Local or Provincial archives

Local heritage organizations*, such as the municipal heritage committee, historical society, local branch of the Architectural Conservancy of Ontario, etc.*

Consideration should also be given to obtaining oral evidence of CHRs. For example, in many Aboriginal communities, an important means of maintaining knowledge of cultural heritage resources is through oral tradition.

If the answer is "yes" to any question in Step 2, an evaluation of cultural heritage value is required. If cultural heritage resources are identified, proceed to Step 3.

If the answer to any question in Step 1 or to questions 2-4, 6-8 in Step 2, is “unknown”, further research is required.

If the answer is "yes" to any of the questions in Step 3, a heritage impact assessment is required.

If uncertainty exists at any point, the services of a qualified person should be retained to assist in completing this checklist. All cultural heritage evaluation reports and heritage impact assessment reports must be prepared by a qualified person. Qualified persons means individuals (professional engineers, architects, archaeologists, etc.) having relevant, recent experience in the identification and conservation of cultural heritage resources. Appropriate evaluation involves gathering and recording information about the property sufficient to understand and substantiate its heritage value; determining cultural heritage value or interest based on the advice of qualified persons and with appropriate community input. If the property meets the criteria in Ontario Regulation 9/06 under the Ontario Heritage Act, it is a cultural heritage resource.

† The 40 year old threshold is an indicator of potential when conducting a preliminary survey for identification of cultural heritage resources. While the presence of a built feature that is 40 or more years old does not automatically signify cultural heritage value, it does make it more likely that the property could have cultural heritage value or interest. Similarly, if all the built features on a property are less than 40 years old, this does not automatically mean the property has no cultural heritage value. Note that age is not a criterion for designation under the *Ontario Heritage Act*.

Step 3 – Screening for Potential Impacts

YES	NO	Will the proposed undertaking/project involve or result in any of the following potential impacts to the subject property or an adjacent* property?
☐	☑	**Destruction, removal or relocation** of any, or part of any, heritage attribute or feature.
☑	☐	**Alteration** (which means a change in any manner and includes restoration, renovation, repair or disturbance).
☐	☑	**Shadows** created that alter the appearance of a heritage attribute or change the exposure or visibility of a natural feature or plantings, such as a garden.
☐	☑	**Isolation** of a heritage attribute from its surrounding environment, context or a significant relationship.
☐	☑	**Direct or indirect obstruction** of significant views or vistas from, within, or to a built or natural heritage feature.
☐	☑	**A change in land use** such as rezoning a battlefield from open space to residential use, allowing new development or site alteration to fill in the formerly open spaces.
☐	☑	**Soil disturbance** such as a change in grade, or an alteration of the drainage pattern, or excavation, etc.

* For the purposes of evaluating potential impacts of development and site alteration “adjacent” means: contiguous properties as well as properties that are separated from a heritage property by narrow strip of land used as a public or private road, highway, street, lane, trail, right-of way, walkway, green space, park, and/or easement or as otherwise defined in the municipal official plan.

425 York Street, Box 579
Palmerston, ON
N0G2P0

ADDENDUM:
Arthur Wastewater Treatment Plant
Cultural Heritage Impact Assessment Report
160 Preston St., Village of Arthur, Township of Wellington North, Ontario.
August 2016

Prepared for:

TOWNSHIP OF WELLINGTON NORTH
P.O. Box 125, 7490 Sideroad 7 W Kenilworth, Ontario N0G 3E0

Delivered to:

Stephen Nutt, M.Eng., P.Eng.
Senior Consultant
XCG CONSULTANTS LTD.
Suite 300, 2620 Bristol Circle Oakville, Ontario L6H 6Z7

Prepared By:

LRA HERITAGE

Lauren Archer, Heritage Consultant
425 York Street, Palmerston, ON, N0G2P0

425 York Street, Box 579
Palmerston, ON
N0G2P0

Executive Summary

LRA Heritage was retained by XCG Consultants Ltd., on the behalf of The Township of Wellington North (the Township) to prepare a Cultural Heritage Impact Assessment (CHIA) report for the Arthur Wastewater Treatment Plant (WWTP) in the Village of Arthur, Township of Wellington North, Ontario.

A CHIA was completed for the expansion of the Arthur WWTP in August of 2014. The scope of the proposed expansion has since increased to include upgrades to the Frederick Street Sewage Pumping Station (SPS), located at 176 Frederick St West, as well as the installation of a larger forcemain to facilitate transfer of wastewater from the Arthur WWTP to the holding ponds to the north of the Village of Arthur. The following addendum has been prepared to supplement the report titled *"Arthur Wastewater Treatment Plant, Cultural Heritage Impact Assessment Report, 160 Preston St., Village of Arthur, Township of Wellington North, Ontario, August 15th, 2014"* and builds upon the background research and findings within the subject report.

The Frederick Street SPS is not listed or designated under the Ontario Heritage Act (OHA), nor has it been identified by the Township of Wellington North as a property of interest. The proposed forcemain upgrade does not pass through any property within or adjacent to any known OHA designated or listed property. Due to the proximity of these properties to the Conestogo River, a tributary of the Grand River, which has been designated a Canadian Heritage River, a CHIA is required as a part of the Class EA process.

Through an evaluation of the Frederick Street SPS properties using Ontario Regulation 9/06 it has been determined that these properties do not have sufficient cultural heritage value to warrant designation. Additionally, they do not qualify as a significant cultural heritage landscape, apart from their relationship to the Conestogo River. The primary heritage concern for the expansion of the Arthur WWTP is the potential impacts to the cultural heritage values of the Grand River, especially the identified recreational uses.

A review of the proposed design alternatives indicates that no negative impacts to the recreational use of the site are anticipated, however, special consideration should be given during the detailed design phase of any future expansion of the Arthur WWTP. It is recommended that any landscaping that is disturbed by construction activities should be replaced to pre-construction conditions following the completion of the project, to retain the informal use of the property as a trail, and for nature and scenic appreciation be maintained in accordance with *The Grand Strategy: a shared management plan for the Grand River watershed*.

A preliminary assessment of the potential heritage value of properties adjacent to the forcemain replacement has identified eleven potential Cultural Heritage Resources (CHR 1 to CHR 11). Of

425 York Street, Box 579
Palmerston, ON
N0G2P0

these, CHR 1 to CHR 10 should be considered for listing on a municipal heritage register. Additional research and field investigation is recommended for these features at a later time, at the discretion of the municipality. Although the proposed forcemain replacement is not anticipated to impact these resources, special consideration should be made during the planning, staging and construction phases of the project, to ensure no unanticipated impacts. Mature trees form an important part of the historic streetscape, and should also be protected during all phases of work, and retained wherever possible.

1.0 Study Purpose and Approach

LRA Heritage was retained by XCG Consultants Ltd., on the behalf of The Township of Wellington North (the Township) to prepare a Cultural Heritage Impact Assessment (CHIA) report for the Arthur Wastewater Treatment Plant (WWTP) in the Village of Arthur, Township of Wellington North, Ontario.

A CHIA was completed for the expansion of the Arthur WWTP in August of 2014. The scope of the proposed expansion has grown to include upgrades to the Frederick Street Sewage Pumping Station (SPS), 176 Frederick St West, as well as the installation of a larger forcemain to facilitate transfer of wastewater from the Arthur WWTP to the holding ponds at the north end of the Village of Arthur.

The following addendum has been prepared to supplement the report titled *“Arthur Wastewater Treatment Plant, Cultural Heritage Impact Assessment Report, 160 Preston St., Village of Arthur, Township of Wellington North, Ontario, August 15th, 2014”* and builds upon the background research and findings within the subject report.

The Frederick Street SPS is not listed or designated under the Ontario Heritage Act (OHA), nor has it been identified by the Township of Wellington North as a property of interest. The proposed forcemain upgrade does not pass through any property within or adjacent to any known OHA designated or listed property. Due to the proximity of these properties to the Conestogo River, a tributary of the Grand River, which has been designated a Canadian Heritage River, a CHIA is required as a part of the Class EA process.

The following addendum has been prepared to evaluate the potential impacts of the proposed additional scope of the Arthur WWTP expansion on cultural heritage resources, and to make recommendations for an overall approach to the conservation of the heritage values of the potential resources. The addendum will:

- include a historical summary of the development of the additional properties through the review of both primary and secondary sources as well as historical mapping;
- include a survey of the cultural heritage landscapes and built heritage resources found within and adjacent to the properties;
- identify cultural heritage landscapes and built heritage resources within the additional properties through the evaluation of the properties against the criteria within Regulation 9/06, and using Ministry of Tourism, Culture and Sport Info Sheet #2: Cultural Heritage Landscapes (A part of Heritage Resources in the Land Use Planning Process (2006)) to identify and assess potential Cultural Heritage Landscapes;
- to identify potential impacts and sensitivities to change to cultural heritage landscapes and built heritage resources within the study area; and

- to make general mitigation recommendations for the implementation of the proposed alternatives.

A site visit was carried out on Friday May 13th, 2016, and Saturday, July 23rd, 2016 by Lauren Archer. All photographs, unless otherwise noted, were taken by LRA Heritage during these site visits. Barry Trood, Water & Sewer Superintendent, Water & Sewer Department, Township of Wellington North was consulted during May 13th site visit.

Map 1: Location Map - Arthur Wastewater Treatment Plant (WWTP) 160 Preston St. in the Village of Arthur, Township of Wellington North, Ontario.

2.0 Description of the Study Area

The Frederick Street Sewage Pumping Station (SPS) is located at 176 Frederick St West, in the Village of Arthur, Township of Wellington North, Wellington County, Ontario, Canada. The legal description is Part of Park Lot 2, North of Catherine Street, Crown Survey, Village of Arthur.

425 York Street, Box 579
Palmerston, ON
N0G2P0

The site is situated at the end of Frederick Street, adjacent to the Conestogo River, a major tributary of the Grand River system, draining the western half of the watershed with the Nith River. The topography of the site can be generally described as flat.

The study area also includes the path of the forcemain where it is to be replaced, and all properties adjacent to this proposed work. The forcemain connects the Arthur WWTP to the holding ponds, located at the north of the Town of Arthur. The forcemain runs through vacant land, alongside the Conestogo River, down the Frederick Street right of way, and connecting to the Holding Ponds via the Gordon Street right of way. The area also includes the roadway between the Frederick Street SPS, along Frederick Street to George Street, and a short segment from Eliza Street to the holding ponds along Gordon Street. (See Map 1)

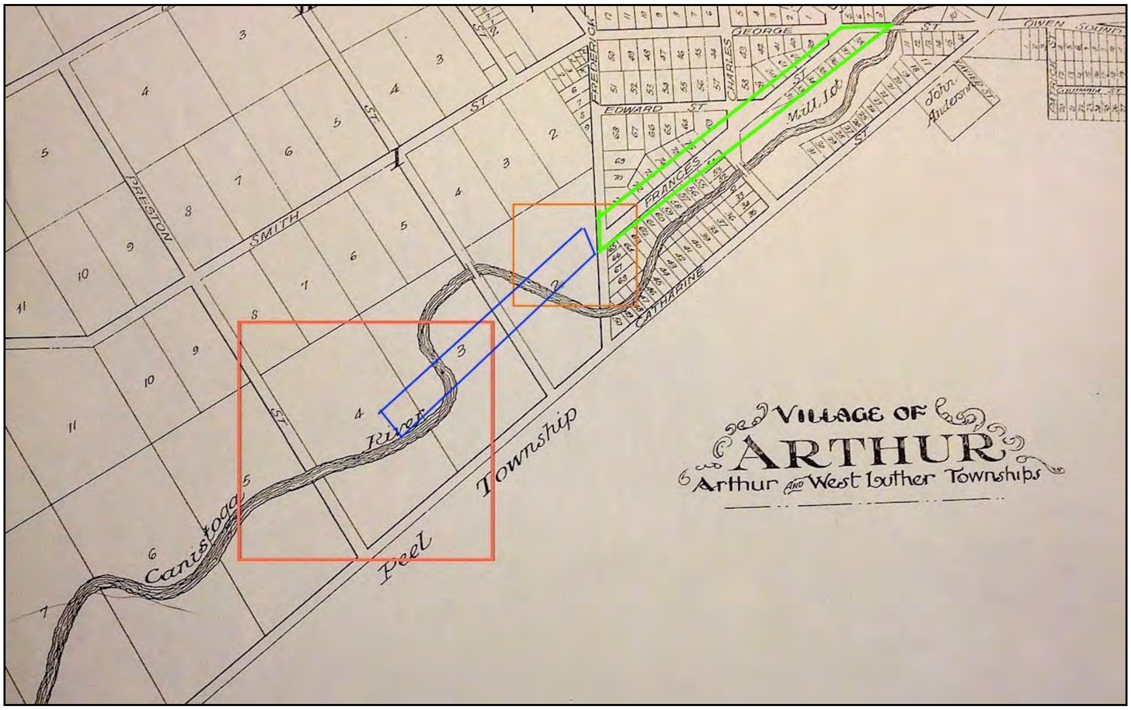
2.1 Summary of Historical Development

The Village of Arthur is located about 40 kilometers northwest of Guelph, on the Conestogo River, along the Canadian Pacific Railway, and at the junction of Highway 6 and Wellington Road 109. The Village of Arthur was first surveyed in 1841 by John McDonald, and officially surveyed in 1846 by D.B. Papineau. Frederick Street can be seen in its current location in all historical mapping, and was a part of the Village of Arthur survey completed in 1841. Arthur was incorporated as a village in 1872, at which time some additional land, surveyed by C.J. Wheelock was annexed. In 1851, a post office was opened and the first church and school were organized. Development was further encouraged in 1872 when a station of the Toronto, Grey and Bruce Railway was opened. In 1897, Arthur was one of the first villages in Ontario to be served by a power transmission line.

The establishment of saw and gristmills along the Conestogo River sparked growth in the community, in addition to its central location. By the early 1900s Arthur had flour, wollen, planing, shingle and flax mills. Arthur was a busy milling centre where area farmers carried their grain to the mills in the village and bartered for goods at the village stores.

The Village of Arthur, Township of Arthur, the Township of West Luther and the Town of Mount Forest, were amalgamated into the Corporation of the Township of Wellington North on January 1st, 1999. The Frederick Street SPS property was first sold as a part of a 14 ½ acre parcel from the Crown to Samuel Small as Park Lot No. 2, North of Catherine Street on September 16th, 1854. The property has been utilized as agricultural land. No structures appear on any of the Historical Atlas mapping. Records for the North side of Catherine Street are incomplete at the Land Registry Office. In January of 1963 an easement was enacted on the property allowing the Ontario Water Resources Commission to utilize the Frederick Street SPS and forcemain properties, including part of Park Lots 2, 3 and 4 North of Catherine Street, Crown Survey, Village of Arthur, for sewer or water main on the property.

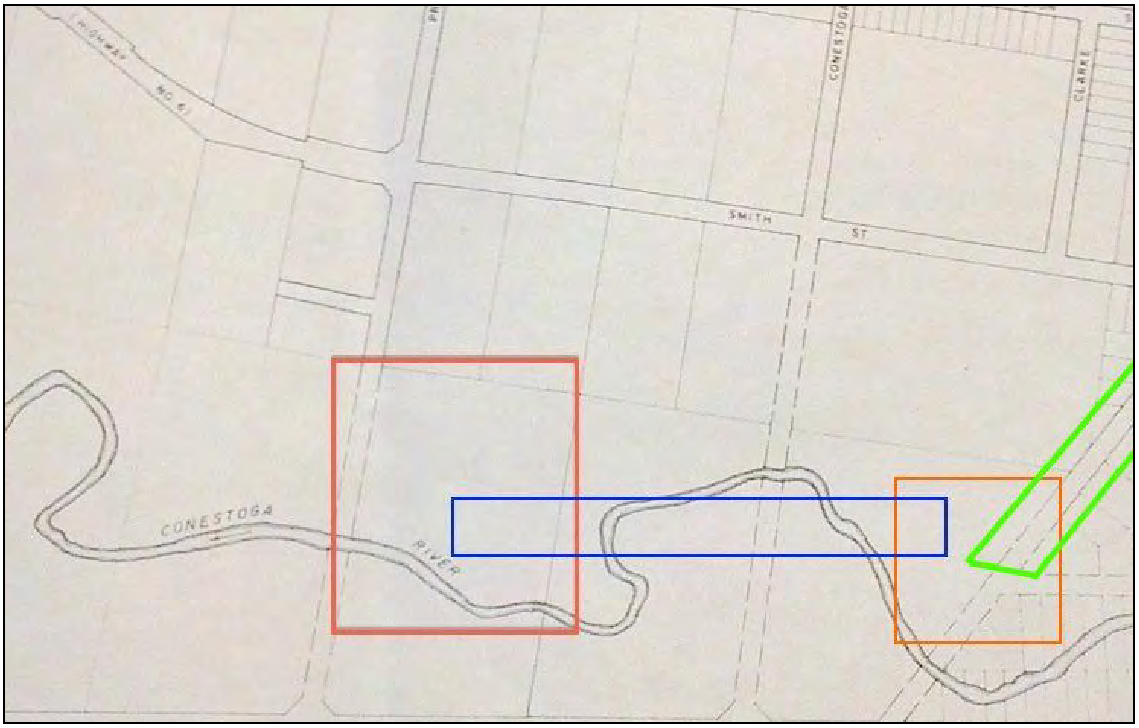
In 1970 the property at 176 Frederick St West was still vacant. Frederick Street did not yet extend south to its current location, however, the Plan for the VIllage of Arthur indicates that the road was intended to be extended.



Map 2: County of Wellington Historical Atlas Map, 1906, Village of Arthur, Park Lot 2, 3 and 4 North of Catherine, approximate future locations of Arthur WWTP, forcemain and Frederick Street SPS upgrades.

LRA HERITAGE

425 York Street, Box 579
Palmerston, ON
N0G2P0



Map 3: Arthur, plan of the village, 1970. County of Wellington Archives. Village of Arthur, Park Lot 2, 3 and 4 North of Catherine, approximate future locations of Arthur WWTP, forcemain and Frederick Street SPS upgrades.

The Frederick Street SPS property was sold to the Corporation of the Village of Arthur as Part of Park Lot 2, Northside of Catherine Street, Parts 1 and 2 on Plan 60R2919 on November 27th 1989 by Irene Pries for two dollars, for use as the future Frederick Street Sewage Pumping Station. In January of 2016 additional lands to the rear of the exiting Frederick Street SPS were transferred to the Corporation of the Township of Wellington North from Edward Michael Baratto and Margaret Ann Baratto from $45,000 for use in the proposed expansion of the Frederick Street SPS. This property is currently vacant, and shares a land use history with the existing Frederick Street SPS lot. (See Map 4)

2.2 Description of the Frederick Street Sewage Pumping Station

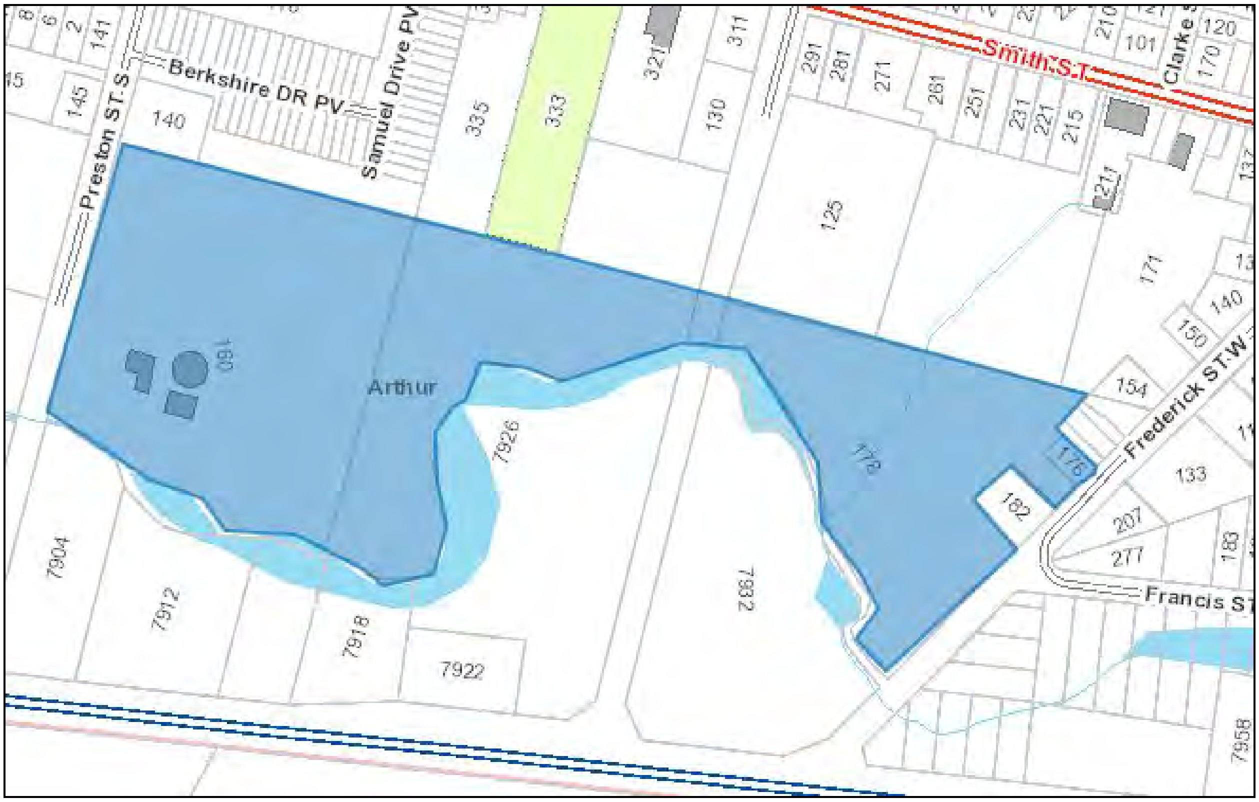
The Frederick Street Sewage Pumping Station (SPS) provides sewage pumping serviced for properties east of Preston Street in the Village of Arthur.

The Frederick Street Sewage Pumping Station was built on the site in 1989 as a part of the Arthur Wastewater Treatment Plant. The Frederick Street SPS is located on a property at the southern end of Frederick Street. The property is set back from Frederick Street by a gravel shoulder. Landscaping consists of trimmed short grass. The Frederick Street SPS is enclosed by a chain link fence with barbed wire, and a locked chain link gate. Poured concrete features on the site include the existing wet well and access to the forcemain.

425 York Street, Box 579
Palmerston, ON
N0G2P0

Figure 2: View of Frederick St SPS from Frederick Street, looking West, additional vacant lands beyond the fenceline.

The Frederick Street SPS was constructed for the purpose of providing sewage pumping services, and as a result, the structure erected on the site is utilitarian with few notable elements and are not remarkable from a physical or design perspective. The building which houses the sewage pumping facilities is a single storey story front gabled structure, clad in white aluminum siding. The front facade has a an asymmetrical painted black metal double door. The south facade has a single painted black metal door, and the rear facade has a large, black painted metal vent.



Map 4: Study area properties, between the Arthur WWTP and the Frederick Street SPS.

2.3 Description of the Forcemain Between the Arthur WWTP and Frederick Street SPS

The existing Arthur WWTP Forcemain connects the Frederick Street Pumping Station to the Arthur WWTP, and the Arthur WWTP to the holding ponds, located at the north of the Town of Arthur. The forcemain run through vacant land, alongside the Conestogo River, down the Frederick Street right of way, and connecting to the Holding Ponds via the Gordon Street right of way. (See Map 1) The forcemain lands directly adjacent to the Conestogo River will be included in the heritage assessment.

The property between the Arthur WWTP and the Frederick Street SPS, along the path of the forcemain, consists of hilly grassy lands, low-lying brush, and wooded areas of a mixture of deciduous and coniferous species. An informal trail network along the banks of the Conestogo River between the residential area on Frederick Street and the Town of Arthur Trails system has been established and is currently in use.

425 York Street, Box 579
Palmerston, ON
N0G2P0

Figure 3: Informal trails along the path of the forcemain between the Arthur WWTP and the Frederick St SPS, looking East.

2.3 Description of the Forcemain Between the Frederick Street SPS and the Holding Ponds

The forcemain between the Frederick Street SPS and the holding ponds runs along Frederick Street within the roadway, between Francis Street to Eliza Street, and along Gordon Street to the ponds. The forcemain along Frederick Street between George Street and Eliza Street was upgraded during the summer of 2015, accordingly this area was not assessed, and no further impacts are expected. (See Map 5)

425 York Street, Box 579
Palmerston, ON
N0G2P0

Figure 4: View of Frederick St, looking Northeast, towards George Street.

Frederick Street between Francis Street to George Street consists of an established, 19th century historic residential streetscape, lined with mature trees. The two-lane road has narrow gravel shoulders, does not have painted dividing lines and has no or little curb, which is consistent with traditional roadscapes. The road slopes upwards towards George Street, away from the river and includes narrow sidewalks on the south-east side.

Figure 5: View of Frederick St, looking Northeast, towards George Street.

Adjacent to the roadway, eleven potential cultural heritage resources were identified during fieldwork. (See Table 1). These generally consist of 19th to 20th century residential, institutional or agricultural buildings and are known or suspected of meeting one or more of the criteria identified in Section 3.1.

Figure 6: View of Gordon Street, looking East, towards the holding ponds.

425 York Street, Box 579
Palmerston, ON
N0G2P0

Gordon Street, from Eliza Street to the holding ponds is a gravel roadway, active agricultural fields, and a 19th century barn at the terminus. Several contemporary residences have been built along Gordon Street, evidence of recent development.

425 York Street, Box 579
Palmerston, ON
N0G2P0

Table 1: Identified properties adjacent to Frederick Street forcemain with cultural heritage potential.

Resource	*Type*	*Address*	*Recognition*	*Description*	*Picture*
CHR 1	Monument	Frederick Street West and George Street	This property is not listed on a heritage register nor is it designated Part IV or Part V under the Ontario Heritage Act.	This memorial property is made up of several plaques and dedications. In 1995 the current Wall of Honour was erected, with all plaques and names of Veterans. A granite monument to the Women Memorial Workers is also included, who erected the first memorial here in 1923. The Village of Arthur is known as "Canada's Most Patriotic Village". More than 14 percent of its citizens served in the Second World War, the highest ratio of involvement of any village in the country.	
CHR 2	Residential	107 Frederick Street West	This property is not listed on a heritage register nor is it designated Part IV or Part V under the Ontario Heritage Act.	A 1 1/2 storey Tudor Revival orange brick house. Notable features include the large enclosed porch, and the jerkinhead roof. The building is set back considerably from the road, and large flowering gardens line the walkways to the front and side doors. Mature trees line the lot. Appears as part of lot 50 in the 1906 Village of Arthur Historical Atlas Map.	

CHR 3	Institutional	100 Frederick Street West	This property is not listed on a heritage register nor is it designated Part IV or Part V under the Ontario Heritage Act.	A 1 storey vernacular-style front gable building. Clad in pressed metal faux-brick cladding, and painted pink. Centre gable chimney. Currently the location of the Highlands Youth for Christ The Door Youth Centre. Appears as Lot K in the 1906 Village of Arthur Historical Atlas Map.	
CHR 4	Residential	111 Frederick Street West	This property is not listed on a heritage register nor is it designated Part IV or Part V under the Ontario Heritage Act.	A 2 storey polychromatic brick Victorian-style home, with an L-shaped plan, front verandah and white painted gingerbread bargeboard. The entranceway features sidelights and an arched transom. The upper storey windows feature a soldier course lintels. The front gable section of the home includes a bay window, with arched windows. Flowering gardens are planted at the foundation. Appears as part of lot 50 in the 1906 Village of Arthur Historical Atlas Map.	

425 York Street, Box 579
Palmerston, ON
N0G2P0

CHR 5	Residential	110 Frederick Street West	This property is not listed on a heritage register nor is it designated Part IV or Part V under the Ontario Heritage Act.	A 1 1/2 storey Ontario Gothic style building, with polychromatic brick, and a gothic arched gable window. The lower level windows feature a soldier course lintel. The front elevation features an enclosed porch. Mature trees line the property, and flowering gardens surround the building. Appears as Lot 6 in the 1906 Village of Arthur Historical Atlas Map.	
CHR 6	Residential	130 Frederick Street West	This property is not listed on a heritage register nor is it designated Part IV or Part V under the Ontario Heritage Act.	A 2 storey Edwardian Foursquare style residence, with four-over one wood windows on the lower floor, a hipped metal roof, a covered verandah, and external side chimney. A small hipped dormer is located in the roofline on the front elevation. Gardens with flowers and shrubs surround the building, and mature trees line the lot. Appears as Lot 7 in the 1906 Village of Arthur Historical Atlas Map.	

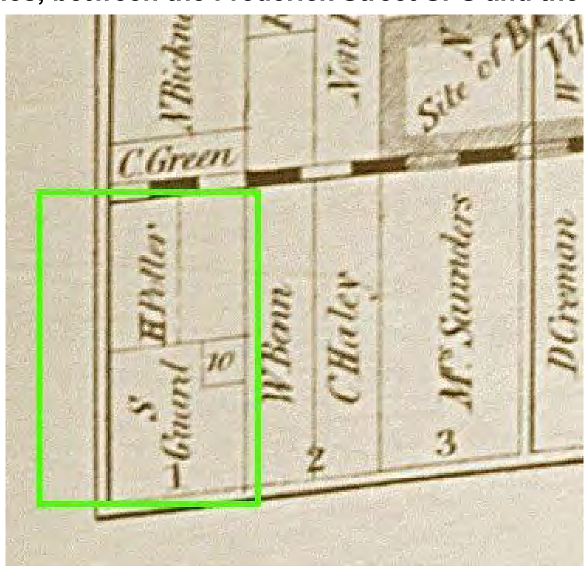
CHR 7	Residential	131 Frederick Street West	This property is not listed on a heritage register nor is it designated Part IV or Part V under the Ontario Heritage Act.	A 2 storey stone Victorian style home, with L-shaped plan, enclosed verandah, and a bay window with a balcony above it. The balcony has a cast iron railing, and an elliptical arched door to provide access. All windows have an elliptical stone arch above them, although contemporary rectangular windows have been installed. A contemporary, but sympathetic coach house is found to the northeast of the home. Gardens and shrubs line the foundation. This property is a corner lot. Appears as Lot 51 in the 1906 Village of Arthur Historical Atlas Map.	
CHR 8	Residential	140 Frederick Street West	This property is not listed on a heritage register nor is it designated Part IV or Part V under the Ontario Heritage Act.	A 2 storey rectangular vernacular stone home, possible previously classical revival. Features an enclosed front gabled porch, white picket fence, gardens and shrubs. Mature trees line the lot. Appears as Lot 8 in the 1906 Village of Arthur Historical Atlas Map.	

425 York Street, Box 579
Palmerston, ON
N0G2P0

CHR 9	Residential	150 Frederick Street West	This property is not listed on a heritage register nor is it designated Part IV or Part V under the Ontario Heritage Act.	A 1 1/2 storey post-war side gable bungalow, with rug brick, a centre chimney, and a large dormer addition. A small gabled garage is located to the rear of the property. A gravel side driveway is lined with flowering gardens. Mature trees line the lot.	
CHR 10	Residential	154 Frederick Street West	This property is not listed on a heritage register nor is it designated Part IV or Part V under the Ontario Heritage Act.	A 2 storey vernacular front gabled home, clad in horizontal siding. Lot features a paved driveway, a contemporary porch, gardens around the foundation of the building and mature trees. Appears as Lot 2 in the 1906 Village of Arthur Historical Atlas Map.	

CHR 11	Agricultural	213 Gordon Street	This property is not listed on a heritage register nor is it designated Part IV or Part V under the Ontario Heritage Act.	A traditional vernacular 19th century barn. Appears isolated from its original agricultural landscape setting, and is without a farmhouse. Located at the end of Gordon Street. Property was owned by H. Potter in the 1906 Historical Atlas Map of the Township of Luther.	

Map 5: Study area properties, between the Frederick Street SPS and the holding ponds.



Map 6: Extract from the 1906 Township of Luther Historical Atlas Map showing location of CHL 11

3.0 Evaluation of Potential Cultural Heritage Values

3.1 Cultural Heritage Evaluation Framework

To support the amendments of the Ontario Heritage Act in 2005, the province established a set of criteria for determining if a property is worthy of protection as a "designated" heritage property. Known as Ontario Regulation 9/06, this regulation states that a property may be designated under the Ontario Heritage Act if it meets one of the three following criteria:

> 1) "The property has design value or physical value because it,
>
> i) Is a rare, unique, representative or early example of a style, type, expression, material or construction method,
> ii) Displays a high degree of craftsmanship or artistic merit, or
> iii) Demonstrates a high degree of technical or scientific achievement.
>
> 2) The property has historical value or associative value because it,
>
> i) has direct associations with a theme, event, belief, person, activity, organization or institution that is significant to a community,
> ii) yields, or has the potential to yield, information that contributes to an understanding of a community or culture, or
> iii) demonstrates or reflects the work or ideas of an architect, artist, builder, designer or theorist who is significant to a community.
>
> 3) The property has contextual value because it,
>
> i) Is important in defining, maintaining or supporting the character of an area,
> ii) Is physically, functionally, visually or historically linked to its surroundings, or
> iii) Is a landmark." O.Reg. 9/06

Several investigative criteria are utilized during the field review to appropriately identify new cultural heritage resources. These investigative criteria are derived from provincial guidelines, definitions, and past experience. A built structure or landscape is identified as a cultural heritage resource that should be considered during the course of the environmental assessment. A resource will be considered if it is 40 years or older, and if the resource satisfies at least one of the one of the previously mentioned 9/06 criteria.

Use of a 40 year old threshold is a guiding principle when conducting a preliminary identification of cultural heritage resources (Ministry of Transportation 2006; Ministry of Transportation 2007; Ontario Realty Corporation 2007). While identification of a resource that is 40 years old or older does not confer outright heritage significance, this threshold provides a means to collect information about resources that may retain heritage value. Similarly, if a resource is slightly younger than 40 years old, this does not preclude the resource from retaining heritage value.

If a resource meets one or more of the categories, it will be identified as a cultural heritage resource and is subject to further research where appropriate and when feasible. (See Table 2) Typically, further historical research and consultation is required to determine the specific significance of the identified cultural heritage resource.

3.2 Evaluation of the Frederick Street SPS

This evaluation criteria has been applied to the Frederick Street SPS property to determine if it has any cultural heritage value under O. Reg. 9/06 and the Ontario Heritage Act:

1) Design Value or Physical Value:

The Frederick Street SPS was constructed for the purpose of providing sewage pumping services to the Village of Arthur in 1989. As a result, the structures erected on the site are functional and utilitarian. The property does not feature any notable elements and is not remarkable from a physical or design perspective, nor does the property display a high degree of craftsmanship.

2) Historical value or Associative Value:

The Frederick Street SPS has historical or associative connections to the development of the Village of Arthur.

It is known that the property at 160 Preston Street in the Village of Arthur was first sold as a part of a 14 ½ acre parcel from the Crown to Samuel Small on September 16th, 1854. The property was utilized as agricultural land and was still in use as agricultural land and was vacant. In January of 1963 an easement was enacted on the Frederick Street SPS and forcemain properties allowing the Ontario Water Resources Commission to utilize the property for sewer or water main on the property. The property was sold to the Corporation of the Village of Arthur as Part of Park Lot 2, Northside of Catherine Street, Parts 1 and 2 on Plan 60R2919 on November 27th 1989 by Irene Pries for two dollars, for use as the future Frederick Street Sewage Pumping Station.

Although the relationship between the sewage pumping station and the village it services is an understood association, it is not of cultural heritage significance. While the facility is evidence of the growth and development of Arthur, the sewage pumping station itself does not communicate this significance.

3) Contextual Value

The Frederick Street SPS is functionally linked to surrounding properties though its use as a sewage pumping station. This alone, however, does not constitute contextual value. While the Frederick Street SPS is associated with an identifiable community, it does not have cultural significance and does not define or support the character of the surrounding area. It is not, in an of itself, an important place or landmark to the local community.

This evaluation has determined that the Arthur Wastewater Treatment Plant property does not demonstrate sufficient cultural heritage value or interest for consideration for designation under O. Reg. 9/06 and.or the Ontario Heritage Act.

3.3 Forcemain-Adjacent Cultural Heritage Resource Assessment

Table 2: Forcemain-Adjacent Property Cultural Heritage Resource Assessment

Resource ID	***Type***	***Address***	***Potential Cultural Heritage Value***
CHR 1	Monument	Frederick Street West and George Street	This property may meet one or more of the criteria identified in O. Reg. 9/06, for historical, design or contextual value, and as such has potential cultural heritage value.
CHR 2	Residential	107 Frederick Street West	This property may meet one or more of the criteria identified in O. Reg. 9/06, for historical, design or contextual value, and as such has potential cultural heritage value.
CHR 3	Institutional	100 Frederick Street West	This property may meet one or more of the criteria identified in O. Reg. 9/06, for historical, design or contextual value, and as such has potential cultural heritage value.
CHR 4	Residential	111 Frederick Street West	This property may meet one or more of the criteria identified in O. Reg. 9/06, for historical, design or contextual value, and as such has potential cultural heritage value.
CHR 5	Residential	110 Frederick Street West	This property may meet one or more of the criteria identified in O. Reg. 9/06, for historical, design or contextual value, and as such has potential cultural heritage value.
CHR 6	Residential	130 Frederick Street West	This property may meet one or more of the criteria identified in O. Reg. 9/06, for historical, design or contextual value, and as such has potential cultural heritage value.

CHR 7	Residential	131 Frederick Street West	This property may meet one or more of the criteria identified in O. Reg. 9/06, for historical, design or contextual value, and as such has potential cultural heritage value.
CHR 8	Residential	140 Frederick Street West	This property may meet one or more of the criteria identified in O. Reg. 9/06, for historical, design or contextual value, and as such has potential cultural heritage value.
CHR 9	Residential	150 Frederick Street West	This property may meet one or more of the criteria identified in O. Reg. 9/06, for historical, design or contextual value, and as such has potential cultural heritage value.
CHR 10	Residential	154 Frederick Street West	This property may meet one or more of the criteria identified in O. Reg. 9/06, for historical, design or contextual value, and as such has potential cultural heritage value.
CHR 11	Agricultural	213 Gordon Street	No known cultural heritage value.

3.4 Cultural Heritage Landscape Evaluation

Cultural heritage landscapes are defined as key considerations for all planning applications in the Provincial Policy Statement (2005) and all planning matters *“shall be consistent with”* the policy statements issued under the Planning Act.

The PPS defines a “cultural heritage landscape” as:

> *“A defined geographical area of heritage significance that has been modified by human activities and is valued by a community. It involves a grouping(s) of heritage features such as structures, spaces, archaeological site and natural elements, which together form a significant type of heritage form, distinctive from its constituent elements or parts. Examples include, but are not limited to, heritage conservation districts designated under the Ontario Heritage Act, villages, parks, gardens, battlefields, main streets and neighbourhoods, cemeteries, trailways, and industrial complexes of heritage value.”*

The Ministry of Tourism, Culture and Sport has identified three main types of cultural heritage landscapes.

The three main types of cultural heritage landscapes are:

> *“Designed landscapes: those which have been intentionally designed e.g. a planned garden or in a more urban setting, a downtown square;*

> *Evolved landscapes: those which have evolved through the use by people and whose activities have directly shaped the landscape or area. This can include a "continuing" landscape where human activities and uses are still on-going, or evolving e.g. residential neighbourhoods or mainstreets; or in a "relict" landscape, where even though an evolutionary process may have come to an end, the landscape remains historically significant e.g. an abandoned mine site or settlement area; and,*
>
> *Associative landscapes: those with powerful religious, artistic, or cultural associations of the natural element, as well as those with material cultural evidence e.g. a sacred site within a natural environment or a historic battlefield."*

These definitions and criteria have been applied to the Sewage Pumping Station and the lands along the location of the existing forcemain, between the Arthur WWTP and the Frederick Street SPS property to determine if it could potentially be identified as a cultural heritage landscape.

The study area has been modified by human activities and the property is valued by the community for its use as a sewage pumping station, and for the informal recreational trails that run along the boundaries of the property.

Although in the previous section of this report it was determined that the property does not contain a significant grouping of heritage structures, the property does contain significant natural elements, including the Conestogo River, a tributary of the Grand River, a Canadian Heritage River. The informal recreational trail use and the Conestogo River natural features form a landscape distinctive from its constituent elements or parts.

However this landscape is indistinguishable from the greater cultural heritage landscape described in the designation of the Grand River as a Canadian Heritage River, and in an of itself does not exhibit a unique potential cultural heritage value separate from that of the Grand River. Accordingly, the study area can be assessed using the cultural heritage values identified in the Grand River heritage river designation.

3.5 Grand River Cultural Heritage Values

The Grand River was nominated to the Canadian Heritage Rivers System in 1990 and designated in 1994. The nomination was accepted because of the abundant nationally significant human heritage and recreational features which are associated with the river.

The outstanding heritage resources are represented by the following five themes:

- the watershed's cultural mosaic since the mid-nineteenth century;
- the strong association of Native Peoples with the watershed for thousands of years;

- the Grand River's industrial heritage;
- human adaptation to fluctuating river flows; and
- the many famous persons associated with the Grand River watershed.

The following five themes illustrate the range of quality recreational opportunities available in the Grand River watershed:

- water sports;
- nature/scenic appreciation;
- fishing and hunting;
- trails and corridors; and,
- human heritage appreciation.

4.0 Description of the Overall Project

To meet the servicing requirements of future growth in the service area, the Township has decided to explore the expansion of the Arthur WWTP beyond its existing rated capacity. This project has been identified as a Schedule C activity under the Municipal Class Environmental Assessment (Class EA) process.

The scope of the Arthur WWTP project has expanded to include improvements to the Frederick Street Sewage Pumping Station, to fulfil requirements for increased capacity and treatment requirements. (See Appendix B) These improvements as identified by XCG Consultants Ltd., include:

The expansion of the existing lot to include lands to the west of the existing property, this land is allocated for the construction of two new wet wells below grade, a new pretreatment system, also below grade, and a new generator above grade. The land may also be used for equalization, which will be confirmed during preliminary Phase 1 or Phase 2. The existing wet well will be converted into an emergency overflow chamber. The existing building on the site will be used to house the new pump controls.

The forcemain between the Frederick Street SPS and the holding ponds will be replaced with a wider diameter pipe along Frederick Street to George Street, and along Gordon Street from Eliza Street to the holding ponds. The forcemain between the Arthur WWTP and the Frederick St SPS may be upgraded if required.

5.0 Consideration of Impacts

5.1 Impacts to Frederick Street SPS

The subject properties have not been designated under Part IV or Part V of the Ontario Heritage Act, nor has it been listed on a heritage register under Section 27 of the Ontario Heritage Act. An assessment of the potential cultural heritage value of the properties indicate that there isn't sufficient heritage resources within the property to warrant designation nor to identify the property as being of heritage interest. Additionally, the properties are also not of interest as a cultural heritage landscape, aside from its relationship to the Conestogo River. There are no heritage resources identified in the Grand River heritage river inventory associated with the subject properties. As a result, there is no legislative reason from a cultural heritage perspective that the Arthur WWTP, Frederick Street SPS and forcemain cannot be altered. The proposed alterations will have no impact on any built heritage resources associated with the study area.

5.2 Impacts to Forcemain-Adjacent Cultural Heritage Resources

Table 3: Impacts to Cultural Heritage Resources and Conservation Recommendations

Resource	Address	Impact Assessment	Conservation Recommendations
CHR 1	Frederick Street West and George Street	The proposed forcemain replacement does not directly affect the subject monument. No impacts are anticipated to the identified resource.	Wellington North does not currently keep a register of heritage properties, nor has it designated any properties under Part IV or Part V of the Ontario Heritage Act.The subject monument should be considered for listing on the municipal register, and/or designation under Part IV of the Ontario Heritage Act, if determined to qualify through additional research. Although the proposed forcemain replacement is not anticipated to impact this resource, special consideration of this resource should be made during the planning, staging and construction phases of the project, to ensure no impacts.
CHR 2	107 Frederick Street West	The proposed forcemain replacement does not directly affect the subject building. No impacts are anticipated to the identified resource.	Wellington North does not currently keep a register of heritage properties, nor has it designated any properties under Part IV or Part V of the Ontario Heritage Act.The subject building should be considered for listing on the municipal register, and/or designation under Part IV of the Ontario Heritage Act, if determined to qualify through additional research. Although the proposed forcemain replacement is not anticipated to impact this resource, special consideration of this resource should be made during the planning, staging and construction phases of the project, to ensure no impacts. Mature trees should be protected during all phases of work, and retained wherever possible.
CHR 3	100 Frederick Street West	The proposed forcemain replacement does not directly affect the subject building.	Wellington North does not currently keep a register of heritage properties, nor has it designated any properties under Part IV or Part V of the Ontario Heritage Act.The subject building should be considered for listing on the municipal register, and/or designation under Part IV of the

		No impacts are anticipated to the identified resource.	Ontario Heritage Act, if determined to qualify through additional research. Although the proposed forcemain replacement is not anticipated to impact this resource, special consideration of this resource should be made during the planning, staging and construction phases of the project, to ensure no impacts. Mature trees should be protected during all phases of work, and retained wherever possible.
CHR 4	111 Frederick Street West	The proposed forcemain replacement does not directly affect the subject building. No impacts are anticipated to the identified resource.	Wellington North does not currently keep a register of heritage properties, nor has it designated any properties under Part IV or Part V of the Ontario Heritage Act.The subject building should be considered for listing on the municipal register, and/or designation under Part IV of the Ontario Heritage Act, if determined to qualify through additional research. Although the proposed forcemain replacement is not anticipated to impact this resource, special consideration of this resource should be made during the planning, staging and construction phases of the project, to ensure no impacts. Mature trees should be protected during all phases of work, and retained wherever possible.
CHR 5	110 Frederick Street West	The proposed forcemain replacement does not directly affect the subject building. No impacts are anticipated to the identified resource.	Wellington North does not currently keep a register of heritage properties, nor has it designated any properties under Part IV or Part V of the Ontario Heritage Act.The subject building should be considered for listing on the municipal register, and/or designation under Part IV of the Ontario Heritage Act, if determined to qualify through additional research. Although the proposed forcemain replacement is not anticipated to impact this resource, special consideration of this resource should be made during the planning, staging and construction phases of the project, to ensure no impacts. Mature trees should be protected during all phases of work, and retained wherever possible.
CHR 6	130 Frederick Street West	The proposed forcemain replacement does not directly affect the subject building. No impacts are anticipated to the identified resource.	Wellington North does not currently keep a register of heritage properties, nor has it designated any properties under Part IV or Part V of the Ontario Heritage Act.The subject building should be considered for listing on the municipal register, and/or designation under Part IV of the Ontario Heritage Act, if determined to qualify through additional research. Although the proposed forcemain replacement is not anticipated to impact this resource, special consideration of this resource should be made during the planning, staging and construction phases of the project, to ensure no impacts. Mature trees should be

425 York Street, Box 579
Palmerston, ON
N0G2P0

			protected during all phases of work, and retained wherever possible.
CHR 7	131 Frederick Street West	The proposed forcemain replacement does not directly affect the subject building. No impacts are anticipated to the identified resource.	Wellington North does not currently keep a register of heritage properties, nor has it designated any properties under Part IV or Part V of the Ontario Heritage Act.The subject building should be considered for listing on the municipal register, and/or designation under Part IV of the Ontario Heritage Act, if determined to qualify through additional research. Although the proposed forcemain replacement is not anticipated to impact this resource, special consideration of this resource should be made during the planning, staging and construction phases of the project, to ensure no impacts. Mature trees should be protected during all phases of work, and retained wherever possible.
CHR 8	140 Frederick Street West	The proposed forcemain replacement does not directly affect the subject building. No impacts are anticipated to the identified resource.	Wellington North does not currently keep a register of heritage properties, nor has it designated any properties under Part IV or Part V of the Ontario Heritage Act.The subject building should be considered for listing on the municipal register, and/or designation under Part IV of the Ontario Heritage Act, if determined to qualify through additional research. Although the proposed forcemain replacement is not anticipated to impact this resource, special consideration of this resource should be made during the planning, staging and construction phases of the project, to ensure no impacts. Mature trees should be protected during all phases of work, and retained wherever possible.
CHR 9	150 Frederick Street West	The proposed forcemain replacement does not directly affect the subject building. No impacts are anticipated to the identified resource.	Wellington North does not currently keep a register of heritage properties, nor has it designated any properties under Part IV or Part V of the Ontario Heritage Act.The subject building should be considered for listing on the municipal register, and/or designation under Part IV of the Ontario Heritage Act, if determined to qualify through additional research. Although the proposed forcemain replacement is not anticipated to impact this resource, special consideration of this resource should be made during the planning, staging and construction phases of the project, to ensure no impacts. Mature trees should be protected during all phases of work, and retained wherever possible.
CHR 10	154 Frederick Street West	The proposed forcemain replacement does not directly affect	Wellington North does not currently keep a register of heritage properties, nor has it designated any properties under Part IV or Part V of the Ontario Heritage Act.The subject building should be considered for listing on the

		the subject building. No impacts are anticipated to the identified resource.	municipal register, and/or designation under Part IV of the Ontario Heritage Act, if determined to qualify through additional research. Although the proposed forcemain replacement is not anticipated to impact this resource, special consideration of this resource should be made during the planning, staging and construction phases of the project, to ensure no impacts. Mature trees should be protected during all phases of work, and retained wherever possible.
CHR 11	213 Gordon Street	No impacts are anticipated to the identified resource.	The subject building does not retain cultural heritage value. No impacts are anticipated.

6.0 Mitigation Recommendations

Although the exact site plan and layout will be determined during the detailed design phase, it is expected that the expanded Frederick Street SPS site layout will be similar to those in the proposed alternatives found in Appendix B. Based on these design concepts, no negative impacts to the recreational uses and/or cultural heritage values of the Grand River are anticipated.

New construction that may have an impact on the recreational heritage attributes of the Conestogo River are to be mitigated through the design and layout of the new construction. Any landscaping that is disturbed by construction activities should be replaced to pre-construction conditions following the completion of the project. Township of Wellington North staff are to be involved during the design and construction to ensure no unanticipated adverse impacts to the recreational uses and/or cultural heritage values of the Grand River occur.

The Township of Wellington North does not currently keep a register of heritage properties, nor has it designated any properties under Part IV or Part V of the Ontario Heritage Act. A preliminary assessment of the potential heritage value of properties adjacent to the forcemain replacement has identified eleven potential Cultural Heritage Resources (CHR 1 to CHR 11). Of these, CHR 1 to CHR 10 should be considered for listing on a municipal heritage register. Additional research and field investigation is recommended for these features at a later time, at the discretion of the municipality. Although the proposed forcemain replacement is not anticipated to impact these resources, special consideration should be made during the planning, staging and construction phases of the project, to ensure no unanticipated impacts. Mature trees form an important part of the historic streetscape, and should also be protected during all phases of work, and retained wherever possible.

7.0 References

Chapman, Lyman John and Donald Fulton Putnam. The Physiography of Southern Ontario. Ontario Geological Survey Special Volume 2. Ontario: Ministry of Natural Resource, 1984.

Grand River Conservation Authority (GRCA). *The Grand Strategy: a shared management plan for the Grand River watershed.* Grand River Conservation Authority: Cambridge, ON. 1996

Grand River Conservation Authority (GRCA). *Canadian Heritage Rivers System Grand River Nomination Document .* Grand River Conservation Authority: Cambridge, ON. 1990

Grand River Conservation Authority (GRCA). *Canadian Heritage Rivers System Grand River Nomination Document .* Grand River Conservation Authority: Cambridge, ON. 1990

Mika, Nick, and Helma Mika. *Places in Ontario: Their Name Origins and History, Part I,* Belleville, Ont.: Mika Pub., 1983.

Ministry of Tourism, Culture and Sport. Heritage Resources in the Land Use Planning Process. Ontario: Queen's Printer for Ontario, 2006.

Ministry of Tourism, Culture and Sport. Heritage Property Evaluation. Ontario: Queen's Printer for Ontario, 2006.

Nelson, J.G. and Pauline O'Neill *Nominating the Grand as a Canadian heritage river : a study for the Canadian Heritage Rivers Board and the Grand River Conservation Authority*, Waterloo, Ont. Heritage Resources Centre, University of Waterloo, 1990.

Legislation

Ontario Heritage Act (2005)
Municipal Act (Ontario)
Planning Act (Ontario)
Provincial Policy Statement (2005)
Regulation 9/06 of the Ontario Heritage Act
County of Wellington Official Plan

Maps

County of Wellington Archives, Accession # A1976.87, Copy Print, Aerial View of Arthur, 1971

County of Wellington Archives, Abstracts, Wellington County Land Registry Collection, 1820-1958.

Cumming, Ross. Parsell, H & Co., Historical Atlas of Wellington County, 1877

Historical Atlas Publishing Company, Historical Atlas of Wellington County, 1906

J. M. Tomlinson and Associates, Accession # A1976.87.31C Arthur, Plan of the Village, 1970.

425 York Street, Box 579
Palmerston, ON
N0G2P0

11.0 Appendices

Appendix A:

Additional Site Visit Images

Figure 4: The Frederick St SPS from Frederick Street looking Northeast.

Figure 5: The Frederick St SPS from the adjacent property, looking north towards the south facade.

425 York Street, Box 579
Palmerston, ON
N0G2P0

Figure 6: The Frederick St SPS from the property to the rear, looking west towards the rear facade.

Figure 7: The Frederick St SPS looking north towards the south facade.

Figure 8: Informal trails along the path of the forcemain between the Arthur WWTP and the Frederick St SPS, looking East.

Figure 9: Informal trails along the path of the forcemain between the Arthur WWTP and the Frederick St SPS, looking East.

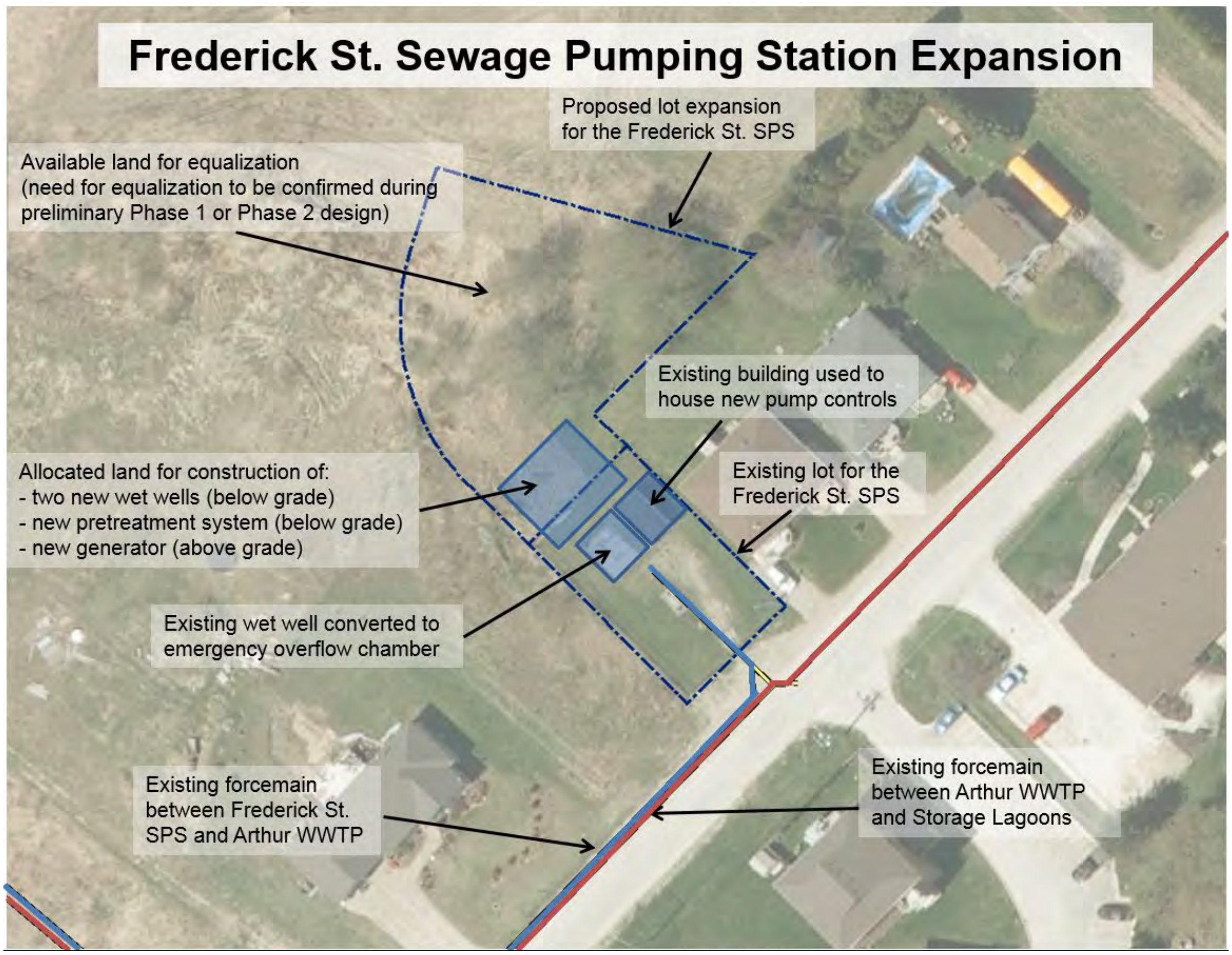
Figure 10: View of the Conestogo River from the Informal trails along the path of the forcemain between the Arthur WWTP and the Frederick St SPS, looking Southwest.

Figure 11: View of the Conestogo River from the Informal trails along the path of the forcemain between the Arthur WWTP and the Frederick St SPS, looking Southwest.

11.0 Appendices

Appendix B:

Frederick Street SPS Preferred Alternative
Design Concept



425 York Street, Box 579
Palmerston, ON
N0G2P0

11.0 Appendices

Appendix C

MCTS Screening for Impacts to Built Heritage and Cultural Heritage Landscapes
Check Sheet for Environmental Assessments

Screening for Impacts to Built Heritage and Cultural Heritage Landscapes

This checklist is intended to help proponents determine whether their project could affect known or potential cultural heritage resources. The completed checklist should be returned to the appropriate Heritage Planner or Heritage Advisor at the Ministry of Tourism and Culture.

Step 1 – Screening for Recognized Cultural Heritage Value

YES	NO	Unknown	
☐	☑	☐	1. Is the subject property designated or adjacent* to a property designated under the *Ontario Heritage Act*?
☐	☑	☐	2. Is the subject property listed on the municipal heritage register or a provincial register/list? (e.g. Ontario Heritage Bridge List)
☐	☑	☐	3. Is the subject property within or adjacent to a Heritage Conservation District?
☐	☑	☐	4. Does the subject property have an Ontario Heritage Trust easement or is it adjacent to such a property?
☐	☑	☐	5. Is there a provincial or federal plaque on or near the subject property?
☐	☑	☐	6. Is the subject property a National Historic Site?
☐	☑	☐	7. Is the subject property recognized or valued by an Aboriginal community?

Step 2 – Screening Potential Resources

YES	NO	Unknown	**Built heritage resources**
			1. Does the subject property or an adjacent property contain any buildings or structures **over forty years old**[†] that are:
☐	☑	☐	▪ Residential structures (e.g. house, apartment building, shanty or trap line shelter)
☐	☑	☐	▪ Farm buildings (e.g. barns, outbuildings, silos, windmills)
☐	☑	☐	▪ Industrial, commercial or institutional buildings (e.g. a factory, school, etc.)
☐	☑	☐	▪ Engineering works (e.g. bridges, water or communications towers, roads, water/sewer systems, dams, earthworks, etc.)
☐	☑	☐	▪ Monuments or Landmark Features (e.g. cairns, statues, obelisks, fountains, reflecting pools, retaining walls, boundary or claim markers, etc.)
☐	☑	☐	2. Is the subject property or an adjacent property associated with a known architect or builder?
☐	☑	☐	3. Is the subject property or an adjacent property associated with a person or event of historic interest?
☐	☑	☐	4. When the municipal heritage planner was contacted regarding potential cultural heritage value of the subject property, did they express interest or concern?
YES	**NO**	**Unknown**	**Cultural heritage landscapes**
			5. Does the subject property contain landscape features such as:
☐	☑	☐	▪ Burial sites and/or cemeteries
☐	☑	☐	▪ Parks or gardens
☐	☑	☐	▪ Quarries, mining, industrial or farming operations
☐	☑	☐	▪ Canals
☐	☑	☐	▪ Prominent natural features that could have special value to people (such as waterfalls, rocky outcrops, large specimen trees, caves, etc.)
☑	☐	☐	▪ Evidence of other human-made alterations to the natural landscape (such as trails, boundary or way-finding markers, mounds, earthworks, cultivation, non-native species, etc.)
☑	☐	☐	6. Is the subject property within a Canadian Heritage River watershed?
☐	☑	☐	7. Is the subject property near the Rideau Canal Corridor UNESCO World Heritage Site?
☐	☑	☐	8. Is there any evidence from documentary sources (e.g., local histories, a local recognition program, research studies, previous heritage impact assessment reports, etc.) or local knowledge or Aboriginal oral history, associating the subject property/ area with historic events, activities or persons?

<u>Note:</u>

If the answer is "yes" to any question in Step 1, proceed to Step 3.

The following resources can assist in answering questions in Step 1:

- ***Municipal Clerk or Planning Department*** – Information on properties designated under the Ontario Heritage Act (individual properties or Heritage Conservation Districts) and properties listed on a Municipal Heritage register.
- ***Ontario Heritage Trust*** – Contact the OHT directly regarding easement properties. A list of OHT plaques can be found on the website: Ontario Heritage Trust
- ***Parks Canada*** – A list of National Historic Sites can be found on the website: Parks Canada
- ***Ministry of Tourism and Culture*** – The Ontario Heritage Properties Database includes close to 8000 identified heritage properties. Note while this database is a valuable resource, it has not been updated since 2005, and therefore is not comprehensive or exhaustive. Ontario Heritage Properties Database
- ***Local or Provincial archives***
- ***Local heritage organizations****, such as the municipal heritage committee, historical society, local branch of the Architectural Conservancy of Ontario, etc.*
- Consideration should also be given to obtaining oral evidence of CHRs. For example, in many Aboriginal communities, an important means of maintaining knowledge of cultural heritage resources is through oral tradition.

If the answer is "yes" to any question in Step 2, an evaluation of cultural heritage value is required. If cultural heritage resources are identified, proceed to Step 3.

If the answer to any question in Step 1 or to questions 2-4, 6-8 in Step 2, is "unknown", further research is required.

If the answer is "yes" to any of the questions in Step 3, a heritage impact assessment is required.

If uncertainty exists at any point, the services of a qualified person should be retained to assist in completing this checklist. All cultural heritage evaluation reports and heritage impact assessment reports <u>must</u> be prepared by a qualified person. Qualified persons means individuals (professional engineers, architects, archaeologists, etc.) having relevant, recent experience in the identification and conservation of cultural heritage resources. Appropriate evaluation involves gathering and recording information about the property sufficient to understand and substantiate its heritage value; determining cultural heritage value or interest based on the advice of qualified persons and with appropriate community input. If the property meets the criteria in Ontario Regulation 9/06 under the Ontario Heritage Act, it is a cultural heritage resource.

† The 40 year old threshold is an indicator of potential when conducting a preliminary survey for identification of cultural heritage resources. While the presence of a built feature that is 40 or more years old does not automatically signify cultural heritage value, it does make it more likely that the property could have cultural heritage value or interest. Similarly, if all the built features on a property are less than 40 years old, this does not automatically mean the property has no cultural heritage value. Note that age is not a criterion for designation under the *Ontario Heritage Act*.

Step 3 – Screening for Potential Impacts

YES	NO	**Will the proposed undertaking/project involve or result in any of the following potential impacts to the subject property or an adjacent* property?**
☐	☑	**Destruction, removal or relocation** of any, or part of any, heritage attribute or feature.
☑	☐	**Alteration** (which means a change in any manner and includes restoration, renovation, repair or disturbance).
☐	☑	**Shadows** created that alter the appearance of a heritage attribute or change the exposure or visibility of a natural feature or plantings, such as a garden.
☐	☑	**Isolation** of a heritage attribute from its surrounding environment, context or a significant relationship.
☐	☑	**Direct or indirect obstruction** of significant views or vistas from, within, or to a built or natural heritage feature.
☐	☑	**A change in land use** such as rezoning a battlefield from open space to residential use, allowing new development or site alteration to fill in the formerly open spaces.
☑	☐	**Soil disturbance** such as a change in grade, or an alteration of the drainage pattern, or excavation, etc.

* For the purposes of evaluating potential impacts of development and site alteration "adjacent" means: contiguous properties as well as properties that are separated from a heritage property by narrow strip of land used as a public or private road, highway, street, lane, trail, right-of way, walkway, green space, park, and/or easement or as otherwise defined in the municipal official plan.