

County of Brant

St. George Wastewater Servicing Schedule C Class Environmental Assessment Study

Environmental Study Report

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T000280A

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County of Brant

Environmental Study Report

**St. George Wastewater Servicing
Municipal Class Environmental Assessment
Schedule C
Project no T000280A**

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List of Acronyms

ACS	Assimilative Capacity Study
ADF	Average Daily Flow
cBOD	Carbonaceous biochemical oxygen demand
CCT	Chlorine Contact Tank
DO	Dissolved Oxygen
EA	Environmental Assessment
ECA	Environmental Compliance Approval
GRCA	Grand River Conservation Authority
HRT	Hydraulic Retention Time
MLSS	Mixed Liquor Suspended Solids
MECP	Ministry of the Environment, Conservation and Parks
OCWA	Ontario Clean Water Agency
OP	Official Plan
ORP	Oxygen Reduction Potential
PHF	Peak Hourly Flow
PWQO	Provincial Water Quality Objectives
RAS	Return Activated Sludge
SWD	Side Water Depth
SLR	Solids Loading Rate
SOR	Surface Overflow Rate
SRT	Solids Retention Time
SSWQO	Site Specific Water Quality Objective
TAN	Total Ammonia Nitrogen
TKN	Total Kjeldahl Nitrogen
TM	Technical Memorandum
TP	Total Phosphorous
TSS	Total Suspended Solids
WAS	Waste Activated Sludge
WPCP	Water Pollution Control Plant

1. Introduction

1.1 Background

The community of St. George, located in the County of Brant (the County), is currently serviced by the St. George Water Pollution Control Plant (WPCP). The St. George WPCP is approaching its approved capacity and an increase in wastewater treatment capacity in the St. George service area is required to meet the growing community's wastewater treatment needs. The existing plant also has process capacity limitations that prevent the plant from providing its approved capacity. Sludge and biosolids management processes at the St. George WPCP are also at or near capacity.

In light of these issues, the County undertook a Schedule C Class Environmental Assessment (Class EA) study to determine the preferred wastewater treatment and biosolids management solution for the St. George service area to provide reliable, long-term operation and performance. The St. George WPCP wastewater treatment and biosolids management is collectively referred to herein as the St. George WPCP Wastewater Service. CIMA Canada Inc. (CIMA+) was retained by the County to undertake the Class EA Study.

1.2 Objectives of the Class EA Study

The main objective of this Class EA Study is:

To objectively evaluate wastewater treatment and biosolids management alternatives and design concepts and identify the preferred wastewater treatment and biosolids management solution to provide the necessary infrastructure improvements for the St. George settlement area in the County. The preferred wastewater treatment and biosolids management design concept should be sustainable, technically and environmentally sound and economically mindful in terms of capital and operating costs.

Other Class EA objectives include:

- To provide appropriate consultation with all affected and interested parties, including participation of a broad range of stakeholders to allow for the sharing of ideas, education, testing of creative solutions and developing alternatives; and
- To document the study process in compliance with all phases of the Municipal Class EA planning process.

This Environmental Study Report (ESR) completes Phases 3 and 4 of the Class EA requirements and provides a description of the preferred wastewater servicing design concept for wastewater servicing solution for the St. George settlement area.

1.3 Objectives of the Environmental Study Report

This Environmental Study Report (ESR) describes the planning and decision-making process followed during the Class EA Study for the St. George Wastewater Servicing. The ESR describes the following:

- Various alternative solutions and design concepts considered for wastewater servicing, including wastewater treatment and biosolids management, in the St. George area,
- Evaluation methodology and evaluation criteria used to assess the different alternatives,
- Anticipated potential impacts,
- Proposed mitigation measures associated with the alternatives,
- Rationale for the selection of the preferred solution and implementation plans, and
- Public and agency consultation records and feedback.

The Class EA process also gives members of the public, interest groups and review agencies a chance to review the ESR during a 30-day review period. The 30-day review period gives individuals an opportunity to raise outstanding concerns regarding the project with the County. If issues cannot be resolved by the County during this period, an individual may request that Minister of the Environment takes action. If the concern is related to Aboriginal and treaty rights, the Minister may make an order for the project to comply with Part II of the Environmental Assessment Act by requiring the project to follow the requirements of an individual environmental assessment. The request must be submitted in writing to the Minister and the Director of the Environmental Assessment and Permissions Branch. Provided that no Part II Order requests are received within the 30-day review period, the project will proceed through the detailed design and construction phases as outlined in the ESR.

1.4 Report Outline

This report was prepared to meet the requirements of the Ontario Municipal Engineer's Association (MEA) Municipal Class EA Planning Process (October 2000, as amended in 2007, 2011 & 2015). This report combines all phases of the planning process under one cover and includes steps that are considered essential for meeting the requirements of the Environmental Assessment Act (EAA). The report includes the following sections:

- **Section 1: Introduction** – Provides background information leading to the initiation of this study, providing the objectives of both the Class EA Study and the ESR, and describes the format of this report.

- **Section 2: Class Environmental Assessment Process** – Provides a summary description of the framework and activities to be completed to meet the Municipal Class EA process requirements.
- **Section 3: Public and Agency Consultation Process** – Describes the consultation program with the public and agencies, and public engagement activities
- **Section 4: Study Area Overview** – Presents an overview of the study area and its social and environmental characteristics
- **Section 5: Existing St. George Wastewater Servicing** – Presents a review of the existing wastewater treatment process and biosolids management at St. George WPCP, and an assessment on the plant's current capacity
- **Section 6: Wastewater Servicing Design Criteria** – Presents the design criteria for wastewater treatment and biosolids management
- **Section 7: Class EA Phase 1 – Identification of Problem/Opportunity** – Presents the problem/opportunity statement for this Class EA Study
- **Section 8: Class EA Evaluation Methodology** – Presents the evaluation methodology used for the St. George Class EA to select the preliminary preferred wastewater treatment and biosolids management alternatives from a long-list of alternatives
- **Section 9: Class EA Phase 2 – Development and Evaluation of Wastewater Servicing Alternative Solutions** – comprehensive review of wastewater treatment and biosolids management technologies by providing information on a long list of alternatives. A short list of feasible alternatives are identified for the wastewater servicing of St. George based on a set of must-meet criteria.
- **Section 10: Class EA Phase 3 – Development and Evaluation of Alternative Design Concepts** – Presents the design concept and high level cost estimate for the short listed wastewater treatment and biosolids management alternatives
- **Section 11: Preferred Wastewater Servicing Design Concept** – Presents a summary of the preferred wastewater treatment and biosolids management alternative design concept
- **Section 12: Proposed Mitigation of Potential Impacts and Monitoring** – Identifies potential impacts and the recommends mitigation measures
- **Section 13: Class EA Phase 4 – Class EA Report Conclusions and Recommendations** – Presents the conclusions of the ESR and the recommendations.
- **Section 14: References** – Lists the key sources of information and reports that were used and consulted during the Class EA study process and in the preparation of the Class EA Report.

2 Class Environmental Assessment Process

2.1 Municipal Class Environmental Assessment

The St. George Wastewater Servicing Class EA Study has been undertaken in accordance with the requirements of the Ontario Environmental Assessment Act (October 2000, as amended in 2007 and 2011 & 2015). The Class EA is an approved decision-making and planning process to ensure that potential effects of a project are identified and managed prior to implementation. It applies to public sector projects that have predictable and manageable environmental effects, including municipal water and wastewater projects.

The Class EA process includes five (5) phases that must be followed to ensure that the best approach is identified to address a specific problem, requiring the evaluation of possible solutions, design concepts, and recommends the best approach based on a comprehensive evaluation of environmental effects and how to minimize them. As shown in **Figure 1**, the five phases include:

- Phase 1 – Define the Problem
- Phase 2 – Identify and Evaluate Alternative Solutions to Determine a Preferred Solution
- Phase 3 – Examine Alternative Methods of Implementation of the Preferred Solution
- Phase 4 – Document the Planning, Design, and Consultation Process
- Phase 5 – Implementation and Monitoring

Public and agency consultation is an important part of the Class EA planning process. Gaining input from individuals and groups can help identify project concerns early, and to find ways to address concerns wherever possible. Public consultation is carried out at key stages of the Class EA process to allow time to review and provide input related to the project.

Projects subject to the Class EA process are classified into three (3) possible “schedules” (or categories), depending on the degree of expected impacts:

- Schedule A projects represent minor operational and maintenance activities and are approved without the need of further assessment.
- Schedule A+ projects also represent minor activities and are pre-approved but require public notification prior to project implementation.
- Schedule B projects require screening of alternative solutions based on their environmental impacts. Phases 1 and 2 must be completed and are typically presented in a report with a Notice of Completion from the project proponent,

followed by a 30-day public review period. If no significant impacts are identified and there are no requests for an Order by the Minister under Part II related to Aboriginal or Treaty rights, then the Schedule B projects are approved and may proceed to Phase 5.

- Schedule C projects typically have greater potential to impact the environment and must complete all five phases of the Class EA planning process. In addition to Phases 1 and 2, Phase 3 involves the assessment of alternative solutions followed by a public consultation of the preferred design concept. Phase 4 typically entails the preparation of the Environment Study Report (ESR) to be filed for public review. As long as no significant impacts are identified and no Part II Order related to Aboriginal or Treaty rights is received from the Minister, then Schedule C projects are approved and proceed to Phase 5.

This Class EA Study was carried out as a Schedule C Class EA undertaking with completion of Phases 1 through 3. Preparation of this report completes Phase 4 of the Class EA process.

2.2 The St. George Wastewater Servicing Class Environmental Assessment Process

The planning and development of wastewater servicing for the St. George area has been conducted as a Schedule C undertaking under the Municipal Class EA process. Phase 1 (Identify the Problem), Phase 2 (Identify and Assess Alternative Solutions) and Phase 3 (Identification and Assessment of Alternative Methods/Design Concepts and Selection of Preferred Alternative) have been carried out accordingly for this Class EA Study. Review agencies and the public were consulted at several points in this project to solicit input and comments.

This document comprises Phase 4 (completion of an ESR) of the Class EA process. The ESR will be placed on the public record for at least 30 calendar days for review by the public. Notification to the public and the agencies will be through the issuing of a Notice of Completion.

2.2.1 Project Team Members

A project team was established to guide the planning decisions that drove the St. George Wastewater Servicing Class EA Study. Key members of the Project Team are:

- Joe Murphy, County of Brant (2014 – Ongoing)
- Alex Davidson, County of Brant (2015 – Ongoing)
- Lee Robinson, County of Brant (2014 – 2015)

- Eric Tuson, CIMA+ (2015 – 2019)
- Sandra Rodriguez, CIMA+ (2014 – Ongoing)
- Troy Briggs, CIMA+ (2017 – Ongoing)
- Erin Longworth, CIMA+ (2015 – 2019)
- Deborah Ross, CIMA+ (2014 – 2015)

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

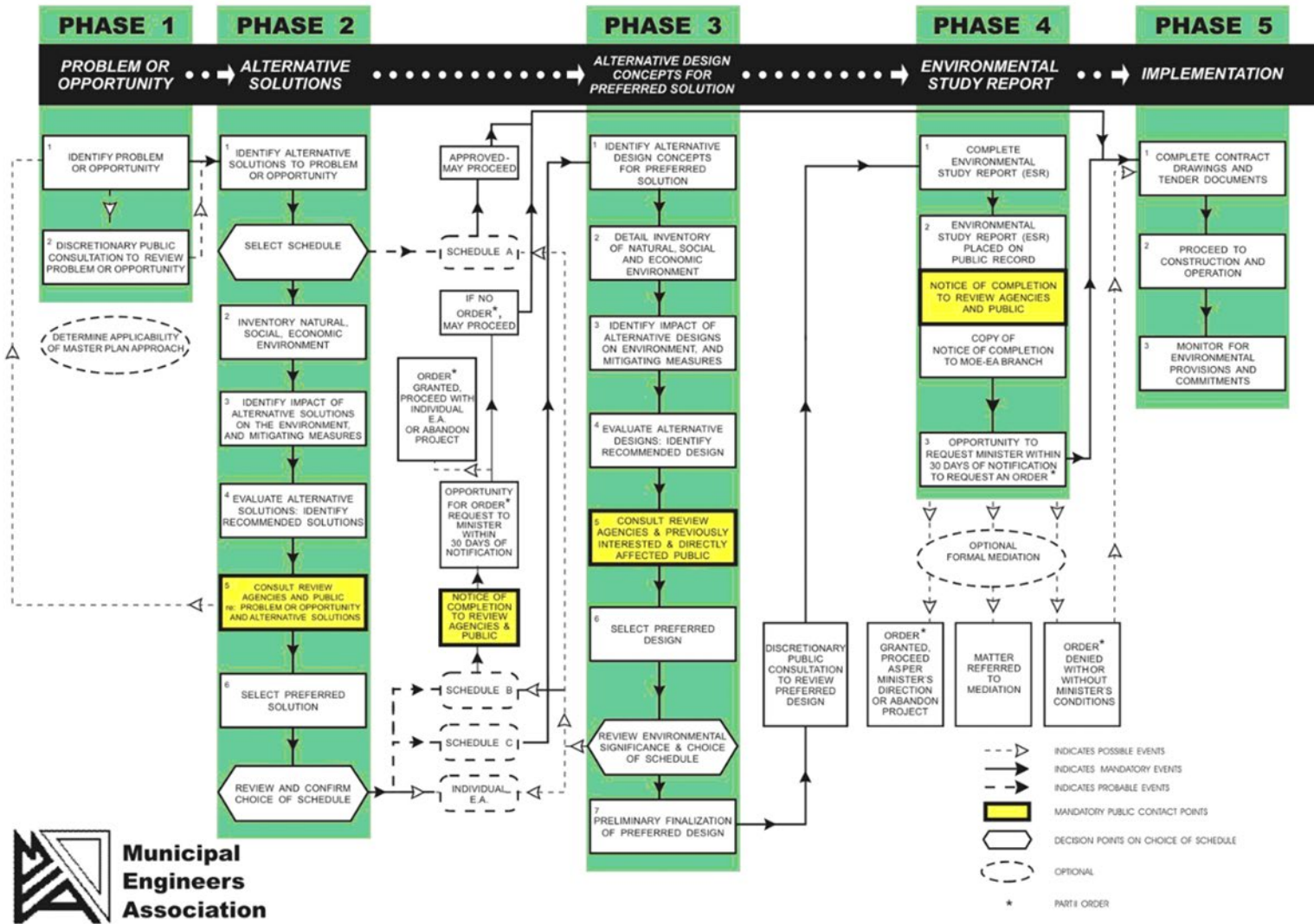


Figure 1 Municipal Class EA Planning and Design Process

2.3 Information on Part II Order Requests

Interested persons may provide written comments on the Environmental Study Report to the project team. All comments and concerns should be sent directly to the County of Brant. In addition, a request may be made to the Ministry of the Environment, Conservation and Parks for an order requiring a higher level of study (i.e. requiring an individual/comprehensive EA approval before being able to proceed), or that conditions be imposed (e.g. require further studies), only on the grounds that the requested order may prevent, mitigate or remedy adverse impacts on constitutionally protected Aboriginal and treaty rights. Requests on other grounds will not be considered. Requests should include the requester contact information and full name for the ministry. Requests should specify what kind of order is being requested (request for additional conditions or a request for an individual/comprehensive environmental assessment), how an order may prevent, mitigate or remedy those potential adverse impacts, and any information in support of the statements in the request. This will ensure that the Ministry is able to efficiently begin reviewing the request. The request should be sent in writing or by email to:

Minister of the Environment, Conservation and Parks

Ministry of Environment, Conservation and Parks

777 Bay Street, 5th Floor Toronto ON M7A 2J3

minister.mecp@ontario.ca

and

Director, Environmental Assessment Branch

Ministry of Environment, Conservation and Parks

135 St. Clair Ave. W, 1st Floor Toronto ON, M4V 1P5

EABDirector@ontario.ca

Requests should also be sent to the County of Brant by mail or by e-mail.

3 Public and Agency Consultation Process

Public consultation is an integral component of the Class EA study process. Successful public consultation programs build and maintain community trust and credibility, improve project decision-making and identify community issues far enough in advance so that they can be effectively addressed. A common public and agency consultation program was developed and implemented for both the St. George Wastewater Servicing Class EA Study and the St. George Water Servicing Class EA Study. Although both Class EA Studies were undertaken simultaneously by CIMA+, on behalf of the County, the processes were considered separate Class EA studies. For the purpose of the public and agency consultation program, common project notices and public information centres were distributed and held, respectively for both Class EA studies.

This section provides a summary of public and agency consultation activities undertaken at key stages of the St. George Wastewater Servicing Class EA Study. Letters, comments and feedback received throughout the course of the Class EA studies, from review agencies and the public, related to the St. George Water Servicing Class EA Study, have been excluded from this section. Only comments, feedback and relevant information related to the St. George Wastewater Servicing Class EA study are described in the following sections. For further reference, detailed information regarding public and agency consultation can be found in Appendices A to E.

3.1 Goals and Objectives of Public Consultation

The project team firmly believed that the quality of decisions made regarding the preferred alternative solution for implementation of wastewater servicing in St. George would be improved by soliciting and acting on input from the public and stakeholders. Specifically, the objectives of public consultation in this project were to:

- Inform the public, stakeholders, and Indigenous and First Nations of the project
- Offer educational information regarding the project
- Obtain input on project components at key decision-making points
- Meet or exceed the consultation requirements of the Class EA process

3.2 Stakeholders

A number of primary stakeholders were considered to have an interest in the St. George Wastewater Servicing Class EA Study, as outlined below.

- Residents: includes all St. George area residents, comprising those currently serviced by existing municipal water and wastewater systems, as well as residents serviced by private groundwater wells and septic systems. This also

includes the property owners of the lands where potential groundwater supply sources have been found.

- St. George Landowners Group
- Local Ward Councillors
- Environmental stakeholders/Conservation Authorities: such as the Grand River Conservation Authority, and Ministry of the Environment, Conservation and Parks (MECP). Pre-consultation with the MECP has taken place throughout the course of the study to discuss the proposed scope of work, preliminary results of the Assimilative Capacity Study for the tributary to Fairchild Creek, and proposed effluent discharge limits.
- Review agencies such as Provincial Ministries and Agencies, Federal Departments and Agencies, local area municipalities, district and planning boards, emergency services (fire, police, ambulance), school boards, transit, utilities (natural, gas, cable, telephone, etc.). Specific Agencies identified in the Master Project Contact List are included in Appendix A.
- Indigenous and First Nations groups such as the Six Nations of the Grand River Territory, the Mississaugas of the New Credit First Nation, Haudenosaunee Confederacy Chiefs Council and Metis Nation of Ontario.

3.2.1 Public Consultation, Communication Strategies, and Tactics

The following outlines the specific consultation activities undertaken to support the St. George Water Servicing Class EA study.

- **Project Mailing List:** A project contact list, including residents, members of community groups, and a number of technical review agencies and organizations, was developed. Interested members of the public were added to the project mailing list if requested and kept informed of project developments via written notifications. All individuals on the project list were contacted at the appropriate stages of the study to inform them of meetings and events.
- **Notice of Study Commencement:** A Notice of Commencement was advertised simultaneously with Public Information Centre (PIC) No.1. The notice was placed on the County's municipal webpage, and sent to all in the project mailing list. A copy of the Notice is provided in Appendix B.
- **Three (3) PICs were held throughout the study.** The purpose of the PICs was to provide opportunities for interested members of the public, agencies, and other stakeholders to learn more about the project and the decisions made throughout the study, and consult with the project team. At the PICs, display boards were set up around the room to present information on the project, and comment sheets were provided to facilitate PIC attendees to provide any written input on the

project. Technical staff and specialists from the County and the consulting team were also available to answer questions, provide updates on the project and encourage dialogue. The PICs were scheduled in a location within the community and ran extended hours through the afternoon and evening to give a wide window of opportunity to accommodate work and school hours.

- **PIC No.1** was held on May 1, 2014 at the South Dumfries Community Centre in the County of Brant. All relevant agencies and members of the general public were invited. The first PIC was advertised on a few local newspapers and through the County's website. In addition, emails and formal invitation letters were sent out to all in the project mailing list to notify them of the date and location of PIC No.1. The purpose of this PIC No.1 was to introduce the project to the public, learn why the study is necessary, understand the study processes and timelines, and to receive public and agency comments and suggestions on the information presented. The first PIC was attended by approximately 9 people, which included the Mayor, a local councillor, a representative of the Grand River Conservation Authority, the Ministry of Citizenship and Immigration, Empire Community and members of the general public. No major comments or completed comments sheets were received during or after the PIC in relation to the St. George Water Servicing Class EA Study. A copy of the formal invitation letter and the notice of the PIC is provided in Appendix B. The information presented at PIC No.1 is included in Appendix C.
- **PIC No. 2** was held on September 25, 2014 at the South Dumfries Community Centre in the County of Brant. All relevant agencies and members of the general public were invited. The second public meeting was advertised on a few local newspapers and through the County's website. In addition, emails and formal invitation letters were sent out to all in the project mailing list to notify them of the date and location of PIC No.2. The purpose of PIC No.2 was to present detailed information on each of the water servicing alternatives for consideration as well as the proposed evaluation framework and evaluation criteria to be used in the assessment of the alternatives. The second PIC was attended by approximately 13 people which included the Mayor, a representative of the Grand River Conservation Authority, the Landowners Group and members of the general public. No major comments or completed comments sheets were received during or after the PIC in relation to the St. George Water Servicing EA. A copy of the formal invitation letter and the notice of the PIC is provided in Appendix B. The information presented at PIC No.2 is included in Appendix C.
- **PIC No. 3** was held on November 21, 2017 at the South Dumfries Community Centre in the County of Brant. All relevant agencies and members of the general public were invited. The second public meeting was advertised on a few local

newspapers and through the County's website. In addition, emails and formal invitation letters were sent out to all in the project mailing list to notify them of the date and location of PIC No.3. The purpose of PIC No.3 was to present an overview of the activities completed to date, the alternative design concepts considered for provision of water servicing in the St. George area, the results of the evaluation processes, the preliminary preferred water servicing concept, and the potential anticipated impacts and mitigation measures for the preliminary preferred water servicing concept. The third public meeting was attended by approximately 49 people. No major comments were received during or after the PIC in relation to the St. George Water Servicing EA. A copy of the formal invitation letter and the notice of the PIC is provided in Appendix B. The information presented at PIC No.3 is included in Appendix C.

- **Notice of Study Completion:** A Notice of Study Completion has been prepared and will be advertised to the public of the commencement of the 30-day review period and the opportunities to provide additional comments before obtaining approval. A copy of the Notice will be sent out to all required agencies, local associations and interested residents. A copy of the Notice of Study Completion is included in Appendix B.

3.3 Summary of Public Issues, Comments and Concerns

At the three (3) PICs, comment sheets were distributed for attendees to provide feedback. Various comments from a member of the general public, who is the neighbouring resident to the existing St. George WPCP site, were received throughout the course of the study, as summarized below. Completed comment sheets from the PICs are attached in Appendix C.

- Request that any structures being built outside of the ring road would be constructed to the south or east of the ring road, as one of the options presented in one of the display boards at PIC No.3. This would reduce the visual, odours and noise impacts resulting from the expansion.
- Request for the current plant discharge to be improved as it currently has certain odours that impact him as he is directly downstream of the plant effluent. Existing and post WWTP expansion odour modelling will be completed as part of the design process and confirmed post-construction to verify reduced odours from the expanded St. George WWTP.
- Access to the treatment plant requires crossing over private land and private roadway. Request that trucks and crews accessing the site exercise caution and limit speed when traversing his land.

- Decibel readings measured privately at the existing St. George WPCP plant currently exceed the MECP guidelines for a stationary government building. Request this is addressed for the existing plant and considered for the proposed expansion. Also request that noise levels are tested post-construction to confirm they are within the limits. Existing and post WWTP expansion noise modelling will be completed as part of the design process and confirmed post-construction to verify reduced noise levels from the expanded St. George WWTP.
- Wastewater effluent quality should account for low flow conditions at outfall and not negatively impact wildlife. The expanded WWTP will be subject to very stringent effluent requirements as confirmed with the MECP as part of this ESR.

3.4 Agency Consultation

Consultation with government review agencies and the public is a necessary and important component of the Class EA process. In conformance with the consultation for this Class EA Study, the County ensured that similarly to the public, appropriate review agencies were informed and given a chance to contribute during the study. This section outlines the key activities and results of the agency consultation component of the study.

A list of agencies was prepared at the start of the project that included all relevant County departments, federal agencies, Provincial Ministries, local municipalities and agencies, as well as local associations and utilities. The opportunity for these agencies to participate in the project was provided through the distribution of the Notice of Study Commencement and PICs via direct letter mailing or through email if specified, which also served as a direct invitation to participate in the formal PICs. Specific Agencies identified in the Master Project Contact List are included in Appendix C, and general agency consultation information is included in Appendix D.

3.4.1 Ontario Ministry of Environment, Conservation and Parks

Extensive consultation with the Ontario Ministry of the Environment, Conservation and Parks (MECP) was undertaken as part of the St. George Wastewater Servicing Class EA Study, specifically related to the Fairchild Creek Assimilative Capacity Assessment carried out to assess potential increased discharges from the St. George WPCP. The overall scope of the assimilative capacity study as well as major recommendations were reviewed in consultation with the MECP. Major comments received from the MECP and a description of how these comments were incorporated or addressed throughout completion of different activities or investigations are summarized in Table 1 below. Correspondence with the MECP in relation to issues surrounding the Assimilative Capacity Study and associated memoranda are included in Appendix E.

Table 1 MECP Summary Key Comments

Comment / Issue Description	Resolution Description
August – September 2014	
<p>MECP provided the following comments in response letter dated August 27, 2014 to a presentation made at a project meeting on June 12 2014:</p> <ul style="list-style-type: none"> • Unclear why plant flows were averaged to determine a flow of 761 m³/d Average Daily Flows. Calculated ADF may underestimate existing flows considering that 2010 and 2013 flows appear lower than normal. • Unclear how current vacant building capacity was determined at 25%. • Unclear how the plant could be re-rated to 1300 m³/d in 2005 if process limitations restrict the plant capacity to 1000 m³/d. • In the assessment of limitations, the criterion for TP is the only one cited but other parameters may become critical considering the expected increase from 657 m³/d to 6507 m³/d. If sewage servicing goes to 3900 m³/d there will be little to no residential build-out with servicing needed for existing users plus commercial, industrial and employment land development. • There may be capacity in the receiver for additional volume from the St. George WPCP but the previous work was preliminary and not submitted to the Ministry. • It may be more practical to build a completely new plant if the planned development is feasible. MBR technology may be the only proven way to achieve the necessary discharge concentrations for TP. 	<p>A formal response letter was issued on September 15, 2014 with the following explanations:</p> <ul style="list-style-type: none"> • There is no information to suggest that there would be a significant increase in wastewater flows from 2012 and 2013. This could be the result of increased vacancies, water efficiency measures, climate and economy changes (affecting industrial discharges). The estimated future capacity of 951 m³/d allocated to existing service area was estimated at 125% of the calculated 3-year ADF. This increase was selected arbitrarily but considered reasonably conservative to allow for the difference in flow year to year. The future ADF of 951 m³/d is more than the maximum year flow of 860 m³/d reported between 2000 and 2013. • Processes at the plant are sized for 1300 m³/d; however, limiting factors with the performance of the tertiary treatment reduces the treatment capacity. The system experiences high solids loadings due to process bottle necks, manual monitoring and control and broken equipment that cannot be replaced due to lack of redundancy. • The flow rate of 6507 m³/d (revised to 6476 m³/d) represents ultimate capacity at build-out. In discussions with the County, a design ADF of 3900 m³/d was identified as a reasonable design target for a 20-25 year planning period. Other parameters are considered in the Assimilative Capacity Review submitted to the MECP on August 14, 2014). • The option to build a new plant will be considered in the Class EA study.

Comment / Issue Description	Resolution Description
September – December 2014	
<p>MECP provided the following key comment to a Draft Assimilative Capacity Review submitted by CIMA+ on August 14, 2019:</p> <ul style="list-style-type: none"> The monitoring location intended to provide data upstream of the plant has reconfigured and was no longer representative of the upstream water quality in Fairchild Creek. New water quality data from an upstream location needs to be collected and considered in the review. <p>Additional key comments received on a letter dated December 17, 2014 included:</p> <ul style="list-style-type: none"> Additional modeling and an upstream sampling program was requested by the MECP in support of the past re-rating of the plant to 1300 m³/d. Some of the previous recommendations remained outstanding. The water environment of the existing receiver should be properly defined. Modeling will be necessary to predict impact on Fairchild Creek from future expansion. Critical that both upstream and downstream stations at St. George be located in the main channel of the tributary. 	<ul style="list-style-type: none"> A site visit with MECP, CIMA+ and the County representatives took place on October 23, 2014 to review existing monitoring location and three additional new locations representative of the Fairchild Creek tributary upstream of the plant. A memo detailing the locations was issued by CIMA+ on November 13, 2014. New monitoring locations were accepted by the MECP on December 10, 2014. Formal direction from MECP to establish the lower wetlands as a permanent upstream sampling location was provided on October 16, 2015. A monitoring program was commenced in Summer 2015 to collect additional water quality samples with the upstream and downstream locations indicated by the MECP.
May – July 2016	
<p>MECP provided the following key comments in a response letter dated May 9, 2016 to CIMA's Assimilative Capacity review of previous work, and documentation dating back to the 2005 plant re-rating:</p> <ul style="list-style-type: none"> Many of the conclusions are based on the OCWA upstream data which is no longer representative based on the creek reconfiguration. MECP 	<ul style="list-style-type: none"> CIMA+ updated the Assimilative Capacity review based on the monitoring and sampling program completed in June-September 2015. The revised report was submitted in December 2015. The County had not been successful in gaining long-term access to the lower wetlands sampling location located on private land (directed by the MECP as the permanent upstream monitoring location).

Comment / Issue Description	Resolution Description
<p>questioned the validity of the data used in the previous reports.</p> <ul style="list-style-type: none"> MECP was not satisfied that their comments had been addressed in the revised version of the report. 	<ul style="list-style-type: none"> A pre-consultation meeting was held with the MECP on June 13, 2016 to review in further detail their comments and the need for additional monitoring and modeling. A memo documenting the proposed work plan associated with the additional sampling and monitoring to support the Assimilative Capacity Study was submitted to the MECP by CIMA+ on July 8, 2016.
<p>July 18, 2016</p>	
<p>Key comments received on the proposed work plan included:</p> <ul style="list-style-type: none"> Request to extend the study area beyond (downstream) of German School Road. This resulted in the addition of a couple of extra water quality monitoring locations, additional reconnaissance, and extension of the study area for the aquatic biologists/ecologists survey. 	<ul style="list-style-type: none"> Hutchinson Environmental Sciences Ltd. was retained by CIMA+ to undertake the additional work for the Assimilative Capacity Update. County initiated sampling at an additional three stations: the Unnamed tributary on Governors Road, Fairchild Creek on Governors Road; and Fairchild Creek on Powerline Road. Additional sampling and monitoring was conducted between July and October 2016. A revised Assimilative Capacity Study Report was prepared by Hutchinson and submitted to the MECP for review on March 2, 2017.
<p>May – June, 2017</p>	
<p>MECP advised via email on May 29, 2017 that comments on revised Assimilative Capacity Study Report were not ready and further indicated that a new person from the Ministry had been assigned to the project. A field visit was requested.</p>	<ul style="list-style-type: none"> A field visit with the County, CIMA+, Hutchinson, GRCA and MECP representatives was held on June 27, 2017. Monitoring and sampling locations were visited and reviewed by all. Further clarification to the MECP was provided by CIMA+ via email on June 28, 2017, following the June 27th field visit related to the approach to develop the recommended effluent TP objectives and compliance limits. It was noted that a TP objective of 0.1 mg/L and limit of 0.14 mg/L at an ultimate plant capacity of 3900 m³/d meets the intent of

Comment / Issue Description	Resolution Description
	maintaining existing loading criteria and not further increasing concentrations in the receiving body.
July –December, 2017	
<p>MECP provided the following key comments in a response letter (dated July 19, 2017) to Hutchinson’s Assimilative Capacity Study (ACS) Report:</p> <ul style="list-style-type: none"> • The proposed effluent quality should be improved further to protect aquatic life. • The proposed TP concentration limit should be reduced from 0.14 mg/L to 0.1 mg/L, and a design objective can be set considering the treatment technology used. • TAN limit for winter should be reduced from the proposed 3.0 mg/L to 2.5 mg/L to achieve a fully mixed un-ionized ammonia concentration in the receiving water of 0.02 mg/L. • Recommended to include DO as an effluent parameter with a monthly average concentration >5.0 mg/L and a design objective >6.0 mg/L. • Recommended a TSS concentration limit of 10 mg/L and a design objective of 5 mg/L. • Total chlorine residual must be regulated and monitored in the discharge. • The proposed effluent criteria for nitrate-nitrogen should be modified using CWQG long-term value as the target objective. The SSWQO approach used may not be suitable. Recommended to reduce the nitrate objective from 5.0 mg/L to 3.9 mg/L. • MECP was in agreement with the other recommendations made in the report about changes to the sampling frequency, monitoring and locations. 	<p>A formal response letter was issued on September 13, 2017 with the following key comments:</p> <ul style="list-style-type: none"> • The team was in general agreement with the comments and recommendations made. • Further discussion and clarification requested for the recommended objectives and limits for nitrate. A meeting with MECP was requested. • County formally requested permission to change the upstream monitoring location to the Burt Road Station to avoid ongoing issues with the long-term access to the sampling point. • A conference call with the MECP was scheduled on December 7, 2017 to discuss approach used in the ACS to derive the SSWQO for nitrates. CIMA+ noted that a reduction in nitrate objective to 3.9 mg/L would have significant treatment costs implications due to the likely need for de-nitrification and potential supplemental carbon source, together with additional operations and maintenance requirements for the County. Parties did not agree on the methodology used to derive the nitrate objectives. <ul style="list-style-type: none"> - Further documentation on the requirements to achieve the proposed objective of 3.9 mg/L and associated costs was to be prepared. Results to be reviewed at a separate meeting.

Comment / Issue Description	Resolution Description
April – November, 2018	
<p>A meeting with the MECP, the County, Hutchinson and CIMA+ representatives was held on April 9, 2018. Key recommendation from the meeting was:</p> <ul style="list-style-type: none"> • CIMA+ determined through BioWin modeling that the lowest achievable effluent nitrate without supplemental carbon addition is approximately 9-10 mg/L. MECP requested that based on this limitation, further analysis be completed through far-field mixing and assimilation using a 10 mg/L nitrate-nitrogen effluent limit with an assessment of the potential impact of downstream nitrate concentration on aquatic life. • Suggested to assess a potential discharge directly to Fairchild Creek, rather than the unnamed tributary. • Consideration to discharge directly to the Grand River. 	<p>Alternate discharge points to the unnamed tributary and Fairchild Creek at Governors Road were further investigated to determine if greater nitrate assimilation could be achieved downstream.</p> <ul style="list-style-type: none"> • On September 18, 2018, CIMA+ submitted a memorandum prepared by Hutchinson to summarize the results of the additional investigation and modeling. The study concluded that Fairchild Creek lacks assimilation capacity due to zero flows which makes the location impractical for a future discharge. Discharge to Governors Road could reduce the fully mixed nitrate concentration by approximately 2 mg/L but processes needed for nitrate reduction between the two reaches are not accounted for. • On November 14, 2019, MECP confirmed via email that relocation of the discharge point to Fairchild Creek at Governor Road would not result in any benefit due flow stagnation. Also, relocation to the unnamed tributary at Governor Road would bring marginal benefit compared to the current discharge location. • MECP further agreed with the recommendation that further analysis be completed considering 10 mg/L nitrate-nitrogen as effluent criteria at the existing discharge location.
August – October 2019	
<p>A memorandum summarizing the additional nitrate analysis for the St. George WPCP at the existing discharge location was submitted to the MECP on August 7, 2019 for review.</p>	<p>In an email on October 17, 2019, MECP confirmed that the proposed concentration of 10 mg/L nitrate-nitrogen is acceptable considering that the proposed objective can be easily achieved with conventional treatment</p>

Comment / Issue Description	Resolution Description
The study concluded that effluent nitrate concentrations of 10 mg-N/L are protective of the resident and riverine fish and invertebrate population and are not predicted to have a long-term effect.	technology. The agreed effluent criteria was provided in the letter as well as other general recommendations which are discussed in detail in further sections of this report.

3.4.2 Ontario Ministry of Heritage, Sport, Tourism and Culture Industries

Email correspondence was received from the Ontario Ministry of Heritage, Sport, Tourism and Culture Industries (MHSTCI) (formerly the Ontario Ministry of Tourism, Culture and Sport) on October 8, 2014 and December 6, 2017 in response to their review to the materials presented in PIC No.2 and No.3, respectively. The 2014 correspondence provided some recommendations for additional screening documentation to be undertaken as part of a Schedule C Class EA in terms of archaeological resources, built heritage resources and cultural heritage landscapes. It is further noted that all technical heritage studies and their recommendations are to be addressed and incorporated into EA projects and asked to provide copies of any technical heritage studies to MHSTCI, before issuing a Notice of Completion, for their review. The 2017 email acknowledges that archaeology and cultural heritage was incorporated within the Class EA evaluation of the alternatives and further reiterated their general comments from the 2014 correspondence.

A Stage 1 Archaeological Assessment and a Cultural Heritage Impact Assessment were prepared in association with the St. George Water Servicing Class EA Study. The findings and recommendations of these assessments were incorporated in the development and evaluation of water servicing design concepts, as described in subsequent sections of this report. A copy of the Stage 1 Archaeological Assessment Report was originally submitted to the MHSTCI on April 1, 2015. Copies of the Stage 1 Archaeological Assessment and a Cultural Heritage Impact Assessment Reports were submitted electronically to the MHSTCI on February 23, 2018 for their review.

3.4.3 Grand River Conservation Authority

The Grand River Conservation Authority (GRCA) was contacted to provide information on flow and water quality data for Fairchild Creek at the following monitoring stations:

- Station ID: 3-437-003 (upstream of the St. George WPCP at County Road 5)
- Station ID: 3-437-001 (downstream of the St. George WPCP at German School Road).

The GRCA also provided aerial images displaying the oxbow was connected to the unnamed tributary of Fairchild Creek (i.e. the outfall location of St. George WPCP) in 2006; however, the oxbow appeared to be stranded from the unnamed tributary in the 2010 and 2015 aerial image. GRCA supported the conclusion that the oxbow was stranded in approximately 2002, which was reported by the St. George WPCP operators.

A copy of the Draft Assimilative Capacity Assessment report of Fairchild Creek prepared by CIMA+ was forwarded to GRCA on May 26, 2016, as per their request, for their review. CIMA+ indicated that recent comments from the MECP had been received. No formal comments were received from the GRCA on the Draft ACS.

3.4.4 Other Agencies

Early on in the Class EA Study, standard response letters or emails were received from some of the provincial and federal review agencies, including; the Canadian Environmental Assessment Agency, Indigenous Affairs and Northern Development Canada, Transport Canada, the Minister of Fisheries and Oceans Canada, the Ministry of Transportation, in response to the Notice of Study Commencement and PIC No.1. Copies of the correspondence are included in Appendix D. General comments from these agencies included the need for the proponent to determine the applicability of their regulations or their involvement in the St. George Class EA Study based on the location of the project and the potential features to be impacted as a result of the project. Copies of the material presented at PIC No.1 were provided to some of these agencies as requested in their initial correspondence. No other comments or additional feedback was received from these agencies.

3.5 Other Stakeholders

On March 6, 2018, a letter was received by the County from a land developer in the area. The letter contained a technical memorandum, prepared by MTE Consultants Inc., which noted concerns to technical information prepared by CIMA+ in association with the St. George Class EA study. Key comments are summarized below:

- The 2031 planning horizon assumed in the study is too short and modifications to the current preferred alternative which involved expansion of the existing St. George WPCP with continued discharge to the Fairchild Creek may be required in the future to accommodate future growth. The County may ultimately need to construct a new discharge forcemain to the Grand River in the near future to service the current planning horizon and beyond. A longer planning horizon and design timeline (e.g. 50 years) for a new treatment plant would result in greater

separation in the lifecycle costs of the options, favouring the option of discharge to the Grand River.

- The independent review notes that a previous ACS conducted on Fairchild Creek determined that any continued discharge at higher flows would require significant process upgrades and result in a more complex wastewater treatment facility. As such, the discharge to the Grand River would allow for less stringent effluent treatment requirements and use similar treatment technologies to those currently used in the St. George WPCP.
- The weighting factors applied to the major evaluation criteria (40% Environmental, 40% Social and 20% Economical) reduce the impact of the significantly higher capital costs with the construction and operational costs of a more sophisticated wastewater treatment plant needed to discharge to Fairchild Creek. It is also argued that in several instances, the option that comprised expansion of the existing St. George WPCP with discharge to the Grand River should have received a higher score, related to the other option – continued discharge to the Fairchild Creek. The independent review recommends the use of equally distributed weighting factors amongst the three (3) main evaluation categories, where each category would have 33.3% weighting.

The 20-25 year planning used in the Class EA Study was initially established in discussions with the County and considered to be a reasonable target for the Class EA study. Similarly, the weighting factors applied to the three (3) main categories in the evaluation criteria were assigned in consultation with the County and presented to the public at the PICs, before the detailed evaluation was carried out. No objections from the public were received in regard to the proposed weighting factors. The relative scores assigned between the two options i.e., Option A – Continued discharged to the Fairchild Creek unnamed tributary and Option B – Discharge to the Grand River, were assigned by the project team based on professional judgement, and the anticipated potential impact on the overall environment based on information available at the time, the findings and recommendations of the detailed investigations, as well as the engineer's previous experience in constructing and operating similar projects.

A sensitivity analysis was conducted as part of the study to examine the robustness of the evaluation process. Two (2) different analyses were carried out to evaluate the impacts of the life cycle costs within the evaluation process, as well as the impacts of changing weighting factors around. Different time periods for the life cycle costs (25-year, 40-year and 60-year) were assumed for each option, as well as changing the weighting factors of the three (3) main categories within the evaluation process. For the latter exercise, each of the three (3) main evaluation category was assigned a weighting factor of 33%.

The results of the sensitivity analysis confirmed that Option A – Upgrade existing St. George WPCP with continued discharge to the Fairchild Creek Tributary, remained as the option with the highest overall scores and thus, remained as the preferred solution. Details of the sensitivity analysis are discussed in Section 10.6

3.6 First Nations and Indigenous Groups

The following First Nations have been consulted during this Class EA study to determine their interest and desired level of communication:

- Six Nations of the Grand River Territory
- Mississaugas of the New Credit First Nation
- Haudenosaunee Confederacy Chiefs Council
- Metis Nation of Ontario.

Public notices and invitations to the project PICs were distributed to the groups noted above. Individual invitation letters were prepared and mailed to the Six Nations of the Grand River in anticipation of the public meetings, due to the proximity of the project to their traditional territory. Copies of the PIC Notice and PIC boards were attached to the invitation letters. In addition, the letters requested the Six Nations of the Grand River to advise if a separate individual meeting was necessary to discuss the projects. A phone call to the Six Nations of the Grand River took place on June 25, 2014 where they indicated that they did not have any issues with the St. George Water and Wastewater Servicing Class EA studies but would like to be kept informed. All notices were circulated to all First Nations contacts and no correspondence or response was received from the Six Nations of the Grand River or any of the other First Nations and Indigenous Groups contacted.

A log documenting the consultation activities that took place with the First Nations and Indigenous Groups as part of the St. George Wastewater Servicing Class EA Study is included in Appendix F.

4 Study Area Overview

The County was created in 1999 as a single-tier municipality under the name of the Corporation of the County of Brant. The County is located in southwestern Ontario and is bordered by the City of Hamilton; Haldimand County; Norfolk County; the Townships of Blandford-Blenheim and Norwich in the County of Oxford; the Township of North Dumfries in the Region of Waterloo; Six Nations of the Grand River; and the Mississaugas of the New Credit First Nations; and encircles the City of Brantford.

4.1 Study Area Location and Site Features

The County includes a number of areas of Urban Settlement including St. George, which is the area of interest for this project. The boundaries of the study area, shown in Figure 2, coincide, for the most part, with the Primary Urban Settlement Area Boundary for the settlement of St. George.

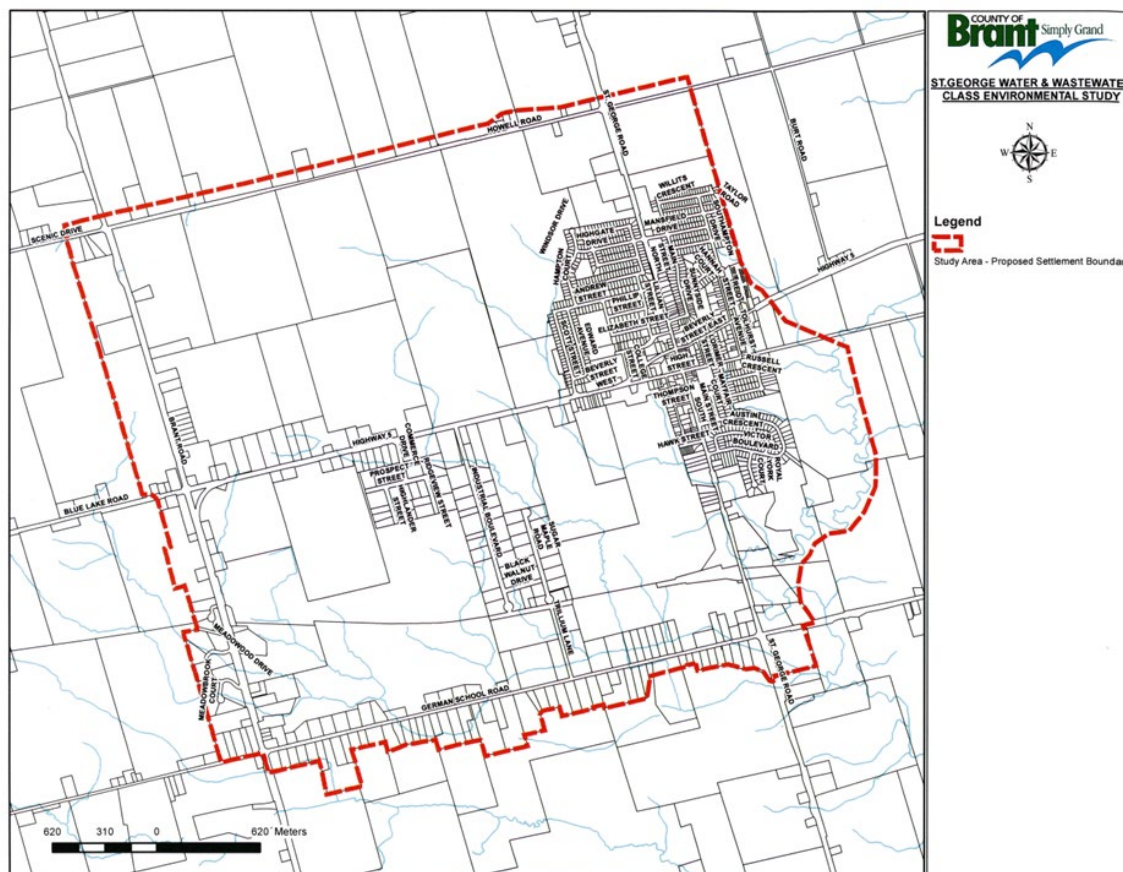


Figure 2 St. George Study Area

The study area of St. George is generally bounded by Highway 5 and Howell Road to the north, Burt Road to the east, German School Road to the south and Highway 24 to

the west. The limits of the St. George study area cover 831 hectares, which include a combination of agricultural fields and developed areas, as well as natural features including woodlands, wetlands, meadows and watercourses.

4.2 Existing Socio-Cultural Environment

4.2.1 Land Uses

The dominant land uses within the study area are agricultural and natural features. The agricultural areas found within the study area include farms and rural low density residential properties which are on partial municipal services. The primary urban settlement receives full County water and sanitary sewage systems.

The 2012 OP has designated the lands within the study area for various types of land uses, as shown in Figure 3.

The St. George area encompasses two existing built-up areas. Generally, residential and other community uses are located in and around St. George and the majority of employment uses are in the west end of the study area extending south of Highway 5, as shown in Figure 3.

St. George is mostly designated as a “Primary Urban Settlement Area” and has access to full County services with a land supply that can accommodate new development. Urban Residential designations are provided in locations within the surrounding and existing built-up area of the historical settlement of St. George, and extend north, west and southwest up to the existing employment lands along Industrial Boulevard and Trillium Lane.

In general, the land uses within the study area in terms of size and proportion with respect to the total study area lands include:

- Urban residential uses account for approximately 378 ha or approximately 42% of the St. George study area
- What was previously known as “Estate Residential” as seen in Figure 3, along German School Road and Highway 24 is identified as “Suburban Residential” and accounts for 126 ha or 14% of the study area lands
- “Core Area” uses account for 9 ha and just over 1% of the study area lands
- “General Commercial” occupy 28 ha or 3% of the study area lands
- “Recreational” uses occupy 55 ha or 6% of the study area lands
- The large “Natural Heritage System” is approximately 123 ha or 14% of the study area lands

- “Institutional” uses comprise a small portion of the land at 5.5 ha or 1% of the study area lands
- “Employment” lands account for 167 ha or 19% of the study area lands.

The county’s Growth Plan does not specifically project growth within the St. George settlement study area, but it does project the total population of the County to reach 47,000 by 2031. The 2011 Census anticipated a population of 35,638 by 2031. Similarly, the County’s employment projection for 2031 was 19,000 jobs.

4.2.2 Archaeological Features

The 2012 County’s OP indicates that a number of archaeological remnants and important archaeological evidence of historic activities exists within the County. This includes the presence of marine archaeological remains including remains of ships, boats and vessels. Artifacts from the contents of boats and belongings of crew or passengers are also included and may be currently under water. Areas of potential archaeological resources, as presented in the County’s OP, are identified in Figure 4. It can be seen from the figure that the St. George study area has locations of potential archaeological resources and should be handled accordingly. The location of St. George, with respect to the County, is circled in red on Figure 4.

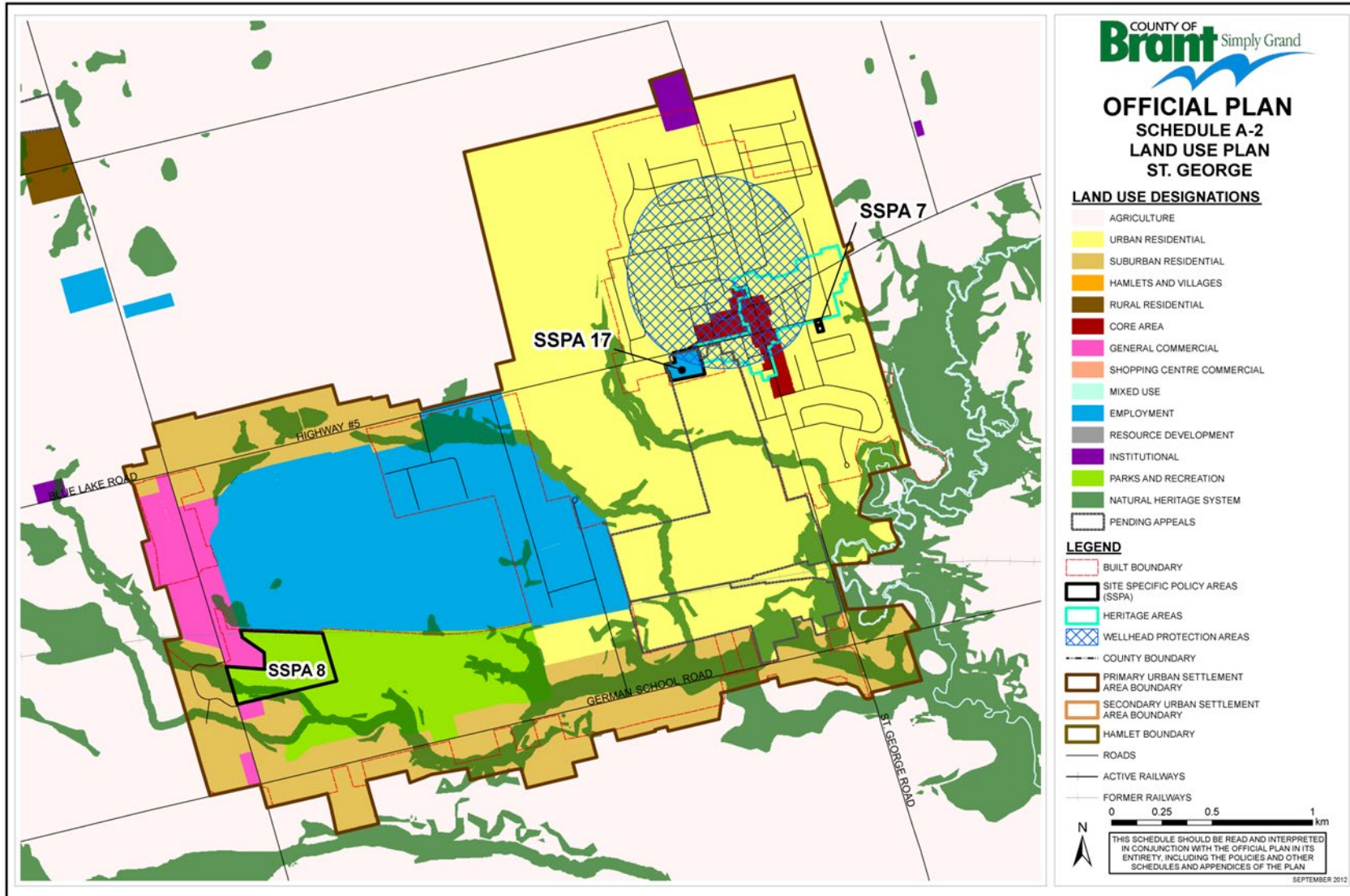


Figure 3 St. George Land Use Designations

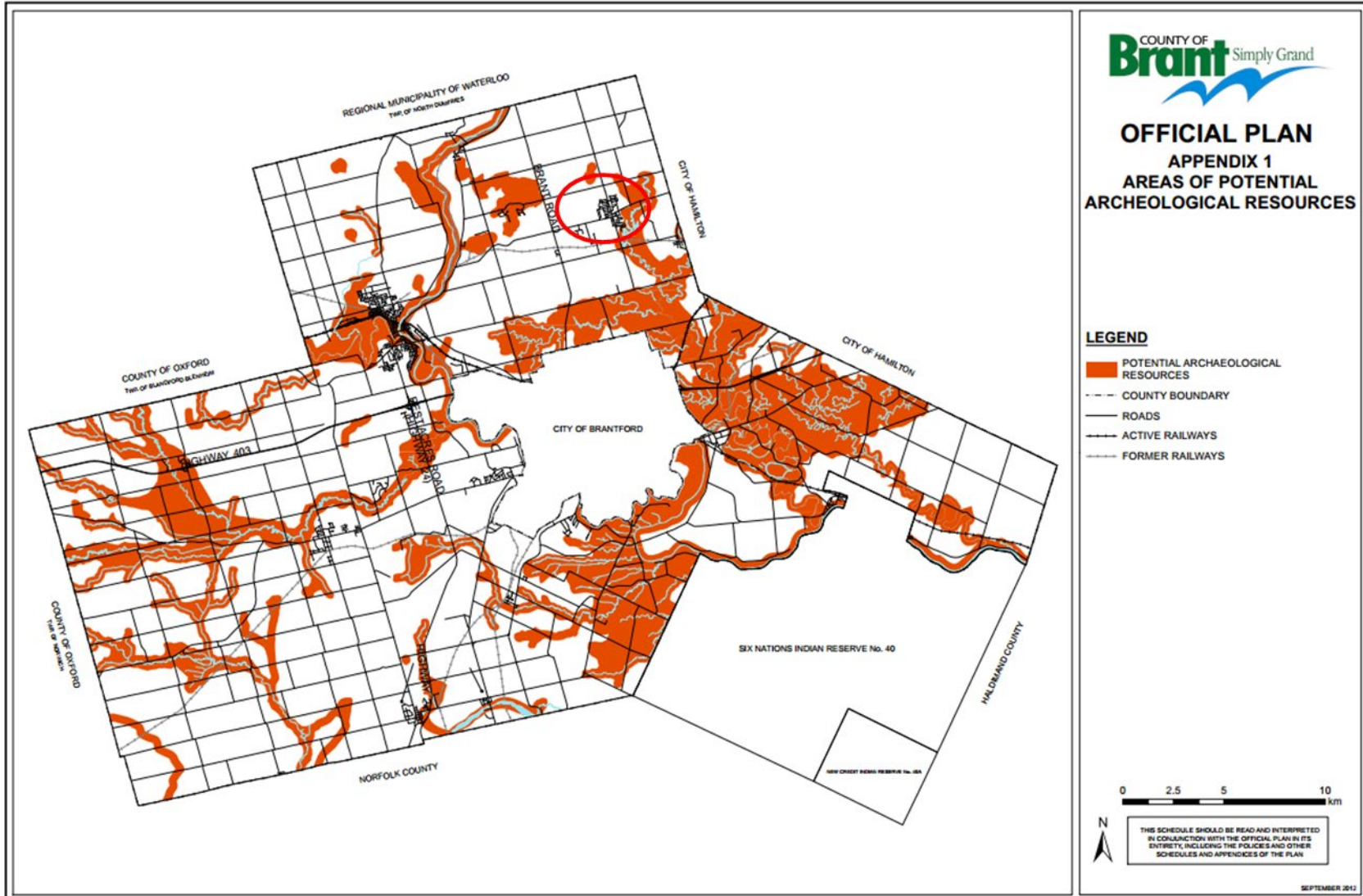


Figure 4 Areas of Potential Archaeological Resources

4.3 Existing Natural Environment

4.3.1 Overview

Background information on the existing natural heritage features in the St. George area was gathered and documented in the St. George Area Study Natural Heritage Report, completed by Natural Resource Solutions Inc. in July 2013, on behalf of the St. George Land Owners Group. The following sections provide a description of the major natural heritage features within the study area.

4.3.2 Designated Natural Areas and Features

St. George is located within the Grand River Watershed and the Fairchild Creek Sub-watershed with significant natural features within these areas and the surrounding vicinity. There are several designated significant natural areas and features within the study area and vicinity, including significant wetlands and woodlands. The overall location of these features is shown in Figure 5 and described in the following paragraphs.

4.3.2.1 Fairchild Creek Wetland Complex

Approximately 9.5 ha of the Fairchild Creek Wetland Complex overlaps with the southeastern side of the study area, as shown in Figure 5. The Fairchild Creek Wetland Complex is considered a Provincially Significant Wetland (PSW) because it contains significant species, nesting of colonial water birds and active feeding area, winter cover for wildlife and presence of fish spawning and rearing habitat for brown trout and northern pike. The wetland complex is comprised of 88% swamp and 12% marsh with all of these wetland units being riverine, mean they have a permanent surface water inlet and outlet.

The wetland soils are mostly clays, loams or silts with a smaller portion (approximately the remaining 5%) being organic. The wetlands within the study area are mostly cattail and common reed shallow marshes and small pockets of poplar mineral deciduous swamp and white cedar-hardwood mixed mineral swamp communities.

4.3.2.2 St. George Forest Environmentally Significant Area

The 104 ha St. George Forest, located just east of the study area, is listed as an Environmentally Sensitive Area (ESA). This ESA is composed of upland deciduous forest, sedge and rush meadow, secondary deciduous forest, floodplain forest and old fields. It has been listed as an ESA for the following reasons:

- It consists of Pleistocene deposit, which is only found in this location within the County
 - It contains regionally significant vegetation communities such as floodplain forest
 - It contains regionally significant plant and wildlife species
- The site is easy to access and contains a high diversity of habitats which makes it suitable for conservation and educational purposes.

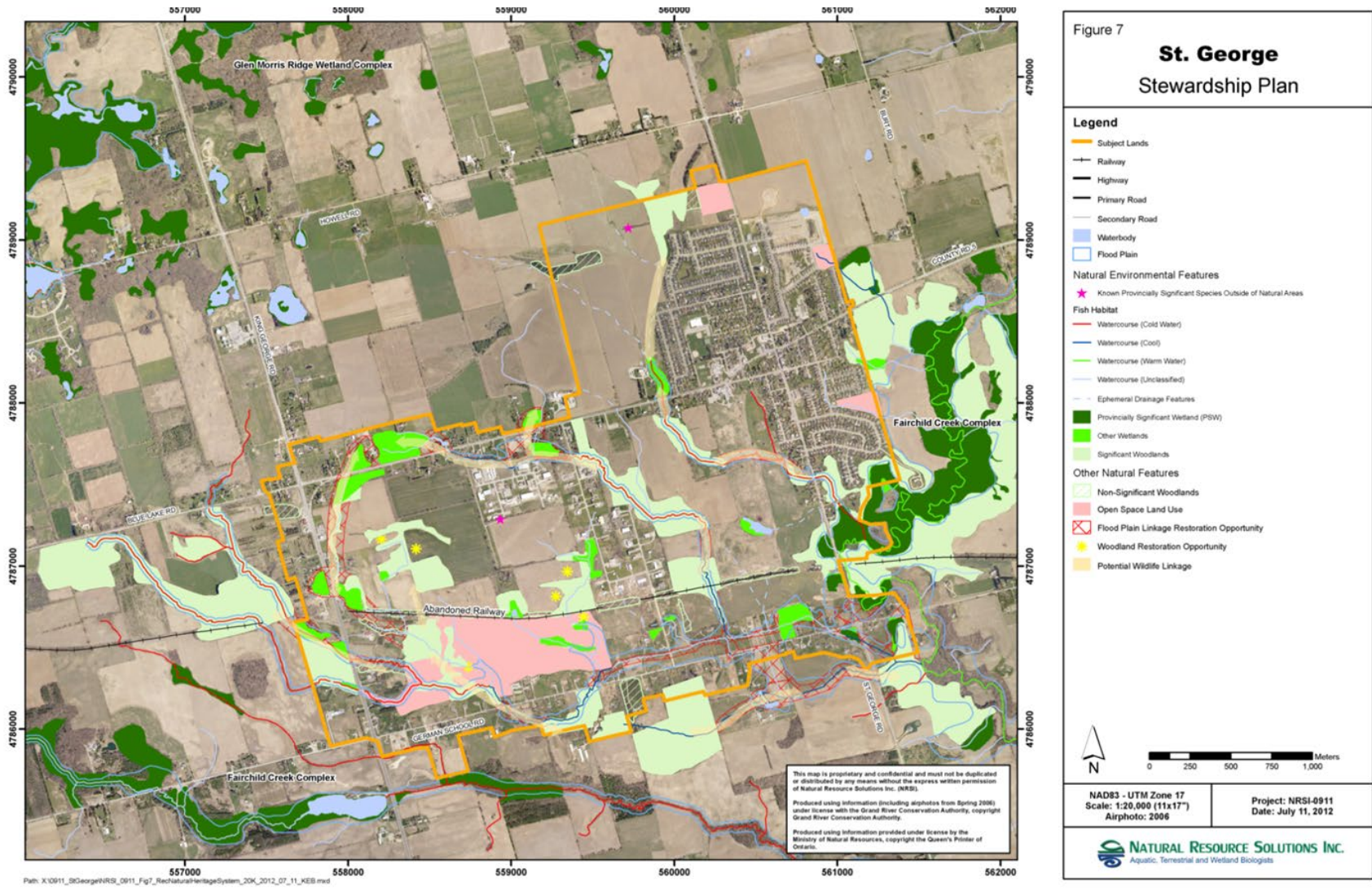


Figure 5 Overall Location of Designated Natural Areas and Features

4.3.2.3 Areas of Natural and Scientific Interest

There are no Areas of Natural and Scientific Interest in the St. George study area (MNR 2012).

4.3.3 Vegetation Resources

4.3.3.1 Vascular Flora

A total of 235 species of vascular flora were identified within the study area by NRSI biologists. The list of vascular flora species was limited to the areas where access was possible. The most significant vascular plants found within the area are presented in Table 2.

Table 2 Study Area – Significant Vascular Plants

Common Name	Description / Observations	Source
Northern Pin Oak	Not protected under the provincial or federal Species at Risk Act Observed in several locations in the centre of the study area Considered regionally rare S3 - Vulnerable Provincial Status	MNR/NRSI
Fern-leaved False Foxglove	Not protected under the provincial or federal Species at Risk Act Known to grown on sandy soils in forest openings Not observed in the study area during 2009 field services but the study area is a suitable habitat Known associated species are present in the area S2 - Imperiled Provincial Status	MNR
Pignut Hickory	Not protected under the Species at Risk Act An upland species that occurs on well-drained sites with other broad-leaf trees Observed during work on the Empire Communities lands and within the woodlands immediately east of the Empire Community Lands Considered regionally rare S3 - Vulnerable Provincial Status	NRSI/MNR/ Ecoplans
Butternut	Considered provincially and national endangered due to fungal disease that has destroyed one third of the Ontario population	NRSI/ Ecoplans

Common Name	Description / Observations	Source
	Several of those observed in the study area appeared to be infected and some were dead, standing snags S3 - Vulnerable Provincial Status END - Endangered as per OMNR and COSEWC	
American Chestnut	Provincially and nationally Endangered species Reported in the north of the study area Occurs on a variety of sites, growing best on well-drained sands and gravels It is usually found mixed with other broadleaf trees and was once prominent in southern Ontario END - Endangered as per OMNR and COSEWC	MNR
Hamlock Parsley	Reported southwest of the study area in 1993 Suitable habitat for this species includes cold swamps, wet woods and riverbanks This type of habitat is present, but limited, within the study area S2 - Imperiled Provincial Status	MNR

4.3.3.2 Vegetation Communities

The landscape within the study area is mostly flat to gently sloping. Vegetation communities include deciduous forests, coniferous plantations, cultural meadows, swamp and marsh. Descriptions of these communities are provided in Table 3, with location shown in Figure 6.

Significant vegetation communities such as prairie, savannah and oak woodland types are known to occur in the County of Brant and the local area. During background data collection in 2013, the Ministry of Natural Resources indicated that there was the potential for significant oak woodland and prairie communities to be present within the study area.

Table 3 Study Area – Significant Vegetation Communities

Common Name	Classification	Description / Observations
Dry to Moist Old Field Meadow (CUM1-1)	Cultural	Is the result of cultural-based disturbance, mainly agriculture Vegetation has recolonized agricultural fields taken out of production

Common Name	Classification	Description / Observations
		Consists of a large population of non-native plants
Coniferous Plantation (CUP3, CUP3-2)m CUP3-6)	Cultural	These communities are found dispersed throughout the study area Mostly a mix of species
Mineral Cultural Wetland (CUW1)	Cultural	This community is present within the residential and developed areas Primarily private, wooded lots and consist o f a variety of trees
Deciduous Forest (FOD)	Forest	Dominated by sugar maple and/or white ash
Dry-Fresh White Ash Deciduous Forest (FOD4-2)	Forest	Dominated by white ash with small numbers of white pine and sugar maple
Dry-Fresh Sugar Maple Deciduous Forest (FOD5)	Forest	Dominated by sugar maple with small numbers of black cherry, American elm, black walnut and white ash Several dead butternut trees, a species at risk, were observed from the old rail line, indicating more live butternuts could be present within the woodlot A tributary of Fairchild Creek runs through this forested community Majority of the forest has groundcover consisting of white trillium, false Solomon's seal and jack-in-the-pulpit
Dry-Fresh Sugar Maple-Beech Deciduous Forest (FOD 5-2)	Forest	This vegetation community borders the eastern edge of the study area
Sugar Maple-White Ash Deciduous Forest (FOD 5-8)	Forest	A portion of a cold water tributary runs through this vegetation community with

Common Name	Classification	Description / Observations
		likely contributes to the cooling of the stream
Fresh-Moist Lowland Deciduous Forest (FOD7)	Forest	Relatively abundant throughout the study area and typically associated with riparian and floodplain areas
Fresh-Moist Poplar Deciduous Forest (FOD8-1)	Forest	Three poplar dominated forests exist within the study area One is within the Riverview Holdings Lands The other two are located at the northern end of the study area west of the cemetery
Dry-Fresh White Pine-Sugar Maple Forest (FOM2-2)	Forest	There is a network of trails through this community used by local residents
Reed-Canary Grass Mineral Marsh (MAM2-2)	Wetland	Comprised almost entirely of reed-canary grass
Mineral Shallow Marsh (MAS2)	Wetland	Vegetation community dominated by common reed or cattails
Mineral Deciduous Swamp (SWD)	Wetland	The majority of mineral swamps in the study area are deciduous, dominated by poplars including trembling aspen and balsam poplar with smaller numbers of eastern cottonwood and large-toothed aspen

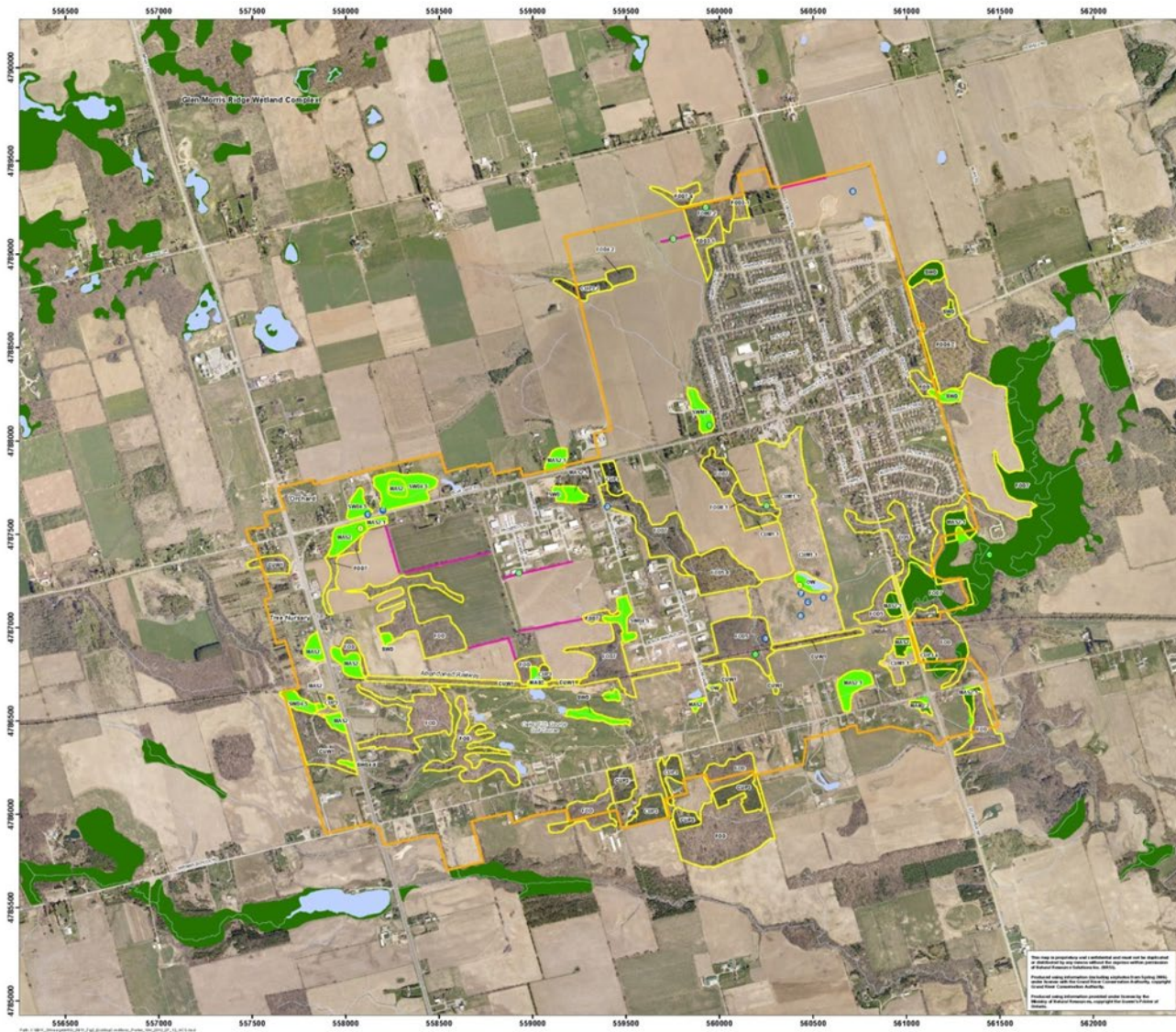


Figure 6 Location of Vegetation Resources

4.3.3.3 Wetlands

The wetlands in the study area of St. George are all a part of the Fairchild Creek subwatershed so it was appropriate to study all of them as one complex. The location of the wetlands in the study area is shown in Figure 6. There is one very small wetland in the study area that was unevaluated and lacks significant ecological functions. All other wetland polygons in the study area are within 750 m of each other and can be considered as a stand-alone complex, with a total complex size of 22 ha. The wetland complex in the study area is considered non-significant based on the scoring achieved. The large wetland complex in the study area can be identified as the core area, while the smaller wetlands perform valuable functions with the potential to be incorporated into the natural heritage system based on factors such as location, association with other natural vegetation types and presence of significant species and habitats.

4.3.3.4 Woodlands

The County has 13% woodland or forest cover with 25% of all woodland found in five forests within the County. Most of the woodland is found in association with other natural environmental features such as swamps and wetland complexes. Figure 6 shows the woodlands found within the study area. Woodlands and vegetation have been identified and delineated by the County as a constraint to development.

In its Official Plan (OP) (2012), the County defined significant woodlands as “an area which is ecologically important in terms of features such a species composition, age of trees and stand history; functionally important due to its contribution to the broader landscape because of its location, size or due to the amount of forest cover in the planning area; or economically important due to site quality, species composition or past management history.”

There are a number of woodlands within the St. George study area that are considered significant. Significant woodlands are recommended to be included in the Natural Heritage System and are protected by policies.

4.3.4 Wildlife Resources

Currently, no regional lists for rare species exist for the County of Brant; however, there are regionally significant species lists for neighbouring counties including Waterloo and Hamilton. There are a total of 116 local bird species known to be present in the local area. According to the Ontario Breeding Bird Atlas, size provincially and nationally significant species have been observed in the vicinity of the study area.

There were 58 species of birds observed by NRSI biologists during breeding bird point counts and an additional nine (9) species were observed over the duration of other field

surveys. The highest level of diversity was 24 species and the lowest diversity of species was 16. The NRSI biologists observed five provincially significant bird species within the study area. Four (4) recently listed provincially and nationally threatened species of birds were also observed in the study area:

1. Chimney swift
2. Bobolink
3. Eastern Meadowlark
4. Barn Swallow

All four (4) of these bird species prefer agricultural lands, open meadows or grassland habitat, which are all present within the study area. In addition to bird species, the following summarizes the major wildlife resources found within the subject area:

- Twenty-nine herpetofauna species (reptiles and amphibians) are known to occur in the vicinity of the study area according to the Ontario Herpetofaunal Atlas. Nine species have been observed by the NRSI within the study area, including 1 turtle and 8 amphibian species. The study area provides a less than ideal habitat for amphibians due to the lack of wetlands and open water. A number of amphibians' survival relies on the temporary nature of wetlands as they prevent the establishment of fish and other predators. The majority of wetlands within the study area are seasonal, making them suitable for these types of amphibians.
- A number of manmade ponds are also found in the study area and are suitable for turtles as well as amphibians that require permanent water. The habitat in the study area is also suitable in parts for a number of snake species to exist.
- A total of eight (8) species in the study area are known to be Species at Risk (SAR), all of them nationally and 7 of them provincially. The SAR found within the study area include Black-crowned Night-heron, Red-headed Woodpecker, Hooded Warbler, Chimney Swift, Bobolink, Eastern Meadowlark and Barn Swallow.
- 23 mammal species are known to be based in the study area with NRSI biologists recording evidence of nine of these species, all of which are common in Ontario. None of the mammal species in the study area are considered to be SAR.
- There are 50 species of butterflies known to be living in the vicinity of the study area with 15 of them being observed by biologists. These 15 included the monarch butterfly which is considered a SAR. Two (2) common dragonflies were also observed within the boundaries of the study area.

4.3.5 Significant Species

There are a number of nationally and provincially significant species documented in the study area and the NRSI observed several significant species during field studies. Included in these are a number of species that are protected under the Endangered Species Act and/or the Species at Risk Act. Significant plant, fish and wildlife species have been identified and these species may be found in significant natural habitats such as woodlands and wetlands.

SAR open country birds are known to inhabit the study area and make use of meadows and agricultural lands as well as built structures. These habitats are not included in the Natural Heritage System but must be assessed on a site specific basis. Habitat for all levels of significant species exists within the study area and should be protected and enhanced as development planning in St. George progresses.

4.3.6 Aquatic Habitat and Water Resources

Watercourses within the study area are tributaries of Fairchild Creek, which eventually turns into the Grand River downstream of the City of Brantford. The main portion of Fairchild Creek is located to the east of the study area and is classified as a warm body of water, but there are a number of tributaries in the study area that are classified as cool water or cold water streams. Cold water and cool water streams have the potential to support sensitive species such as brook trout. The aquatic habitats in the study area range from agricultural drains and manmade ponds to cold water streams. Fairchild Creek receives the effluent from the St. George WPCP.

Watercourses in the study area are classified by their temperature. Warm water, cool water, cold water, ephemeral drainage features and unclassified habitats are shown Figure 7.

In general, the cold and cool water tributaries flowing through the study area contribute to the thermal regime of Fairchild Creek and provide habitat and potential habitat for species such as brook trout, which require coldwater temperatures and groundwater for survival. Tributaries classified as cold water include portions of tributary B, the wooded corridors of tributary F, and tributary I downstream of Blue Lake Road. These portions of these reaches are naturally vegetated and relatively undisturbed habitats that contribute to the thermal regime of the tributaries by providing shade from the sun.

Fish Species

The Ministry of Natural Resources maintains a number of fish data and aquatic habitat observations recorded within the St. George study area that dates back to 17 years prior. There are 35 species of warm, cool and cold water habitats known to exist within

the study area with no SAR listed. One significant fish species found in the Fairchild Creek is the Greater Redhorse which is identified as provincially vulnerable. Other fish species of interest located in the study area include Brook Trout, Northern Pike and Largemouth Bass.

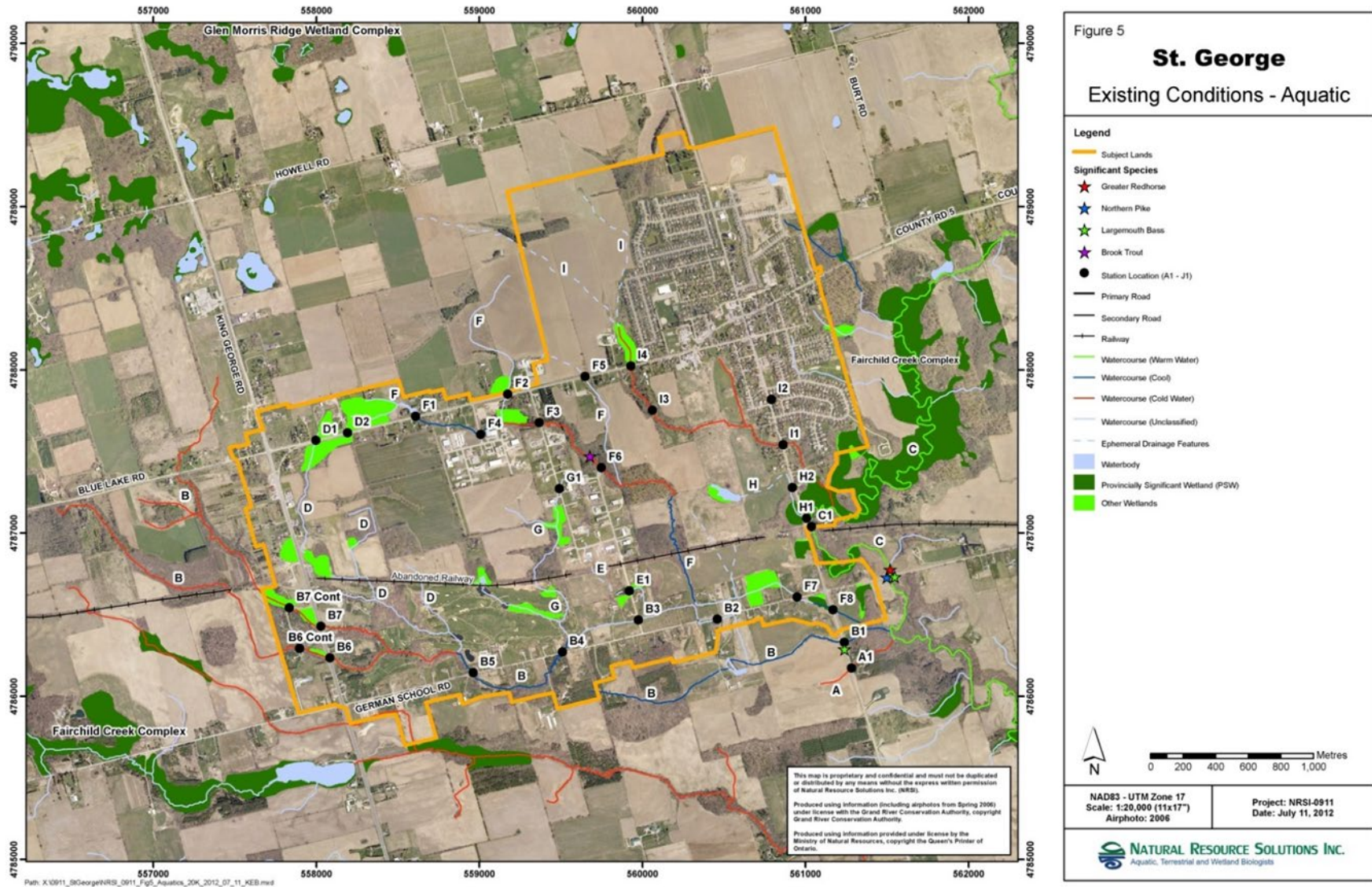


Figure 7 Location of Aquatic Habitat and Water Resources

4.4 Floodplain Areas

Overall location and extent of the floodplain areas within the project Study Area are shown in Figure 8, as per the blue hatched areas. As per Figure 8, the location of the existing St. George supply wells, treatment and storage facilities are outside of the floodplain areas, which can generally be found on the southern limits of the Study Area.

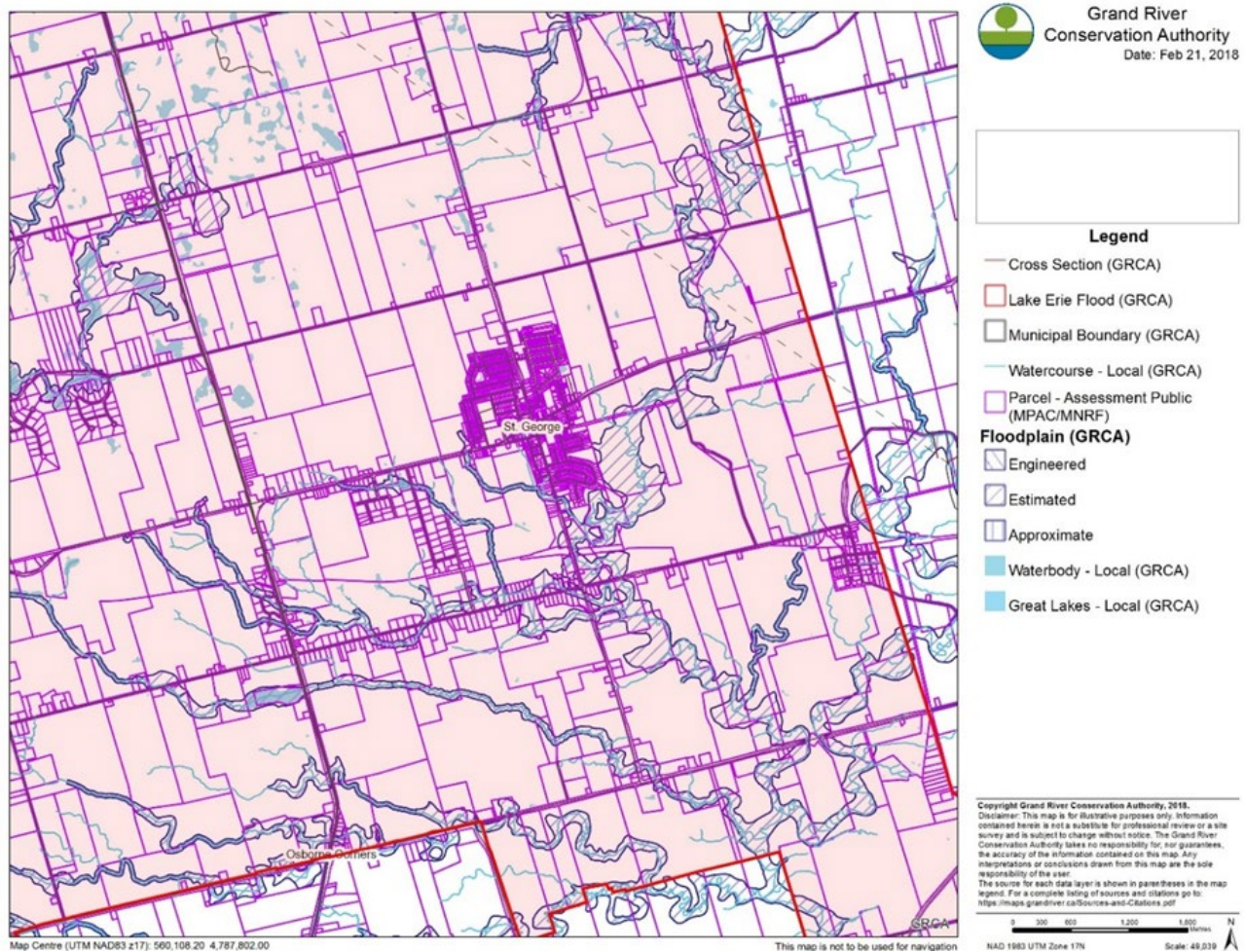


Figure 8 Floodplain Areas – Source: GRCA Interactive Mapping Tool

4.5 Existing St. George WPCP Outfall – Unnamed Tributary to Fairchild Creek

The existing St. George WPCP is owned by the County of Brant and operated by the Ontario Clean Water Agency (OCWA) under contract by the County. The facility operates under the Environment Compliance Approval (ECA) number 7620-97CPND dated June 7, 2013, with a rated average daily capacity of 1300 m³/d and approval to continuously discharge treated effluent to an unnamed tributary to Fairchild Creek

(herein referred to as the unnamed tributary). An assimilative capacity study (ACS) was carried out in 2016-2017 by Hutchinson Environmental Sciences Limited, in support of this Cass EA study to assess the potential increase in rated capacity of the St. George WPCP from 1,300 m³/d to an ultimate capacity of 3,900 m³/d. A potential increase in rated capacity of the existing St. George WPCP was considered as an alternative solution in this Class EA study, as described in subsequent sections of this report.

The following section provides a summary of the key findings with respect to the existing conditions of the unnamed tributary to Fairchild Creek within the study area. The complete “St. George Water Pollution Control Plant, Assimilative Capacity Study Final Report” (dated March 2, 2017) by Hutchinson Environmental Sciences Ltd., including modeling results, findings and recommendations can be found in Appendix G for further reference.

The characteristics of the unnamed tributary to Fairchild Creek within the study area were generally consistent, with “sticky” clay and silt substrates dominating the watercourses. The watercourses are highly meandering, relatively shallow (<1 m) while increasing in depth moving downstream tower Powerline Road. Moderately steep banks were noted through the unnamed tributary, while shallower banks were consistent in Fairchild Creek with the study area. Tall grasses and dense thickets grow along the banks of the watercourse, with forest beyond. The watercourse are turbid and the creek bottoms are not visible. There was an absence of macrophytes within the watercourses.

4.5.1 Aquatic Assessment – Unnamed Tributary to Fairchild Creek

As part of the scope of the ACS, an aquatic assessment was completed at various sites throughout the study area to characterize the habitat and determine resident biota, including Species at Risk, so that critical habitat types of resident species could be determined.

The study area was found to support a warmwater fish community. Twenty-nine fish species have been collected in the St. George settlement area, a subset of which is likely to occur in the study area. To the date of the report, the only provincially significant fish or mussel species observed in the study area is the Greater Redhorse (MNRF, 2016) in 1995 and 1999. Greater Redhorse spawning habitat is sparse in the study area because of the rarity of shallow riffles which they typically inhabit. They are also sensitive to increased siltation, so the local population is likely limited by the silty, highly turbid conditions within the watercourses that have resulted from local runoff and not from effluent inputs.

In general, aquatic habitat in the study area was found to be limited. Substrates are relatively homogenous and unconsolidated, water temperatures are warm, and high

turbidity limits production of macrophytes as well as the diversity of lower trophic level organism such as benthic invertebrates. General spawning, nursery and cover habitat is limited by these factors and scarcity of critical habitats appears to limit the presence of rare or sensitive species.

4.5.2 Unnamed Tributary and Fairchild Creek Water Quality

Water quality monitoring was completed on a weekly basis between June and October 2016. Within the study area, in both the unnamed tributary and Fairchild Creek, there was a low oxygen demand. Dissolved oxygen (DO) concentrations were well above the Provincial Water Quality Objective (PWQO) for both reaches, with the exception of Fairchild Creek at Governors Road where DO concentrations fell below the PWQO, likely due to near-stagnant flows at this station.

Total suspended solids (TSS) concentrations were generally consistent but elevated throughout the study area as a result of the agricultural inputs, eroding banks in some locations, clay-silt substrate, and an absence of macrophytes which would assist in settling suspended solids and preventing erosion and re-entrainment of substrate.

Total phosphorus (TP) concentrations in the study area are well above the PWQO, including at the upstream monitoring stations. The watercourses are nutrient rich due to in-stream bank erosion, bed scouring, and agricultural inputs throughout the subwatershed. Therefore, the unnamed tributary is a Policy 2 receiver for TP, which means that the tributary “shall not be degraded further and all practical measures shall be taken to upgrade the water quality to the objectives” (MECP, 1994a). Within the unnamed tributary and Fairchild Creek, orthophosphate and dissolved phosphorus concentrations were similar, indicating that bioavailable phosphorus represents approximately half of the TP concentrations measured.

A detailed description of water quality in terms of other parameters is described in detail in the St. George Water Pollution Control Plant, Assimilative Capacity Study Final Report” (dated March 2, 2017) by Hutchinson Environmental Sciences Ltd., included in Appendix G.

4.5.3 Abandoned Oxbow Water Quality

While the abandoned oxbow received surface water runoff during storm events and spring freshet, the St. George WPCP discharge is the only source of consistent flow to the oxbow. As such, the water quality in the oxbow is reflective of the WPCP effluent quality.

TSS concentrations increased between WPCP effluent and the abandoned oxbow, as a result of picking up sediment through the natural watercourse. TP concentration are

slightly higher in the abandoned oxbow, likely due to the elevated TSS in the abandoned oxbow and particulate-associated TP.

4.5.4 Unnamed Tributary and Fairchild Creek Flows

The measured stream flows were the lowest in July and August, increasing in September and October. There was a steady increase in flow between all unnamed tributary stations on all flow monitoring events, indicating the existence of additional sources of flow to the tributary, such as smaller tributaries, runoff and/or groundwater input.

4.6 Existing Geotechnical and Hydrogeological Conditions

Available hydrogeological information of the study area, including MECP well records and hydrogeological reports were reviewed and compiled by Armstrong Hunter and Associates during a phased exploration program completed between 2010 and 2012, on behalf of the St. George LOG, in support of the St. George Area Study.

The following provides a summary of the surficial geology characteristics of the study area, based on the hydrogeological information documented in the past.

The St. George study area was found to have a complex surficial geology with a variety of surficial materials. Surficial materials within this area are dominated by sand and gravel outwash deposits that resulted from a melting glacial ice front to the north. These materials are permeable and have high groundwater infiltration potential. There are also topographically low areas within the outwash channel that are occupied by wetland features and are mostly found in the east central portion of the study area along Highway 5. A small kettle lake also occurs within the area east of Highway 24 and south of Howell Road.

The southern and eastern part of the study area has mostly fine-grained glacial lake deposits consisting primarily of silt and clay with some minor sand. The study area drains in a general south easterly direction via tributaries emptying to Fairchild Creek. The underlying bedrock in the area is mostly dolostones of the Guelph Formation and occurs between 180 mASL and 220 in the study area. An east west bedrock valley cuts across the south of the study area with the deepest part occurring south of German School Road and crossing at Highway 24 (Ontario Department of Mines, 1963).

There are three major aquifer sequences occurring within the study area:

- Unconfined outwash sand and gravel deposits
- Buried sand and gravel deposits

- Shallow bedrock – bedrock is encountered at depths of between 25 m to 50 m from surface

The surficial sand and gravel deposits represent an unconfined aquifer which has variable thickness and locally has limited thickness. These types of deposits are found throughout the study area but are more abundant within the northern and central portion of the study area. They will generally be found beneath fine grained confining units or aquitards at depths ranging from 5 to 15 m with varying thickness of 5 and 20 m. The majority of wells in the area are dug into these deposits.

In areas where the buried granular deposits are of a low thickness or absent, the bedrock is utilized as an aquifer. Most of the wells along German School Road are completed into bedrock. Wells buried in the sand and gravel aquifer yield between 0.076 L/s to 8.4 L/s with most testing between 0.38 L/s and 1.52 L/s. This indicates that there is generally more than adequate groundwater available for most private domestic wells. The majority of water use is reported for domestic use although some minor industrial and commercial use and stock water is also reported.

Water quality is generally reported to be fresh, but a small number of wells south of the study area have reported sulphurous water and in a few cases wells have been reported dry. A number of wells within the study area are considered to be completed into an aquifer of moderate to high aquifer (i.e., well yield) potential.

4.7 Existing Development Constraints

The 2012 OP includes development constraints for areas where naturally occurring environmental features exist and human made features or conditions occur. There are specific policies in the County's OP that restrict development on lands and uses that have the potential to be a hazard as a result of human activity, including waste disposal sites, potentially contaminated sites, and the creation of noise, dust and emissions.

The main natural heritage system features and development constraints with the St. George study area, are shown in Figure 9. As shown in the figure, the St. George study area contains significant wetlands as well as hazardous lands and sites.

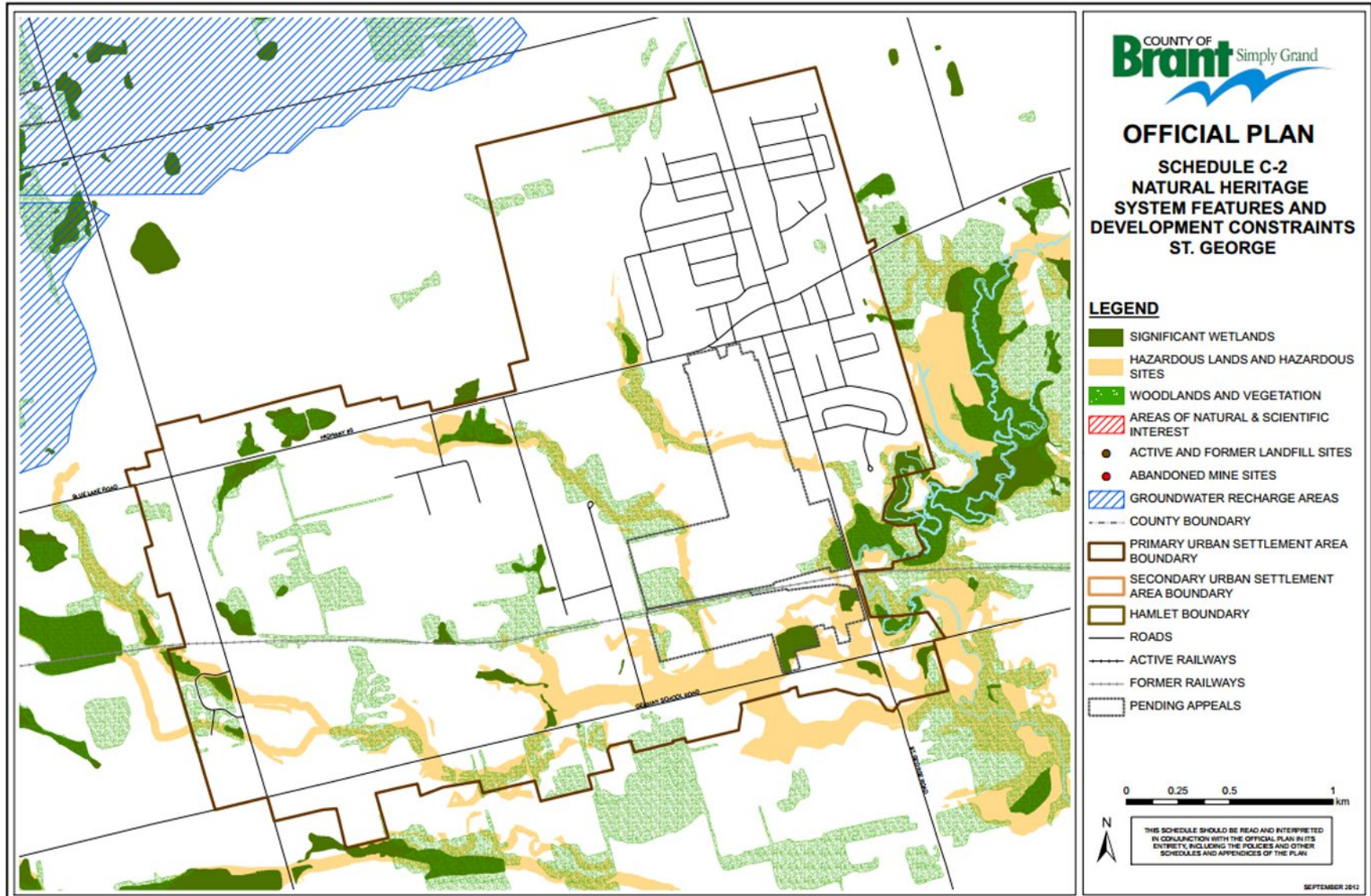


Figure 9 St. George Existing Development Constraints

5 Existing St. George Wastewater Servicing

5.1 Wastewater Treatment

The existing St. George WPCP is located at 43 Victor Boulevard, St. George in the County of Brant. The facility is owned by the County and operated by the Ontario Clean Water Agency (OCWA). Operations staff members are on site for a few hours per day, five days per week. The influent wastewater is considered typical municipal domestic wastewater, primarily composed of residential wastewater flow, with some limited commercial and industrial contributions.

The existing St. George WPCP is an extended aeration activated sludge sewage treatment plant with a current approved average daily flow (ADF) capacity of 1,300 m³/d and a peak flow rate of 3,900 m³/d, as per its Amended Environmental Compliance Approval (ECA) Number 7620-97CPND (June, 2013).

Due to process limitations, the actual processing capacity of the plant is constrained to 1,000 m³/d. This capacity limit was recommended in 2009 (Gamsby and Mannerow) and approved by the County of Brant Corporate Development Committee in June 2009. This capacity limit is governed by County Policy CDC 2009-03 “Servicing Capacity – St. George.”

The original plant was constructed in 1981, with a rated capacity of 1,063 m³/d. In 2005, the plant was re-rated to the current approved capacity. The works included in the plant re-rating included a new channel inlet grinder (replaced original comminutor), new fine bubble aeration diffusers, an additional aeration blower, upgraded chlorination system and addition of dechlorination system, and a new aerobic digester and blower.

A process flow diagram and aerial image of the existing St. George WPCP are provided in Figure 10 and Figure 11, respectively.

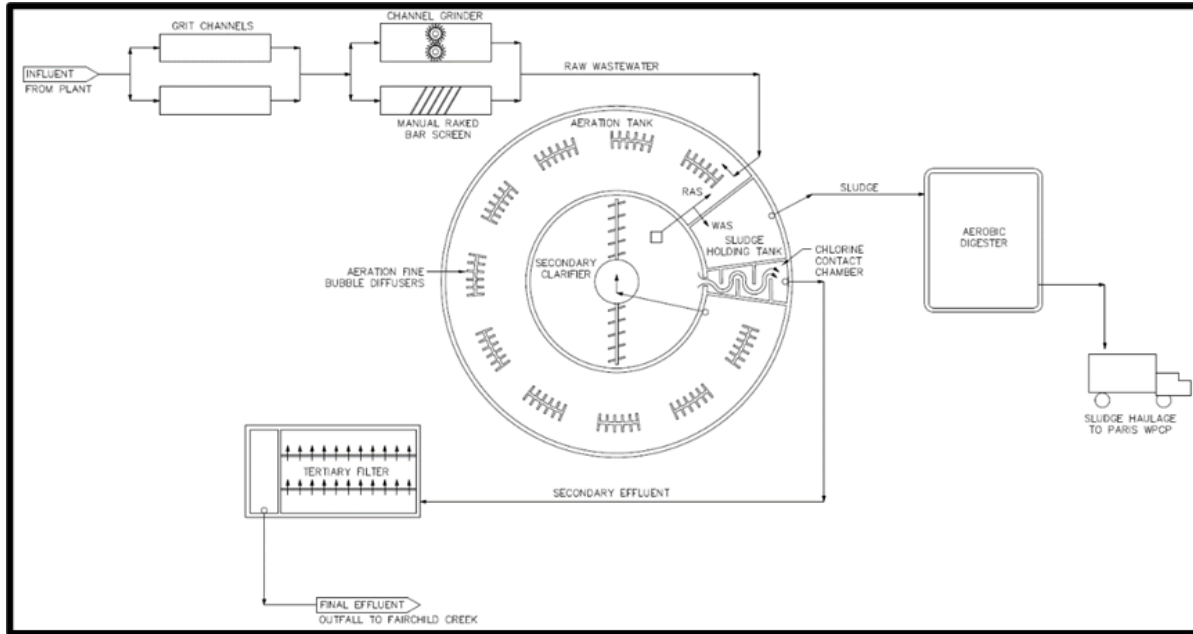


Figure 10 St. George WPCP - Process Flow Diagram



Figure 11 St. George WPCP – Aerial Image (Source: Google Maps, 2013)

Raw wastewater receives preliminary treatment via two parallel grit channels (duty/standby) followed by a channel grinder and manually raked bypass bar screen. Secondary treatment is provided in a circular extended aeration package plant, consisting of one annular ring aeration tank equipped with fine bubble diffusers and one

circular secondary clarifier located in the centre of the package plant. Secondary effluent is disinfected using sodium hypochlorite, with contact time provided by an annular ring segment chlorine contact tank (CCT), and directed to a travelling bridge sand filter for tertiary polishing. Filtered effluent is dechlorinated using sodium bisulphite and conveyed by gravity via a single outfall pipe to a stranded oxbow of an unnamed tributary of Fairchild Creek. Return activated sludge (RAS) and waste activated sludge (WAS) pumping are controlled manually using an air lift pump. The sludge processing system at St. George WPCP is described in more detail in the following section.

The main components of the St. George WPCP are:

- Preliminary Treatment:
 - Two (1 duty, 1 standby) manually cleaned grit channels
 - One (1) channel grinder and one bypass manual raked bar screen
- Aeration System:
 - One annular segment aeration tank equipped with fine bubble diffused aeration system
 - Three (2 duty, 1 standby) positive displacement blowers to supply process air to the aeration tank, RAS/WAS air lift pump (described below), and aerobic digester
- Secondary Clarifier:
 - One (1) circular secondary clarifier
 - One (1) air-lift RAS (discharge to aeration tank) and WAS (discharge to the sludge holding tank) pump and one air-lift scum removal pump (discharge to the sludge holding tank)
- Chemical Phosphorus Removal
 - Chemical (metal salts) dosing facilities consisting of one ferric chloride chemical storage tank with secondary containment, day tanks, and three chemical metering pumps (discharge to aeration tank and/or tertiary filter)
- Effluent Chlorination/Dechlorination Disinfection System:
 - Three (3) sodium hypochlorite chemical storage tanks, two chemical dosing pumps and one annular segment CCT
 - Secondary containment for delivered sodium bisulphite drums, three chemical metering pumps and one oxidation-reduction-potential (ORP) feedback control system to control the chemical metering pumps
- Tertiary Filtration System:

- One (1) travelling bridge sand filter
- One (1) backwash water storage tank
- One (1) submersible waste sump pump (discharge to the aeration tank)
- Outfall Sewer System
 - One (1) outfall sewer pipe from tertiary filter effluent to a stranded oxbow of an unnamed tributary to Fairchild Creek
- One (1) Standby Diesel Generator

5.2 Sludge and Biosolids Management

A simplified overview of the St. George WPCP solids process is provided in Figure 12. The facilities involved in the sludge/biosolids process (St. George WPCP and Paris WPCP) are described in the following subsections.

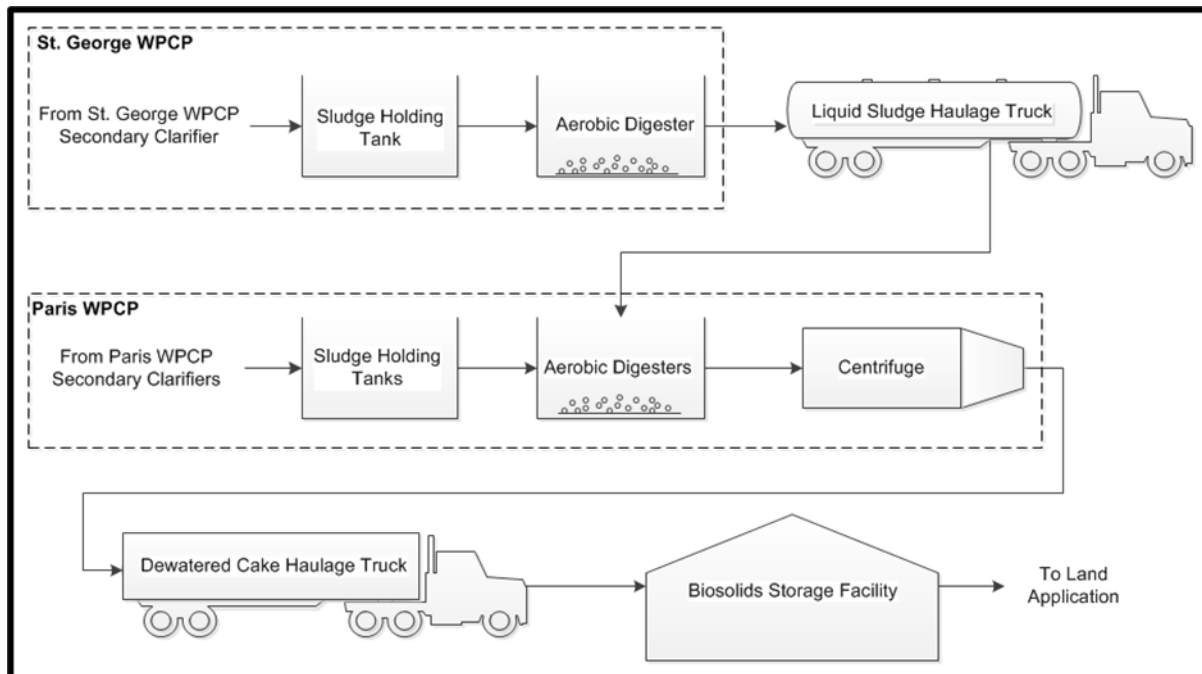


Figure 12 Simplified St. George and Paris WPCP Sludge/Biosolids Flow Schematic

5.2.1 St. George WPCP

Sludge is stored and gravity thickened in the annular ring segment sludge holding tank and periodically (approximately once per week) transferred to the aerobic digester prior to haulage (approximately every one or two weeks) offsite to the Paris WPCP for further aerobic digestion and dewatering. The main components of the St. George WPCP sludge management system includes:

- One (1) annular segment sludge holding tank (intended for operation as an aerobic digester) equipped with a coarse bubble diffuser header assembly (not currently operated) and manual supernatant withdrawal system with air lift pump (discharge to aeration tank)
- One (1) aerobic digester with a coarse bubble diffuser header system and telescopic valve supernatant withdrawal system (not currently operated)
- One (1) positive displacement blower (aeration also provided through tie-in with process air system), one submersible type sludge transfer pump to load trucks for off-site haulage, one sludge transfer pump, one supernatant return pump, one supernatant lift pump (discharge to aeration tank), and sludge loading bridge and waste sludge loading pipe for loading liquid biosolids for off-site haulage

5.2.2 Paris WPCP

The Paris WPCP is located at 120 Race Street, Paris in the County of Brant. The facility is owned by the County and operated by OCWA.

The Paris WPCP stabilizes sludge using aerobic digestion and dewateres the stabilized sludge (i.e., biosolids) using a centrifuge. Liquid partially digested sludge from the St. George WPCP aerobic digester is hauled to the Paris WPCP for co-digestion and dewatering with centrifuges. The St. George WPCP sludge is discharged into the Paris WPCP aerobic digesters.

The main components of the Paris WPCP sludge management system include:

- Sludge Holding Tanks and Aerobic Digesters
 - Three (3) sludge holding tanks
 - Five (5) aerobic digesters
 - One (1) sludge transfer pump with variable frequency drive (VFD) to transfer sludge from between digesters or to the dewatering centrifuge and one sludge transfer pump with VFD to transfer biosolids from the aerobic digesters to the dewatering centrifuge
 - Three (2 duty, 1 standby) positive displacement blowers
- Centrifuge Dewatering
 - One (1) dewatering centrifuge
 - Shaftless screw conveyor and distribution screw
 - One (1) liquid polymer make-up system

5.2.3 Biosolids Storage Facility

The County of Brant Biosolids Storage Facility is located on the Paris Landfill Site (40 Railway Street in the County of Brant). The landfill was closed once it reached capacity and at this time only the Biosolids Storage Facility and the Paris Waste Transfer and Recycling Station actively operate on the site. The facility receives and stores dewatered biosolids generated by the St. George and Paris WPCPs, prior to seasonal land application. The Biosolids Storage Facility is a 20 m by 30 m building and is approved to store a maximum of 1200 m³ of biosolids cake at any one time for up to 12 months.

5.3 Historical Flows, Wastewater Quality and Sludge Generation

5.3.1 St. George WPCP Flow Rates

Historical flow data from the 2010 to 2013 St. George WPCP Annual Performance Reports (OCWA 2011, 2012, 2013, 2014) are charted in terms of historic Average Daily Flow (ADF) and maximum day flow in Figure 13. Both ADF and maximum day flow are reported on a monthly basis. As required in the St. George WPCP ECA, the ultrasonic flowmeter measures the plant effluent flow rate with an accuracy of +/-15% of the actual flow rate.

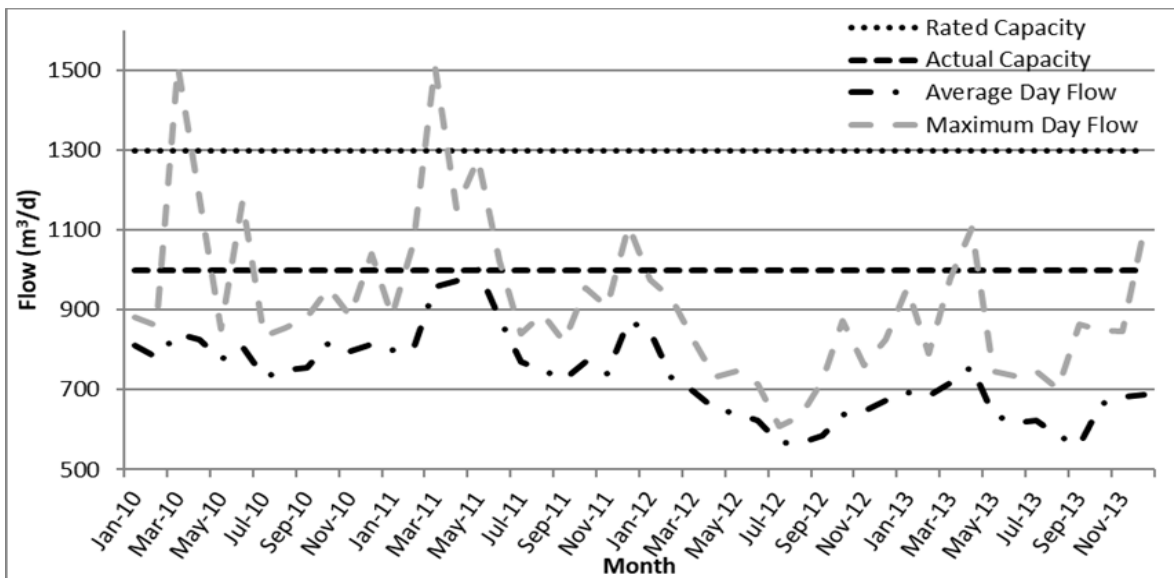


Figure 13 Historic Average Day and Maximum Day Flows to the St. George WPCP (2010 – 2013)

The flow data demonstrate a seasonal trend, with peak maximum day flow values generally occurring during spring runoff periods, which is indicative of high inflow levels. The ADF remained at or below both the approved (1,300 m³/d) and actual (1,000 m³/d) plant capacities. The maximum day flow remained well below the plant peak design flow rate of 3,900 m³/d (based on a peaking factor of 3, and as stipulated in the ECA) throughout this period.

The St. George WPCP ADF and maximum daily flow data for the period of 2010 to 2013 are presented in Table 4.

Table 4 Current St. George WPCP Flow (2010 – 2013)

Year	Average Daily Flows (m ³ /d)	Maximum Daily Flows (m ³ /d) (Month reported)
2010	793	1,512 (March)
2011	833	1,511 (March)
2012	656	977 (January)
2013	659	1,105 (April)
4-Year Average Daily Flows	736	

To ensure capacity is available for currently vacant buildings and to allow for peak flow years, a 25% safety factor was added to the ADF to establish the capacity allocated to existing serviced area. The existing allocated capacity at ADF is 920 m³/d, which is 92% of the actual plant process capacity. A summary of current, allocated, actual, and ECA rated average daily flow and peak flow is presented in Table 5.

Table 5 Summary of St. George WPCP Average Daily Flow and Peak Flow

Year	Current	Allocated	Actual ¹	ECA Rated Capacity
Average Daily Flow (m ³ /d)	736	920	1,000	1,300
Peak Flow ² (m ³ /d)	2,208	2,760	3,000	3,900

Notes:

1. As governed by County Policy CDC 2009-03 “Servicing Capacity – St. George.”
2. Based on a peaking factor of 3.0

5.3.2 Raw Wastewater Quality

Table 6 presents the raw wastewater average concentration and loadings to the plant from 2010 and 2012. Data from 2013 were excluded due to low concentration and loading values, which may be due to uncharacteristic influent sampling.

Table 6 Historic Raw Wastewater Average Concentrations and Loadings to St. George WPCP (2010 to 2012)

Parameters	Historic Average Concentration (mg/L)	Historic Average Loadings (kg/d) ¹
Carbonaceous Biochemical Oxygen Demand (CBOD ₅)	174	128
Total Kjeldahl Nitrogen (TKN)	37	27
Total Suspended Solids (TSS)	296	218
Total Phosphorus (TP)	4.6	3.4

Notes

1. Based on a historic average ADF of 736 m³/d

5.3.3 Effluent Quality and Performance

Effluent data for the period of 2010 to 2013 are presented in Table 7. The St. George WPCP produced excellent effluent quality, with concentrations below effluent objectives, and well below effluent compliance requirements.

Table 7 Historic Effluent Quality (2010 to 2013) Compared to Effluent Requirements

Parameters	Average ¹	Peak Month	Objective ²	Compliance ²
CBOD ₅ (mg/L)	2.1	3.5	10	15
Total Ammonia Nitrogen (mg/L)				
May to October	0.37	1.1	1	1.2
November to April	0.49	2.3	3	3.6
TSS (mg/L)	1.8	7.0	10	15
TP (mg/L)	0.13	0.28	0.3	0.42
pH (at all times)	7.9	8.14	6.5 - 9.0	6.5 - 9.0
E. coli (organisms/ 100 mL Monthly Geometric Mean Density)	3.4 ³	111 ³	150	200

Notes

1. Non-detect values are assumed to be equal to the detection limit; therefore, average values are conservative estimates
2. Source: ECA Number 620-97CPND
Geometric mean

5.4 Historical Sludge and Biosolids Generation

5.4.1 St. George WPCP Sludge Generation

An overview of average monthly and total annual sludge haulage from the St. George WPCP is presented in Table 8. A trend of increasing monthly average and total annual haulage is observed.

Table 8 St. George WPCP Sludge Haulage

Year	Monthly Average (m ³ /month)	Total Annual Haulage (m ³)	Total Annual Haulage (Dry kg)
2010	142	1,700	41,650
2011	152	1,826	44,737
2012	178	2,132	52,234
2013	190	2,279	55,836

Notes

1. Based on an average Sludge TSS

A simplified mass balance based on BOD loading (assuming a relationship of 1 kg influent BOD to 1 kg sludge generated) reveals the expected relationship between BOD loading and reported sludge haulage, with sludge generation estimated using BOD loading ranging from -5% to 18% of reported sludge haulage, from 2010 and 2012.

The relationship of influent plant flow to sludge generation ranged from 146 to 231 kg sludge/1000 m³ plant flow. While sludge generation has increased steadily from 2010 to 2013, plant influent flow and BOD concentrations have fluctuated; therefore, the relationship between plant influent flow and sludge generation has varied. A design sludge generation basis of 290 kg sludge/1000 m³ plant flow (231 kg sludge/1000 m³ plant flow and a 25% safety factor) was used as the design basis for this Class EA Study.

Haulage rates vary widely from month to month. Operations reports indicate that approximately 80 m³ of St. George WPCP sludge is hauled every two weeks to the Paris WPCP at 2 to 3% solids.

5.4.2 Combined Paris WPCP and St. George WPCP Biosolids Generation Rates

Paris WPCP and St. George WPCP biosolids generation data were available in terms of amount of dewatered biosolids hauled from the Paris WPCP to land application (via the Biosolids Storage Facility). These biosolids generation values include the sludge produced at both the Paris and St. George WPCPs, which are combined and undergo aerobic digestion and dewatering at the Paris WPCP. Biosolids data were provided in terms of haulage of wet tonnes; dry weight was provided only for 2011. Based on the 2011 data, the solids content of the hauled dewatered biosolids is estimated to be 19%. This dewatered biosolids concentration was described as typical during a site visit to the Paris WPCP in July 2014. The total combined annual Paris WPCP/St. George WPCP biosolids haulage to land application is presented in Table 9.

Table 9 Combined Dewatered Biosolids Haulage to Land Application

Year	Amount (Wet Tonnes)	Amount (Dry kg) ¹	Volume (m ³) ²
2011 Total	776	148,113	773
2012 Total	787	148,388	775
2013 Total	743	140,227	732

Notes:

1. Reported in 2011; estimated for 2012 and 2013 based on average 2011 solids percentage of 19%
2. Based on dewatered sludge solids content of 19% (average reported in 2011, the only year for which data was available)

5.5 Capacity Assessment

The St. George WPCP was reviewed on the current operations/performance for the major process units, and the capacity was assessed based on MECP Guidelines (2008). Detailed descriptions of the process units are described in the following sub-sections.

5.5.1 Preliminary Treatment

5.5.1.1 Description

The inlet works consist of two manually cleaned grit channels and one channel grinder with a bypass manual raked coarse bar screen.

Plant influent flow first passes through the grit channels, which allow grit to settle out of the influent wastewater stream. Degritted effluent is conveyed through one channel grinder, which reduces the size of influent particles without removing solids from the influent stream. A bypass channel equipped with a manual raked course screen is available for when the capacity of the grinder is exceeded, or when the grinder is unavailable for service. A design description overview for the preliminary treatment is provided in Table 10.

5.5.1.2 Current Operation/Performance

The grit channels operate as duty/standby. The duty assignment is changed approximately every six months, and a sucker truck is used to empty the last duty grit channel.

Lack of screening and inadequate grit removal causes significant operational problems in downstream treatment processes. Accumulations of coarse material (e.g., rags, plastics and grit) cause mechanical failures of diffusers and pumps and settle in tanks. Aeration is significantly impaired in the aeration tanks and decanting has been ceased from the aerobic digester due to problems with coarse bubble diffusers clogging when aeration was turned off.

Table 10 St. George WPCP Preliminary Treatment Design Description

Item	Description
Grit Channels	
Number	2
Volume (per channel) (m ³)	1.875
Channel Grinder	
Number	1
Design Capacity (total) (m ³ /d)	7,800
Manual Raked Bar Screen	
Bar Spacing (mm)	50

5.5.1.3 Capacity and Performance Assessment

As stated in the St. George WPCP ECA (No. 620-97CPND), the design capacity of the grit channels is 3,900 m³/d (equal to the St. George WPCP rated peak flow capacity) and the design capacity of the channel grinder is 7,800 m³/d. The design of the grit removal facilities generally meets MECP Guidelines (2008), including dimensions, location, minimum number of units, and storage.

The design of the grinder system generally meets MECP Guidelines (2008), including peak hourly flow capacity and the provision of a screened bypass channel. However, the MECP notes that while grinders are considered an alternative to coarse screening, physical removal of coarse material is preferred, due to potential problems with recombination of material in downstream treatment units (MECP, 2008).

The MECP Guidelines (2008) recommend that coarse screening should be provided upstream of grit removal and grinders; no such equipment is provided at the St. George WPCP.

5.5.2 Aeration Tanks

5.5.2.1 Description

The extended aeration system consists of one (1) annular aeration tank equipped with a fine bubble diffuser aeration system. Three (3) positive displacement blowers (2 duty, 1 standby) supply air to the aeration tank, as well as the RAS/WAS air lift pumps and the aerobic digester. There is one (1) aeration tank bypass channel, which discharges to the secondary clarifier.

The diffusers were replaced in 2005, as part of the plant upgrades that were performed to re-rate the plant to 1,300 m³/d (with full nitrification). The second duty blower was also added at this time. A design description overview for the aeration tank is provided in Table 11.

Table 11 St. George WPCP Aeration Tank Design Description

Item	Description
Aeration Tank	
Tank Type	Annular
Flow type	Plug
Dimensions	
Side Water Depth (SWD) (maximum) (m)	4.3
Volume (m ³)	851.6
Process Air System	
Diffusers	Fine bubble diffusers (Stamford Scientific Int.)
Blower	
Blower Type	Positive displacement blowers
Number	2 duty, 1 standby
Capacity	800 m ³ /h at 54 kPA per blower

5.5.2.2 Current Operation

Plant effluent CBOD₅ and nitrogen levels are indicative of aeration tank performance; as presented in Table 7, the plant effluent was comfortably meeting effluent objectives between 2010 and 2013.

The fine bubble diffusers have experienced on-going maintenance problems since installation in 2005, which have resulted in overall poor aeration system performance. Operations described problems with broken distribution headers, clogged diffusers, and failures of support frame. Poor diffuser performance was evident in the uneven aeration tank surface, depicted in Figure 14.

The aeration diffuser grids were removed (without draining the tank) and maintenance activities were performed in 2011; a crane was used to remove the diffuser grids and accumulated material such as rags were removed. Accumulation of solid material in the bottom of the tank was observed, and caused difficulties in removing the grids, but was not removed. One grid was removed completely and not replaced; a total of nine aeration diffuser grids are currently in place. Most of the grids are broken, requiring the air to be controlled by throttling a manual valve on the individual air pipes.

Annual average mixed liquor suspended solids (MLSS) concentrations from the years of 2004 to 2008 ranged from 4,328 to 4,928 mg/L (Gamsby and Mannerow, 2009), which is at the higher end of the 3,000 to 5,000 mg/L MLSS range typical for extended aeration tanks (MECP, 2008). Operators noted that MLSS levels reached as high as 7,000 to 8,000 mg/L in 2014. Sludge wasting is a manual process and is limited by the rate of supernating from the sludge holding tank; the sludge wasting limitations result in poor MLSS control.



Figure 14 Aeration Tank Surface (July 2014)

5.5.2.3 Capacity and Performance Assessment

The MECP Guidelines (2008) recommend a minimum solids retention time (SRT) of 15 days and a minimum extended aeration tank hydraulic retention time (HRT) at average daily flow of 15 hours. The results of the extended aeration process capacity assessment are presented in Table 12; based on MECP Guidelines (2008) the capacity of the aeration tank is sufficient for the current rated capacity.

Table 12 Extended Aeration Process Capacity Assessment

Parameter	Units	MECP Guideline	Plant Parameter Value at Rated Capacity
Solids Retention Time (SRT) at Average Daily Flow ¹	days	>15	18
Hydraulic Retention Time (HRT) at Average Daily Flow	hours	>15	16

Note:

1. Based on a MLSS of 4,700 mg/L, based on historical operation

The lack of aeration tank redundancy is a major limitation at the St. George WPCP. It is not practical to take the one tank out of service for maintenance. Although the diffusers

can be removed for cleaning and repairs with the tank in service, cleaning out of accumulated material in the tank (caused by insufficient preliminary treatment) requires the tank to be taken out of service.

5.5.3 Secondary Clarification

5.5.3.1 Description

The one (1) circular secondary clarifier is located in the centre of the annular aeration tank, and is equipped with a rotating sludge collection system. One (1) air-lift pump is used for RAS/WAS pumping; RAS is returned to the aeration tank and WAS is directed to the sludge holding tank. Scum is skimmed off of the surface of the secondary clarifier using a rotating scum plate, and one (1) air-lift scum pump removes collected scum and directs it to the sludge holding tank. A design description overview for the secondary clarifier is provided in Table 13.

Table 13 St. George WPCP Secondary Clarification Design Description

Item	Description
Diameter (m)	10.67
Surface Area (m ²)	89.42
SWD (m)	3.8
RAS / WAS Air Lift Pump	15.0 L/s (1,300 m ³ /d) at 4.0 m
Scum Removal	Rotating Scum Plate

5.5.3.2 Current Operation

Data were not available on the secondary clarifier effluent quality. The low effluent TSS levels (presented in Table 7) are generally indicative of good secondary clarifier performance. However, filter bypass events reported in annual reports (OCWA 2009, 2010, 2011) (described in Section 5.5.6) suggest the occurrence of secondary clarifier solids washout events.

No specific issues with sludge quality (e.g., sludge bulking) or RAS/WAS pumping were identified as current issues by operations. However, the use of air lift pumps for RAS/WAS pumping may result in poor control of sludge pumping rates. Also, the sludge collection mechanism is broken and requires attention.

Sludge wasting is a manual process, based on the rate of supernating from the sludge holding tank, rather than maintaining a target MLSS concentration in the aeration tank. As a result, elevated MLSS concentrations were reported in the aeration tank (discussed in Section 5.5.2). The elevated MLSS is indicative of a high solids load in the

system. Operations reported problems with solids carryover at flow rates greater than 1000 m³/d, which causes filter blinding, and is a key factor limiting the actual plant capacity.

5.5.3.3 Capacity and Performance Assessment

The MECP Guidelines (2008) recommend secondary clarifier loading rates in terms of surface overflow rate (SOR) at design peak hourly flow (PHF) and solids loading rate (SLR) at PHF and peak RAS return.

The results of the secondary clarification process capacity assessment are presented in Table 14. The St. George WPCP secondary clarifier SOR at peak flow and SLR at peak flow and maximum RAS return rate exceed the maximums recommended by the MECP (2008). Therefore, based on MECP Guidelines (2008), the secondary clarifier is not sized adequately for the current rated capacity.

Table 14 Secondary Clarification Process Capacity Assessment

Parameter	Units	MECP Guideline	Plant Parameter Value at Rated Capacity
Surface Overflow Rate (SOR) at Peak Flow	m ³ /m ² ·d	<37	44
Solids Loading Rate (SLR) at Peak Flow and maximum RAS return rate ¹	kg/m ² ·d	<170	273

Note:

1. Based on a MLSS of 4,700 mg/L, based on historical operation

The MECP Guidelines (2008) state that the side water depth (SWD) should be designed to provide an adequate separation zone between the sludge blanket and the overflow weirs, and recommend a SWD of between 3.6 m and 4.6 m. Although the St. George WPCP secondary clarifier SWD is within (although on the lower end of) the recommended range (3.8 m), due to the thick sludge blanket that has historically been maintained in the tank (Gamsby and Mannerow, 2009), the zone between the sludge blanket and the overflow weirs may not be adequate, thus leading to solids washout problems.

The lack of secondary clarifier redundancy is a major limitation at the St. George WPCP. It is not practical to take the one tank out of service for maintenance (e.g., to service the secondary clarifier mechanism, which is currently broken).

5.5.4 Phosphorus Removal

5.5.4.1 Description

The St. George WPCP uses a chemical phosphorus removal system that consists of one ferric chloride chemical storage tank with secondary containment, day tanks, and three chemical metering pumps. The phosphorus removal system can dose to the aeration tank and/or the tertiary filter. A design description overview for the phosphorus removal system is provided in Table 15

Table 15 St. George WPCP Chemical Phosphorus Removal System Design Description

Item	Description
Chemical	Ferric chloride
Chemical Storage	1 storage tank, complete with secondary containment 3 day tanks
Chemical metering pumps (dose aeration tank mixed liquor)	1,892 L/h chemical metering pumps, 1 d/1 s
Chemical feed pump (provisions to dose tertiary filter)	1 chemical feed pump rated at 24 L/h

5.5.4.2 Current Operation

Total phosphorus (TP) levels met design objectives during the period reviewed for this study (2010 – 2013). Currently, ferric chloride is dosed to the aeration tank only.

The ferric chloride storage tank is in poor condition and requires replacement. Due to the size of the tank, it may not be possible to replace the existing tank in the building; therefore, a new outdoor tank may be required.

5.5.5 Chlorination and Dechlorination

5.5.5.1 Description

The St. George WPCP disinfection system uses chlorination and dechlorination. The chlorination system includes three (3) sodium hypochlorite storage tanks, two chemical dosing pumps, one annular segment type chlorine contact tank (CCT) and one 60° V-notch weir located at the CCT overflow for automatic control of the chlorination and chemical feed system. The dechlorination system includes secondary containment for sodium bisulphite (delivered in 200 L drums), three (3) chemical metering pumps (1 duty, 1 standby, 1 emergency duty). An ORP feedback control system is used to control

the chemical metering pumps. Secondary clarifier effluent is chlorinated and tertiary filter effluent is dechlorinated (three dosing points are available). A design description overview for the chlorination/dechlorination system is provided in Table 16.

Table 16 St. George WPCP Chlorination/Dechlorination System Design Description

Item	Description
Chlorination	
Chemical	Sodium Hypochlorite
Chemical Storage	3, 1 m ³ tanks
Chemical dosing pumps	
No. of pumps	2
Capacity (L/h)	14
Chlorine Contact Chamber	
Tank Type	Annular
Volume (m ³)	26
Dechlorination	
Chemical	Sodium Bisulphate
Chemical Storage	Delivered 200 L drums
Chemical metering pumps	
No. of pumps	3 (1 duty, 1 standby, 1 emergency duty)
Control system	Oxidation reduction potential feedback control system to control chemical metering pumps

5.5.5.2 Current Operation

The low E. coli levels in the plant effluent (see Table 7) are indicative of an effective disinfection process.

5.5.5.3 Capacity and Performance Assessment

The MECP (2008) recommends a minimum chlorine contact time of 30 minutes at Average Daily Flow and 15 minutes at Peak Hourly Flow. The results of the disinfection process capacity assessment are presented in Table 17. The contact time guidelines are generally met; additional contact time is provided during filtration.

Table 17 Disinfection Process Capacity Assessment

Parameter	Units	MECP Guideline (2008)	Plant Parameter Value at Rated Capacity
Contact Time at Average Daily Flow	min	30	29
Contact Time at Peak Hourly Flow	min	15	10

5.5.6 Tertiary Filtration

5.5.6.1 Description

The tertiary filtration system consists of one (1) travelling bridge sand filter, one backwash water storage tank, and one (1) submersible waste sump pump (discharge to the aeration tank). A design description overview for the tertiary filtration system is provided in Table 18.

Table 18 St. George WPCP Tertiary Filtration Design Description

Item	Description
Travelling Bridge Sand Filter	Automatic backwashing travelling bridge shallow sand filter with anthracite bed
Dimensions	
Length (m)	7.93
Width (m)	2.74
Surface Area (m ²)	21.7
Backwash water storage tank volume (m ³)	1.7
Submersible filter water sump pump (discharge to aeration tank)	4.0 L/s at a TDH of 4.57 m
Number of Cells	40

5.5.6.2 Current Operation

Low TSS and TP in the final effluent (see Table 7) are indicative of generally effective tertiary filtration. The tertiary filter has encountered numerous operational problems the period from 2010 to 2013. Tertiary bypass events were reported in 2010 and 2011, caused by solids overflow from the secondary clarifiers during high flow events (OCWA, 2011 and 2012). In 2012 there were 13 High Filter Alarm after-hours responses that had

to be addressed (OCWA, 2013). When interviewed in 2014, operators reported no occurrences of the filter clogging in the past 2 years; when a filter clog occurs, a fire hose is used to clean filter media.

While additional granular media has been added, the media and underdrain system have never been replaced since the original construction of the filter (in 1981). The tertiary filter has exceeded the expected service life (25 years) of tertiary filters.

Backwash flow rate data were collected. Backwashing occurs for approximately 1 hour/day.

The tertiary filter was identified as the main capacity bottleneck at the St. George WPCP by plant operations staff. The maximum plant flow was estimated to be approximately 900 – 1,000 m³/d; at higher flow rates, secondary clarifier washout blinds the filter. This limitation is in keeping with the findings of Gamsby and Mannerow (2009), who estimated the maximum processing capacity of the St. George WPCP that was the basis for County Policy CDC 2009-03 “Servicing Capacity – St. George”, which limits the actual capacity of the St. George WPCP to 1,000 m³/d.

5.5.6.3 Capacity and Performance Assessment

The MECP (2008) states that for shallow bed single media systems, filtration rates at design Peak Hourly Flow (including backwash flow) should not exceed 2.1 L/m²·s and the peak solids loading rate should not exceed 51 mg/(m²·s).

The results of the tertiary filter process capacity assessment are presented in Table 19. This assessment is based on peak flow and a typical secondary clarifier effluent TSS concentration of 25 mg/L. Based on MECP Guidelines (2008), the capacity of the tertiary filter is undersized based on solids loading.

Table 19 Tertiary Filtration Process Capacity Assessment

Parameter	Units	MECP Guideline (2008)	Plant Parameter Value at Rated Capacity
Filtration Rate at Peak Flow Rate	L/m ² ·s	<2.1	2.1
Solids Loading Rate (SLR) ¹ at Peak Flow Rate	mg/m ² ·s	<51	52

Note:

1. Based on assumed TSS concentration to filters of 25 mg/L

The problem of limited filter capacity at peak flows is exacerbated during filter blinding conditions, which may occur at high flow rates due to solids carry over from the

secondary clarifiers. Such conditions have been reported at the St. George WPCP at high flow rates (>1,000 m³/d). The SLR at design Peak Flow during a washout event (50 mg/L effluent TSS assumed), is estimated to be 104 mg/(m²·s), which significantly exceeds the MECP guideline of 51 mg/(m²·s).

The lack of tertiary filter redundancy results in filter service and maintenance (such as media or porous plate replacement or cleaning) not being performed as required. The filter can only be taken offline for maintenance/repair if the secondary effluent can temporarily meet compliance criteria, which requires diligent control of sludge and possibly enhanced coagulant addition.

5.5.7 Outfall

The outfall from the St. George WPCP is approximately 31 m of 300 mm diameter and 69 m of 355 mm diameter outfall sewer pipe from the effluent filter to the receiving stream, a stranded oxbow of an unnamed tributary of Fairchild Creek.

5.5.8 Summary

An overview of the capacity and issues are summarized in Table 20.

Table 20 Capacity Assessment Summary

Major Process	Summary of Capacity and Issues
Preliminary Treatment	<ul style="list-style-type: none"> • Lack of screening • Inadequate grit removal • Coarse material in wastewater cause downstream problems with the aeration system and other equipment and may accumulate in tanks
Aeration Tanks	<ul style="list-style-type: none"> • Aeration diffuser grids are broken and diffusers are clogged • Lack of redundancy means tank cannot be easily taken offline for routine maintenance or repairs (e.g., repair of aeration diffuser grids or removal of accumulated grit) • High MLSS is indicative of solids control problems and high solids loading to secondary clarifier • Manual aeration control limits process performance and energy optimization • Size of tank is insufficient based on MECP Guidelines (2008)

Major Process	Summary of Capacity and Issues
Secondary Clarification	<ul style="list-style-type: none"> • Solids carryover at high flows (>1000 m³/d) due to high solids loading • Lack of redundancy means tank cannot be easily taken offline for routine maintenance or repairs (e.g., repair of broken sludge mechanism) • Manual sludge wasting limits ability to control solids • Broken sludge collection mechanism • Size of tank is insufficient based on MECP Guidelines (2008)
Phosphorus Removal	<ul style="list-style-type: none"> • Ferric tank in poor condition and requires replacement
Chlorination and Dechlorination	N/A
Tertiary Filtration	<ul style="list-style-type: none"> • Becomes blinded at high flows (>1000 m³/d) due to solids carryover from the secondary clarifier • Lack of redundancy means tank cannot be easily taken offline for routine maintenance or repairs (e.g., full media replacement and underdrain system repair/replacement) • Expected service life exceeded
St. George WPCP Sludge Holding Tank and Aerobic Digester	<ul style="list-style-type: none"> • Aerobic digester diffusers become clogged when aeration is turned off for supernating; therefore, system operation has changed such that only the aerobic digester is aerated (reducing available aerobic digestion capacity) while the sludge holding tank is unaerated and used for supernating and thickening • Manual aeration control, based on maintaining mixing, may not be adequate for full stabilization • Available aerobic digestion volume is insufficient based on MECP Guidelines (2008)
Paris WPCP Aerobic Digesters	<ul style="list-style-type: none"> • Insufficient capacity at approved capacity to treat Paris WPCP sludge; therefore, no available capacity to stabilize St. George WPCP sludge
Paris WPCP Dewatering Centrifuges	N/A
Biosolids Storage Facility	<ul style="list-style-type: none"> • Material depth is insufficient to achieve design storage

6 Wastewater Servicing Design Criteria

6.1 Influent Wastewater Loadings and Sludge Generation

Historical influent concentrations and flow data were used to determine the average mass influent loadings for the future design. The proposed influent wastewater treatment loading and biosolids generation is presented in Table 21.

Table 21 Influent Wastewater Treatment Loadings and Sludge Production

Item	Existing Actual Capacity	ECA Rated Capacity	Future Design Criteria
Average Daily Flow (ADF)	1,000 m ³ /d	1,300 m ³ /d	3,900 m ³ /d
Peak Flow ¹	3,000 m ³ /d	3,900 m ³ /d	11,700 m ³ /d
BOD Loading at ADF ²	174 kg/d	226 kg/d	679 kg/d
TKN Loading ²	37 kg/d	48 kg/d	144 kg/d
TSS loading ²	296 kg/d	385 kg/d	1,154 kg/d
TP Loading ²	4.6 kg/d	6.0 kg/d	17.9 kg/d
Sludge Production ³	290 kg/d	377 kg/d	1,131 kg/d

Notes :

1. Based on a peak flow factor of 3.0
2. Based on historical concentration data from 2010 – 2012 (BOD – 174 m/L, TKN – 37 mg/L, TSS – 296 mg/L, and TP – 4.6 mg/L)
3. Based on a sludge generation of 290 kg/1,000 m³ plant flow.

6.2 Effluent Criteria

The recommended ECA effluent objectives and limits for the upgraded and expanded St. George WPCP are presented in Table 22. These limits were established through an assimilative capacity study (HESL, 2017) with input from the MECP.

The most stringent limit is related to TP due to the Policy 2 (MECP, 1994) status (i.e., TP levels exceed the Provincial Water Quality Objective) of the receiving body. Effluent criteria for expanded treatment plants discharging to Policy 2 receivers may not increase the concentration and total load of the Policy 2 contaminant compared to background concentrations and previously approved loadings.

A criterion of 10 mg/L nitrate-nitrogen was proposed as an effluent objective. Its effect on the environment was analysed by calculating mass-balance concentrations using an updated 7Q20 flow, average September flow, and average summer flow. The proposed concentration of 10 mg/L nitrate-nitrogen is not expected to pose any threat to the resident fish and invertebrate communities including the most sensitive species inhabiting the area. The proposed effluent objective can be achieved with a conventional treatment technology.

It is likely that less stringent effluent limits would apply to the St. George WPCP if the effluent outfall were to be replaced with one that discharges to the Grand River. In this case, a higher TP treatment objective of 0.2 mg/L and limit of 0.4 mg/L and no nitrogen limit (consistent with effluent requirements for recent upgrades to existing WWTPs that discharge to the Grand River) may be possible.

Table 22 Proposed Effluent Criteria

Effluent Parameter	Effluent Objectives Concentration (mg/L)	Effluent Objectives Loadings (kg/d)	Effluent Limits ¹ Concentration (mg/L)	Effluent Limits ¹ Loadings (kg/d)
cBOD ₅	5	19.5	7	27.3
Total Suspended Solids	5	19.5	10	39
Total Phosphorus	Set as based on technology ²	To be determined	0.1	0.39
Total Ammonia Nitrogen				
May 1 to October 31	1.0	3.90	1.2	4.68
November 1 to April 30	2.0	7.80	2.5	9.75
pH ³	6.5 to 8.5	6.5 to 8.5		
Nitrate Nitrogen	10	39	-	-
E. coli ⁴	150 CFU/100 mL	-	200 CFU/100 mL	-
Dissolved Oxygen	>6.0	-	>5.0	-

Notes :

1. Based on monthly average, unless otherwise noted
2. Design objective (lower than effluent concentration limit of 0.10 mg/L to be set based on the treatment technology selected and approved by the MECP).
3. Any single grab sample
4. Based on monthly geometric mean density

7 Class EA Phase 1 – Identification of Problem/Opportunity

7.1 Problem/Opportunity Statement

As part of the Municipal Class EA planning process, the proponent of an undertaking is required to first document factors leading to the conclusion that the improvement is needed and develop a clear statement of the problem/opportunity to be investigated.

The problem/opportunity statement for the St. George Wastewater Servicing Municipal Class EA Study was defined as follows:

- Wastewater servicing and biosolids management system infrastructure improvements are required for the St. George settlement area in the County of Brant, to address the following:
- Process deficiencies at the existing St. George WPCP limit the treatment capacity of the plant to 1,000 m³/d or 77% of its approved rated capacity.
- Lack of redundancy in major unit processes, which prevents maintenance and affects overall treatment performance
- Inadequate capacity for sludge treatment and biosolids storage at the St. George WPCP and off-site facilities.
- The need for additional wastewater treatment and biosolids management capacity due to planned growth in the St. George settlement area.
- Opportunities to consider new technologies and approaches to provide an improved and expanded wastewater and biosolids management system for the St. George settlement area will be considered. The preferred strategy will provide an improved system with enhanced reliability and performance and sufficient capacity to service growth within the settlement area.

8 Class EA Evaluation Methodology

8.1 Overview of Evaluation Methodology

A broad range of alternative solutions for providing the required level of wastewater servicing in the St. George area presented many complex choices. Experience in projects of similar nature has shown that development of a systematic, step-wise method for making decisions at the start of the project helps to focus and clarify decision-making. A comprehensive evaluation methodology provides the basis for a decision making that is sound, defensible, traceable and consistent with the specific objectives of the project.

In overview, the evaluation methodology for this Class EA followed the major sequential steps:

1. Identification and Evaluation of the Alternative Solutions – The project team identified all potential alternative solutions and selected only those that were considered feasible for this project and eliminated the alternatives that were not. This evaluation process led to the preliminary identification of a recommended alternative solution and avoided the need to carry unrealistic alternatives through the detailed evaluation step.
2. Development of Alternative Design Concepts – Alternative design concepts were developed for the preferred solution and evaluated in detail against a set of evaluation criteria to include technical, natural environment, socio-cultural and economic considerations.
3. Selection and Confirmation of the Preferred Design Concept

8.2 Preliminary Screening

Once a long list of alternative solutions were developed, they were screened to identify only those alternatives considered feasible for this project. This avoided the need to carry unrealistic alternatives through the detailed evaluation step. Preliminary screening was accomplished by assessing alternative solutions with respect to:

- Providing Required Capacity: Alternative that was not capable of providing capacity for the 25-year planning horizon and/or limit County growth (inconsistent with official plan) was not carried forward,
- Utilizing Existing Site/Infrastructure and Non-Duplication of Services: Alternative that did not utilize the existing site/infrastructure and/or duplicate infrastructure/services with limited benefits was not carried forward,
- Being Financially Responsible: Alternative with significantly higher costs with limited benefits compared to other alternatives was not carried forward

8.3 Detailed Evaluation

A preliminary set of evaluation criteria was developed to represent a 'Triple Bottom Line' (TBL) approach that will enable a comparative evaluation of the alternative design concepts in terms of three primary goals for this project consisting of:

- Minimizing environmental impacts;
- Minimizing social impacts; and,
- Minimizing economic impacts.

Each of the three (3) main categories listed above was assigned a weighting factor, shown in Table 23, which aims to represent the importance of each individual category within the overall evaluation scheme.

Detailed evaluation criteria or sub-criteria were identified within each main category. The sub-criteria were developed with the objective of representing issues and considerations most relevant to this project. The evaluation methodology was used as a basis to compare the features of each alternative design concept, relative to each other, and their ability to perform under each evaluation criterion.

For each sub-criterion, the project team compiled sufficient information and assigned a score unique to each alternative design concept, relative to the other design concepts. Scores from 0 to 5 were assigned to score each alternative design concept being evaluated, with the higher score (5) given to the better performing options. The score represented how well the specific alternative design concept met the criterion under consideration, or in other words, the potential residual impact (i.e., the net impact after mitigation). Therefore, the alternative design concepts were rated such that the higher the ability to perform or meet the criterion, the higher the score (5) assigned.

The final score for each alternative design concept was calculated as the sum of the score of each criterion across all categories multiplied by the value weight assigned to that criterion. The alternative design concept that scored the highest at the end of the evaluation process was considered the option that provided the most overall benefits to this project and thus, was selected as the preliminary preferred alternative design concept.

Weighting factors (shown in Table 23) that corresponded to the degree of importance of each main category within the overall evaluation scheme were assigned in consultation with the project team. The evaluation criteria that were used during the comparative assessment of the alternative design concepts, as well as the criterion's objective and the relative performance scales used when assigning scores, are shown in Table 23.

Table 23 Evaluation Criteria, Objectives and Performance Scales

Category / Criteria	Performance Scales
Environmental Indicators (40%)	
Surface Water Protection – Maximize reliability in achieving effluent quality limits under all flows and loadings to the plant (Wastewater Alternatives only)	<ul style="list-style-type: none"> • Potential for not achieving effluent quality limits is minor or negligible, no mitigation is required – 5 • Potential for not achieving effluent quality limits is moderate, with some potential for mitigation – 3 • Potential for not achieving effluent quality limits is significant, with limited mitigation available – 0
Greenhouse Gas Generation – Minimize greenhouse gas generation or net energy use	<ul style="list-style-type: none"> • Low potential greenhouse gas generation – 5 • Moderate potential greenhouse gas generation – 3 • Significant potential greenhouse gas generation – 0
System Redundancy and Flexibility – Maximize the ability to continue to provide treatment during emergency situations based on provision for redundancy	<ul style="list-style-type: none"> • Provides high degree of system redundancy and flexibility – 5 • Provides moderate degree of system redundancy and flexibility – 3 • Provides low degree of system redundancy and flexibility – 0
Operational Complexity – Maximize reliability and minimize performance risks with a lower complexity system	<ul style="list-style-type: none"> • Low operational complexity – 5 • Moderate operational complexity – 3 • High operational complexity – 0
Ease of Implementation – Maximize the ability to facilitate construction while minimizing risk of impacts to water, land, terrestrial resources and aquatic habitats and potential risk to performance and plant operations during construction	<ul style="list-style-type: none"> • Ease of implementation is high – 5 • Ease of implementation is moderate – 3 • Ease of implementation is low – 0
Need for New Infrastructure – Maximize the ability to use existing infrastructure	<ul style="list-style-type: none"> • Potential to use existing infrastructure is significant with minimum requirements for new infrastructure – 5 • Potential to use existing infrastructure is moderate with some requirements for new infrastructure – 3

Category / Criteria	Performance Scales
	<ul style="list-style-type: none"> • Potential to use existing infrastructure is minimal with significant requirements for new infrastructure – 0
<p>Natural and Archaeological Heritage – Minimize the potential impact from construction to existing terrestrial habitats/features, vegetation communities, including watercourse crossings and archaeological heritage features</p>	<ul style="list-style-type: none"> • Potential impact from construction to natural and archaeological heritage is minimal or negligible, no mitigation is required – 5 • Potential impact from construction to natural and archaeological heritage is moderate, with some potential for mitigation – 3 • Potential impact from construction to natural and archaeological heritage is significant, with limited mitigation available – 0
<p>Regulatory Approvals – Minimize the need and time spent to obtain permits and approvals</p>	<ul style="list-style-type: none"> • Required infrastructure is compatible with existing land uses and permits and approvals can be easily obtained, no mitigation is required – 5 • Required infrastructure can be compatible with existing land uses and some effort is expected to obtain permits and approvals, with some potential for mitigation – 3 • Required infrastructure is not compatible with existing land uses and significant effort is expected to obtain permits and approvals, with limited mitigation available – 0
<p>Social Indicators (40%)</p>	
<p>Health and Safety – Minimize the potential risk to health and safety</p>	<ul style="list-style-type: none"> • Extremely small potential risk to health and safety, no mitigation is required – 5 • Minor potential risk to health and safety, with some potential for mitigation – 3 • Moderate potential risk to health and safety, with limited mitigation available – 0

Category / Criteria	Performance Scales
<p>Noise and traffic (during construction) – Minimize potential for noise and traffic during construction</p>	<ul style="list-style-type: none"> • Potential for noise and traffic during construction is minor or negligible, no mitigation is required – 5 • Potential for noise and traffic during construction is moderate, with some potential for mitigation – 3 • Potential for noise and traffic during construction is significant, with limited mitigation available – 0
<p>Public Perception – Maximize the potential to receive public support and acceptance</p>	<ul style="list-style-type: none"> • Potential to receive a high level of support and endorsement from the public, no mitigation is required – 5 • Potential to receive a moderate level of support and endorsement from the public, with some potential for mitigation – 3 • Potential to receive a low level of support and endorsement from the public, with limited mitigation available – 0
<p>Aesthetics – Minimize potential visual impacts from infrastructure on private properties</p>	<ul style="list-style-type: none"> • Potential for visual impacts from infrastructure is minor or negligible, no mitigation is required – 5 • Potential for visual impacts from infrastructure is moderate, with some potential for mitigation – 3 • Potential for visual impacts infrastructure is significant, with limited mitigation available – 0
<p>Land Use – Maximize land use to preserve site area for future requirements and minimize construction beyond current WPCP footprint</p>	<ul style="list-style-type: none"> • Maximizes use of existing WPCP site and minimizes construction beyond current footprint – 5 • Moderate use of existing WPCP site with potential impacts beyond current footprint – 3 • Non-optimal use of existing WPCP site with impacts beyond current footprint – 0
<p>Construction Duration – Minimize duration of project construction</p>	<ul style="list-style-type: none"> • Short construction duration – 5 • Moderate construction duration – 3 • Long construction duration – 0

Category / Criteria	Performance Scales
Odours – Minimize potential for odours affecting the community	<ul style="list-style-type: none"> • Potential for odour generation is minor or negligible, no mitigation is required – 5 • Potential for odour generation is moderate, with some potential for mitigation – 3 • Potential for odour generation is significant, with limited mitigation available – 0
Noise – Minimize potential for noise affecting the community	<ul style="list-style-type: none"> • Potential for noise generation is minor or negligible, no mitigation is required – 5 • Potential for noise generation is moderate, with some potential for mitigation – 3 • Potential for noise generation is significant, with limited mitigation available – 0
Truck Traffic – Minimize the potential for truck traffic during plant operation	<ul style="list-style-type: none"> • Potential for truck traffic is minor or negligible, no mitigation is required – 5 • Potential for truck traffic is moderate, with some potential for mitigation – 3 • Potential for truck traffic is significant, with limited mitigation available – 0
Economic Indicators (20%)	
Life Cycle Cost – Minimize life cycle cost	A proportional scale between 5 and 0 based on a relative difference in 25-year life cycle cost of each alternative, relative to the others

9 Class EA Phase 2 – Development and Evaluation of Alternative Wastewater Servicing Solutions

9.1 Identification of Alternative Wastewater Treatment Solutions

In accordance with Phase 2 of the Municipal Class EA process, alternative wastewater treatment solutions were identified to address existing concerns/limitations associated with the St. George WPCP and the need to provide additional capacity to service proposed development in the St. George area. The following general alternative wastewater treatment solutions were identified:

- Wastewater Alternative 1: Do nothing
- Wastewater Alternative 2: Limit community growth
- Wastewater Alternative 3: Expand St. George WPCP
 - Wastewater Alternative 3a: Expand existing St. George WPCP with existing outfall location
 - Wastewater Alternative 3b: Expand existing St. George WPCP with Grand River outfall
- Wastewater Alternative 4: Connect to another wastewater servicing system
 - Wastewater Alternative 4a: Connect to Brantford wastewater servicing system
 - Wastewater Alternative 4b: Connect to Paris wastewater servicing system
 - Wastewater Alternative 4c: Connect to Cambridge wastewater servicing system
- Wastewater Alternative 5: Build new WPCP on a new site with Grand River outfall
- Wastewater Alternative 6: Build new WPCP on a new site for only flow from new development area

A general schematic, depicting the alternative solutions and the sub-options under consideration is included in Figure 15.

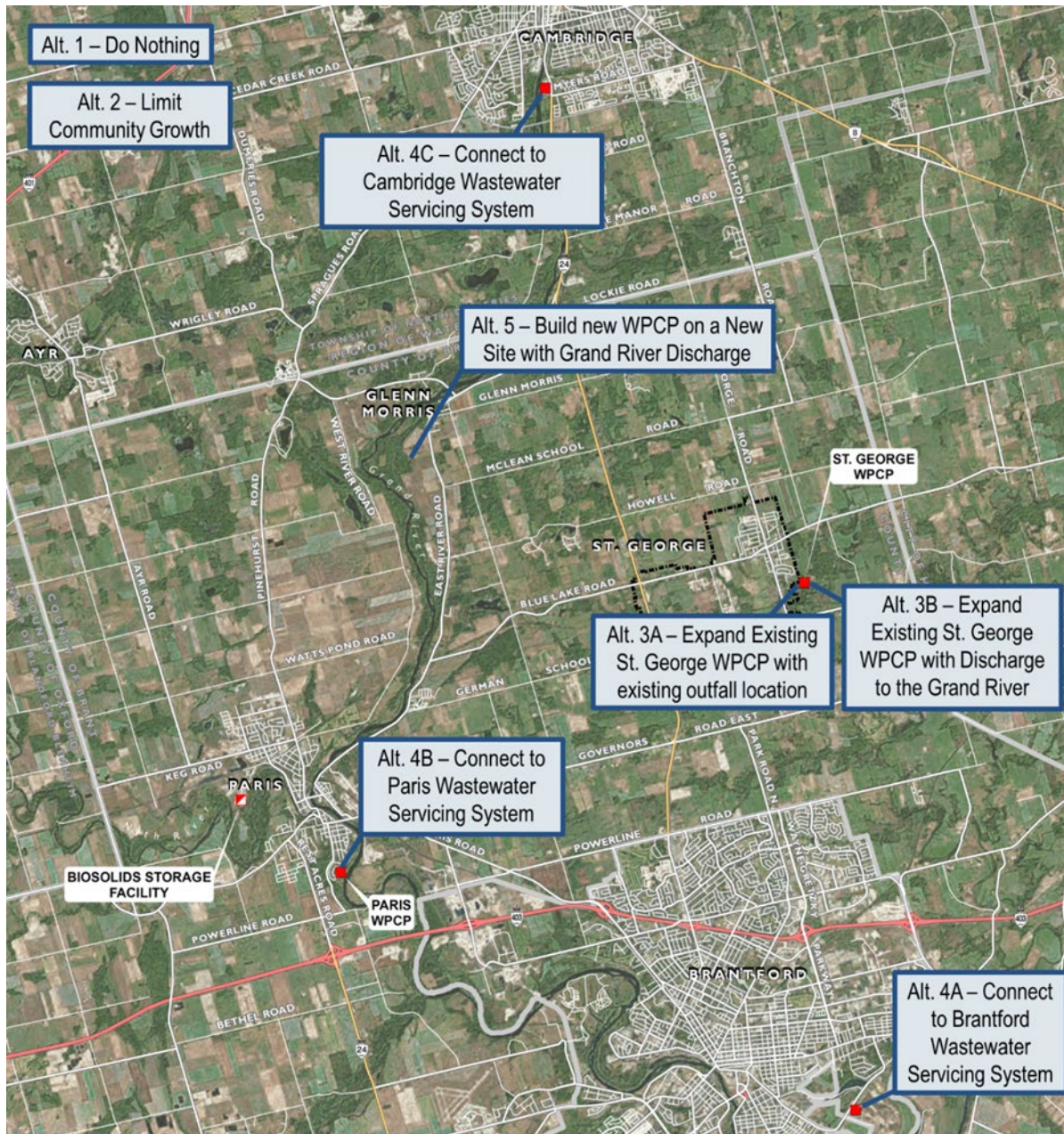


Figure 15 Wastewater Treatment Alternative Solutions – General Schematic

9.1.1 Wastewater Alternative 1: Do Nothing

The “Do Nothing” alternative assumed that the St. George wastewater system will maintain its existing configuration, and no improvements or changes would be made to address the existing concerns with the process limitations of the existing plant.

The St. George WPCP is currently operating at 92% of its functional capacity. Therefore, very limited additional growth could occur in the service area, based on existing capacity. The problems with the existing plant (including lack of redundancy,

filter blinding at high flows, lack of preliminary treatment, and manual monitoring and control) will continue to persist.

Key considerations of Wastewater Alternative 1 include:

- No immediate capital investment
- Does not address process limitations at the existing plant
- Limits future growth
- Inconsistent with growth projections in the Official Plan

9.1.2 Wastewater Alternative 2: Limit Community Growth

Wastewater Alternative 2 is based on limiting the ultimate growth in the area of St. George so that the total demands would not exceed the existing treatment capacity of the St. George WPCP. A limited upgrade program could be implemented to improve process performance and reliability without increasing overall capacity.

Key considerations of Wastewater Alternative 2 include:

- Low capital investment
- May address process limitations at the existing plant
- Limits future growth
- Inconsistent with growth projections in the Official Plan

9.1.3 Wastewater Alternative 3: Expand St. George WPCP

Wastewater Alternative 3a: Expand Existing St. George WPCP with Existing Outfall Location

Wastewater Alternative 3a is based on expanding the existing St. George WPCP at the current site and maintaining the existing outfall discharge location to the unnamed tributary of Fairchild creek. For this alternative, the County would complete the necessary upgrades to existing structures, equipment and processes and construct the additional process works required to increase the plant capacity.

With the appropriate technology selection, land was assessed to be available for expansion within the existing County-owned plant site to upgrade the plant to provide the design average day flow (ADF) of 3,900 m³/d for the 25-year planning horizon. It was anticipated that significant portions of infrastructure from the existing plant could be maintained and used in the upgraded plant. The upgraded treatment plant could be designed to mitigate the process issues currently experienced at the plant, including lack of redundancy and controls and poor preliminary treatment, and be consistent with any expansion to the technology train.

An assimilative capacity study of the receiving stream is required for this option. Based on preliminary assimilative capacity study results (CIMA, 2014a), the ultimate capacity of the plant is limited by the assimilative capacity of the receiving stream, and is equal to the projected capacity needs for the 25-year planning period of 3,900 m³/d. Therefore, future capacity expansions at this site, beyond the 25 year planning period, would require more advanced treatment or a new outfall to another receiving body.

The effluent criteria for an expanded St. George WPCP under this option would be determined through consultation with the MECP. Strict effluent criteria, especially related to TP and partial denitrification (full time or seasonal), were considered, and would be the basis for technology selection for this option. It was anticipated that an advanced treatment plant would be required to reliably achieve the required effluent limits. The specific process configuration would be developed during the conceptual design phase (beyond scope of current EA), consistent with the effluent requirements and site constraints.

Key considerations of Wastewater Alternative 3a include:

- Provides additional capacity for future growth in St. George for a 25 year planning horizon
- Addresses plant process limitations
- Utilizes existing infrastructure
- All works within existing plant footprint
- Significant capital investment
- Assimilative capacity of the receiving stream limits ultimate capacity of the plant
- Requires advanced treatment processes and increased overall operational complexity

9.1.3.1 Wastewater Alternative 3b: Expand existing St. George WPCP with Discharge to the Grand River

Wastewater Alternative 3b is based on expanding the existing St. George WPCP at the current site, with a new outfall constructed to the Grand River, which is approximately 8.5 km away from the plant. For this alternative, the County would complete the necessary upgrades to existing structures, equipment and processes and construct the additional process works required to increase the plant capacity, as per Alternative 3a.

This alternative would require land acquisition for the construction of the new outfall. A pumping station would likely be required to convey effluent to the Grand River. Significant additional studies would be required in the Class EA, including an assimilative capacity study of the Grand River and outfall routing selection. Additional environmental and other approvals would be required for construction.

The Grand River has a significantly greater assimilative capacity than the unnamed tributary of Fairchild Creek, to which the St. George WPCP currently discharges. Therefore, although the expanded plant in this alternative would be designed to achieve the design ADF of 3,900 m³/d, future expansion to a higher flow rate (possibly the ultimate build out capacity) could be accommodated by the receiving body. Preferences related to future expansion potential should be considered during the process selection, because available footprint may become a limiting factor.

Based on effluent requirements for recent upgrades to existing wastewater treatment plants (WWTPs) that discharge to the Grand River, a TP treatment objective of 0.2 mg/L and limit of 0.4 mg/L, and no total nitrogen limit would be anticipated for this option. A secondary treatment plant with tertiary filtration, similar to the existing St. George WPCP process, is expected to provide an appropriate level of treatment for this scenario. The specific process configuration would be developed during the conceptual design phase (beyond scope of current EA).

Key considerations of Wastewater Alternative 3b include:

- Provides additional capacity for project future growth in St. George for the 25 year planning horizon, and potentially accommodate ultimate development build out demands
- Addresses plant process limitations
- Utilizes existing infrastructure and site
- Maintains similar level of operational complexity as the existing plant
- Requires land purchase for outfall easement
- Requires a pumping station
- Significant capital investment for plant upgrades, land purchase, and pumping station
- Potential delays for the additional Class EA investigations (including assimilative capacity assessment and outfall routing selection), land acquisition, and approvals
- A memo was completed by CIMA in June 2018 assessing two forcemain route alternatives to discharge to Grand River and one alternative discharge point downstream of the existing discharge point. The results are discussed further in the following sections.

9.1.4 Wastewater Alternative 4: Connect to Another Wastewater Servicing System

9.1.4.1 Wastewater Alternative 4a: Connect to Brantford Wastewater Servicing System

Wastewater Alternative 4a is based on a connection to the Brantford wastewater servicing system, in the City of Brantford, to the St. George sewer system to provide some or all of the treatment capacity required by the St. George service area. The St. George WPCP could continue to operate to provide a portion of the required treatment capacity, and the County would pay the City of Brantford for the volume of wastewater treated at the Brantford WWTP. The Brantford WWTP is a conventional activated sludge plant with a rated capacity of 81,800 m³/d that discharges to the Grand River.

This alternative assumed that additional wastewater conveyance and treatment capacity is available in the Brantford system. New infrastructure would need to be provided as part of this option, including an approximately 5 km sanitary sewer connection between Brantford and St. George. Requirements for a pumping station would need to be considered.

This option would provide adequate capacity for growth in the St. George WPCP service area. If the St. George WPCP were to remain in operation, the existing process concerns would need to be addressed through an upgrade program of process improvements.

Key considerations of Wastewater Alternative 4 include:

- Provides additional capacity for future growth in St. George
- Utilizes existing infrastructure (if St. George WPCP remains in operation)
- Relies on a different local municipality for the provision of wastewater treatment. The County would need pay the City of Brantford for wastewater treatment services
- High capital and maintenance costs for sanitary sewer connection
- Capital costs for upgrades to St. George WPCP
- Requires a legal servicing agreement between Brantford and the County, which may include limitations to the wastewater capacity and restrict development in St. George
- City of Brantford is not actively seeking to provide wastewater treatment to areas outside of their current service areas.
- Receiving water body and overall treatment requirement is comparable to Alternative 3b

9.1.4.2 Wastewater Alternative 4b: Connect to Paris Wastewater Servicing System

Wastewater Alternative 4b is based on a connection to the Paris wastewater servicing system, in the Community of Paris in the County of Brant, to the St. George sewer system to provide some or all of the treatment capacity required by the St. George service area. The St. George WPCP may or may not continue to operate, to provide a portion of the required treatment capacity. The Paris WPCP is an extended aeration plant with a rated capacity of 7,056 m³/d that discharges to the Grand River.

This option assumed that additional wastewater conveyance and treatment capacity is available in the Paris wastewater servicing system. New infrastructure would need to be provided as part of this option, including an approximately 10 km sanitary sewer connection between Paris and St. George. At least one pumping station would be required.

This option would provide adequate capacity for growth in the St. George WPCP service area. If the St. George WPCP were to remain in operation, the existing process concerns would need to be addressed through an upgrade program of process improvements.

Key considerations of Wastewater Alternative 4b include:

- Provides additional capacity for future growth in St. George
- Utilizes existing infrastructure (if St. George WPCP remains in operation)
- High capital and maintenance costs for sanitary sewer connection
- Use of Paris WPCP wastewater treatment capacity will significantly reduce Paris' opportunities to accommodate projected growth in the area, which is inconsistent with growth projections in the County's Official Plan
- Receiving water body and overall treatment requirement is comparable to Alternative 3b

9.1.4.3 Wastewater Alternative 4c: Connect to Cambridge Wastewater Servicing System

Wastewater Alternative 4c is based on a connection to the Cambridge wastewater servicing system (specifically to the Galt WWTP) in the City of Cambridge, to the St. George sewer system to provide some or all of the treatment capacity required by the St. George service area. The St. George WPCP may or may not continue to operate, to provide a portion of the required treatment capacity, and the County would pay the Region of Waterloo for the volume of wastewater conveyed to and treated at the Galt WWTP. The Galt WWTP is a conventional activated sludge plant with a rated capacity 56,800 m³/d that discharges to the Grand River.

This option assumed that additional wastewater conveyance and treatment capacity is available in the Cambridge Wastewater servicing system. New infrastructure would need to be provided as part of this option, including an approximately 12 km sanitary sewer connection between Cambridge and St. George. At least one pumping station would be required.

This option would provide adequate capacity for growth in the St. George WPCP service area. If the St. George WPCP were to remain in operation, the existing process concerns would need to be addressed through an upgrade program of process improvements.

Preliminary investigations suggested that the Region of Waterloo does not provide wastewater servicing outside of their current service area, and it was not expected to be considered in the short to medium term.

Key considerations of Wastewater Alternative 4c include:

- Provides additional capacity for future growth in St. George
- Utilizes existing infrastructure (if St. George WPCP remains in operation)
- Relies on a different local municipality for the provision of additional wastewater treatment. The County would need pay the Region of Waterloo for wastewater treatment services
- High capital and maintenance costs for sanitary sewer connection
- Requires a legal servicing agreement between the Region of Waterloo and the County, which may include limitations to the wastewater capacity and restrict development in St. George
- Region of Waterloo is not seeking to provide wastewater treatment to areas outside of their current service areas.
- Receiving water body and overall treatment requirement is comparable to Alternative 3b

9.1.5 Wastewater Alternative 5: Build New WPCP on a New Site with Grand River Discharge

Wastewater Alternative 5 consists of constructing a new WPCP on a new site with Grand River discharge. The existing St. George WPCP would be decommissioned. The community of St. George is situated approximately 5 km from the Grand River.

The Grand River has a significantly greater assimilative capacity than the unnamed tributary of Fairchild Creek, to which the St. George WPCP currently discharges. Therefore, although the new plant in this alternative would be designed to achieve the

design ADF of 3,900 m³/d, the possibility for future expansion to a higher flow rate (potentially the future ultimate capacity) could be accommodated.

Based on effluent requirements for recent upgrades to wastewater treatment plants (WWTPs) that discharge to the Grand River, a TP treatment objective of 0.2 mg/L and limit of 0.4 mg/L, and no total nitrogen limit would be anticipated for this option. A secondary treatment plant with conventional tertiary filtration, similar to the existing St. George WPCP process, is expected to provide an appropriate level of treatment for this scenario. The specific process configuration would be developed during the conceptual design phase (beyond scope of current EA).

Significant additional studies would be required in the current Class EA, including an assimilative capacity study of the Grand River and site selection process. Additional environmental and other approvals will be required for construction. New wastewater sewerage infrastructure would be required to convey wastewater flow from St. George to the new WPCP site.

Key considerations of Wastewater Alternative 5 include:

- Provides additional capacity for project future growth in St. George for the 25 year planning horizon, and potentially accommodate ultimate development build out demands
- Maintains similar level of operational complexity as existing plant
- Requires land purchase for development of new WPCP site
- Does not reuse existing infrastructure
- High capital costs for construction of new plant
- Potential delays for the Class EA investigations, land acquisition, and approvals

9.1.6 Wastewater Alternative 6: Build new WPCP on a new site for only flow from new development area

Wastewater Alternative 6 consists of a new WPCP constructed to treat the wastewater from the new development area, while the existing St. George WPCP is maintained in operation to treat its current service area. The existing St. George WPCP would require an upgrade program to mitigate existing process concerns.

The specific process configuration for the new plant would be developed during the conceptual design phase (beyond scope of current EA). The level of treatment required would be based on the outfall location selected (i.e., Grand River or tributary of Fairchild Creek). It was anticipated that the new plant would be located on the new development lands.

Similar to Alternative 3, significant additional studies would be required in the current Class EA, including an assimilative capacity study and site selection process. Additional environmental and other approvals would be required for construction. New wastewater sewerage infrastructure would be required to convey wastewater flow from the town of St. George to the new WPCP site.

Key considerations of Wastewater Alternative 6 include:

- Provides additional capacity for future growth (possibly ultimate build out capacity) in St. George
- Utilizes existing infrastructure
- Construction of new plant is tied to new development
- Requires land purchase or transfer to the County for development of new WPCP site
- Upgrades still required at the existing WPCP to address deficiencies and aging equipment
- Requires operation of two plants – high operation and maintenance costs
- Operational complexity depends on outfall location
- Potential delays for the Class EA investigations, land acquisition, and approvals

9.2 Identification of Biosolids Management Alternative Solutions

The following long list of biosolids management alternative solutions were identified:

- Biosolids Alternative 1: Do Nothing
- Biosolids Alternative 2: Expand Aerobic Digestion at St. George WPCP and Dewater at Paris WPCP
- Biosolids Alternative 3: Expand Aerobic Digestion and Add Dewatering at St. George WPCP
- Biosolids Alternative 4: Expand Aerobic Digestion at Paris WPCP and Dewater at Paris WPCP

9.2.1 Biosolids Management Alternative 1: Do Nothing

The “Do Nothing” alternative assumes that the St. George biosolids management system will maintain its existing configuration, and no improvements or changes would be made to address the existing concerns with the process and capacity limitations.

Sludge processing limitations at the St. George WPCP is a major capacity-limiting factor at the plant. Therefore, very limited additional growth could occur in the service area, based on existing capacity.

Key considerations of Biosolids Management Alternative 1 include:

- No immediate capital investment
- Does not address process limitations at the existing plant
- Limits future growth
- Inconsistent with growth projections in the Official Plan

9.2.2 Biosolids Management Alternative 2: Expand Aerobic Digestion at St. George WPCP and Dewater at Paris WPCP

Biosolids Alternative 2 is based on the construction of new aerobic digesters at the St. George WPCP, sized to fully stabilize sludge produced by the St. George WPCP at the 25 year planning horizon design flow. The biosolids would be hauled by truck to the Paris WPCP and added to the process immediately upstream of the dewatering centrifuges.

Key considerations of Biosolids Management Alternative 2 include:

- Space available within existing footprint of St. George WPCP to expand aerobic digestion
- Utilizes existing available dewatering capacity at the Paris WPCP and does not restrict future Paris WPCP expansion; space is available (and has been allocated for) a second centrifuge at the Paris WPCP, if required
- Aerobic digestion at the St. George WPCP allows supernatant to occur at the plant at which the sludge was produced, which reduces haulage volumes
- Reduced odours of hauled materials (fully stabilized sludge)
- May require a small blend tank at Paris to stabilize dewatering operation with two (2) different sludges
- Low capital investment
- High liquid biosolids haulage volume requirements

9.2.3 Biosolids Management Alternative 3: Expand Aerobic Digestion and Add Dewatering at St. George WPCP

Biosolids Alternative 3 is based on the construction of new aerobic digesters and dewatering at the St. George WPCP, sized to fully stabilize and dewater sludge produced at the design flow. The dewatered sludge would be hauled directly to the Biosolids Storage Facility.

Key considerations of Biosolids Management Alternative 3 include:

- Space available within existing footprint of St. George WPCP to expand treatment process and aerobic digestion; limited additional space is available for dewatering and truck loading facility
- Significantly reduced biosolids haulage (eliminates need for hauling liquid biosolids to Paris WPCP)
- High capital investment
- Additional process at St. George WPCP (increased operational complexity)
- High operation and maintenance costs due to additional dewatering facility (2 separate processes to operate and maintain)
- Does not utilize existing available dewatering capacity at Paris WPCP (duplication of process; Paris WPCP dewatering designed to handle biosolids produced at St. George WPCP)

9.2.4 Biosolids Management Alternative 4: Expand Aerobic Digestion at Paris WPCP and Dewater at Paris WPCP

Biosolids Alternative 4 is based on the construction of new aerobic digesters at Paris WPCP, sized to fully stabilize and dewater sludge produced by the St. George WPCP at the design flow. Unstabilized sludge from the St. George WPCP would be hauled to the Paris WPCP for full stabilization and dewatering prior to haulage to the Biosolids Storage Facility.

Key considerations of Biosolids Management Alternative 4 include:

- Utilizes existing available dewatering capacity at the Paris WPCP; space is available (and has been allocated for) a second centrifuge at the Paris WPCP, if required
- Limited space on the Paris WPCP site for aerobic digester expansion; would limit future expansion options on the Paris WPCP site.
- High sludge haulage volumes and odour potential due to undigested sludge haulage

9.3 Evaluation of Alternative Wastewater Treatment Solutions

A preliminary screening of the alternative solutions described in Section 9.1 and Section 9.2 was carried out in accordance with the methodology described in Section 8.2. The rationale used during the preliminary screening of the alternative wastewater treatment solutions and biosolids management solution included an assessment of their capacity to meet the must-meet criteria.

9.3.1 Screening Results – Alternative Wastewater Treatment Solutions

The preliminary screening of the alternative wastewater treatment solutions is summarized in Table 24. The alternative solutions that were not considered viable for implementation were not recommended for further evaluation in the process and were eliminated. The alternative solutions that were considered viable for a detailed evaluation in the next phase of the Class EA Study

Table 24 Alternative Wastewater Treatment Solutions – Screening Results

Alternative Solution	Preliminary Screening Observations and Comments	Recommendation Short-listed for further Evaluation
1 – Do nothing	<p>Design Capacity:</p> <ul style="list-style-type: none"> Provides no additional capacity – FAIL <p>Use of Ex. Site/Infrastructure:</p> <ul style="list-style-type: none"> Existing St. George WPCP to remain operational – PASS <p>Financial Responsibility:</p> <ul style="list-style-type: none"> No capital cost – PASS 	Not recommended for further evaluation
2 – Limit community growth	<p>Design Capacity:</p> <ul style="list-style-type: none"> Provides no additional capacity – FAIL <p>Use of Ex. Site/Infrastructure:</p> <ul style="list-style-type: none"> Existing St. George WPCP to remain operational – PASS <p>Financial Responsibility:</p> <ul style="list-style-type: none"> Low capital cost – PASS 	Not recommended for further evaluation
3a – Expand Existing St. George WPCP	<p>Design Capacity:</p> <ul style="list-style-type: none"> Provides design capacity – PASS <p>Use of Ex. Site/Infrastructure:</p> <ul style="list-style-type: none"> Existing St. George WPCP to remain operational – PASS <p>Financial Responsibility:</p> <ul style="list-style-type: none"> Moderate capital cost – PASS 	Recommended for further evaluation
3b – Expand Existing St. George WPCP with discharge to the Grand River	<p>Design Capacity:</p> <ul style="list-style-type: none"> Provides design capacity and possibly ultimate buildout capacity – PASS <p>Use of Ex. Site/Infrastructure:</p> <ul style="list-style-type: none"> Existing St. George WPCP to remain operational – PASS 	Recommended for further evaluation

Alternative Solution	Preliminary Screening Observations and Comments	Recommendation Short-listed for further Evaluation
	<p>Financial Responsibility:</p> <ul style="list-style-type: none"> Moderate capital cost – PASS 	
<p>4a – Connect to Brantford Wastewater Servicing System</p>	<p>Design Capacity:</p> <ul style="list-style-type: none"> Theoretically provides design capacity, however, extensive negotiations required, which may ultimately limit growth – FAIL <p>Use of Ex. Site/Infrastructure:</p> <ul style="list-style-type: none"> Existing St. George WPCP may remain operational – PASS <p>Financial Responsibility:</p> <ul style="list-style-type: none"> Moderate to high capital cost – FAIL 	<p>Not recommended for further evaluation</p>
<p>4b – Connect to Paris Wastewater Servicing System</p>	<p>Design Capacity:</p> <ul style="list-style-type: none"> Provides design capacity for St. George study area growth, but limits growth in Paris and therefore is not in keeping with the County’s Official Plan – FAIL <p>Use of Ex. Site/Infrastructure:</p> <ul style="list-style-type: none"> Existing St. George WPCP may remain operational – PASS <p>Financial Responsibility:</p> <ul style="list-style-type: none"> Moderate to high capital cost – FAIL 	<p>Not recommended for further evaluation</p>
<p>4c – Connect to Cambridge Wastewater Servicing System</p>	<p>Design Capacity:</p> <ul style="list-style-type: none"> Theoretically provides design capacity, however, the Region of Waterloo does not provide service to outside municipalities – FAIL <p>Use of Ex. Site/Infrastructure:</p> <ul style="list-style-type: none"> Existing St. George WPCP may remain operational – PASS <p>Financial Responsibility:</p> <ul style="list-style-type: none"> Moderate to high capital cost – FAIL 	<p>Not recommended for further evaluation</p>
<p>5 – Build New WPCP on a new site with discharge to the Grand River</p>	<p>Design Capacity:</p> <ul style="list-style-type: none"> Provides design capacity and possibly ultimate buildout capacity – PASS <p>Use of Ex. Site/Infrastructure:</p>	<p>Not recommended for further evaluation</p>

Alternative Solution	Preliminary Screening Observations and Comments	Recommendation Short-listed for further Evaluation
	<ul style="list-style-type: none"> Existing St. George WPCP to be decommissioned – FAIL <p>Financial Responsibility:</p> <ul style="list-style-type: none"> High cost with limited benefit – FAIL 	
6 – Build New WPCP on a new site for flow from new development areas	<p>Design Capacity:</p> <ul style="list-style-type: none"> Provides design capacity and possibly ultimate buildout capacity – PASS <p>Use of Ex. Site/Infrastructure:</p> <ul style="list-style-type: none"> Existing St. George WPCP site remains in operation; however, requires operation of 2 WPCPs (high capital and operating costs) – FAIL <p>Financial Responsibility:</p> <ul style="list-style-type: none"> High cost (capital and O&M) with limited benefit – FAIL 	Not recommended for further evaluation

9.3.2 Screening Results – Alternative Biosolids Management Solutions

The preliminary screening of the alternative biosolids management solutions is summarized in Table 25. The alternative solutions that were considered viable were further developed and subjected to a detailed evaluation in the next phase of the Class EA Study.

Table 25 Alternative Biosolids Management Solutions – Screening Results

Alternative Solution	Preliminary Screening Observations and Comments	Recommendation Short-listed for further Evaluation
1 – Do nothing	<p>Design Capacity:</p> <ul style="list-style-type: none"> Provides no additional capacity – FAIL <p>Use of Ex. Site/Infrastructure:</p> <ul style="list-style-type: none"> Existing St. George WPCP to remain operational – PASS <p>Financial Responsibility:</p> <p>No capital cost – PASS</p>	Not recommended for further evaluation
2 – Expand Aerobic Digestion	<p>Design Capacity:</p>	Recommended for further evaluation

Alternative Solution	Preliminary Screening Observations and Comments	Recommendation Short-listed for further Evaluation
at St. George WPCP and dewater at Paris WPCP	<ul style="list-style-type: none"> Provides design capacity – PASS <p>Use of Ex. Site/Infrastructure:</p> <ul style="list-style-type: none"> Existing St. George WPCP to remain operational. Space is available at St. George WPCP site for aerobic digestion expansion. Utilizes available capacity at Paris WPCP centrifuges (excess capacity available, therefore capacity for Paris is not restricted.) – PASS <p>Financial Responsibility:</p> <ul style="list-style-type: none"> Low capital cost – PASS 	
3 – Expand Aerobic Digestion and add dewatering at St. George WPCP	<p>Design Capacity:</p> <ul style="list-style-type: none"> Provides design capacity – PASS <p>Use of Ex. Site/Infrastructure:</p> <ul style="list-style-type: none"> Existing St. George WPCP to remain operational. All expansion expected to occur at St. George WPCP site. It results in duplication of dewatering facilities in County (does not utilize existing available capacity at the Paris WPCP) – FAIL <p>Financial Responsibility:</p> <ul style="list-style-type: none"> Higher cost with limited benefit – FAIL 	Not recommended for further evaluation
4 – Expand Aerobic Digestion at Paris WPCP and dewater at Paris WPCP	<p>Design Capacity:</p> <ul style="list-style-type: none"> Provides design capacity for St. George study area growth, but limits growth in Paris and therefore is not in keeping with the County’s Official Plan – FAIL <p>Use of Ex. Site/Infrastructure:</p> <ul style="list-style-type: none"> Expansion required at Paris WPCP where space is limited; no upgrades at St. George WPCP site. Existing St. George WPCP sludge tanks remain in operation as sludge holding tanks – FAIL <p>Financial Responsibility:</p> <ul style="list-style-type: none"> Low capital cost – PASS 	Not recommended for further evaluation

9.3.3 Screening Summary

On the basis of the preliminary screening presented in Table 24 and Table 25, the following alternative solutions were considered feasible and given further consideration:

Wastewater Treatment:

- Wastewater Alternative Solution 3a – Expand existing St. George WPCP with existing outfall location
- Wastewater Alternative Solution 3b – Expand existing St. George WPCP with Discharge to Grand River
- Biosolids Management:
- Biosolids Management Alternative Solution 2 – Expand Aerobic Digestion at St. George WPCP and dewater at Paris WPCP.

10 Class EA Phase 3 – Development and Evaluation of Wastewater Servicing Design Concepts

10.1 Overview

Phase 3 of the Municipal Class EA process examined alternative concepts / methods for implementing the preferred wastewater treatment and biosolids management solutions, based upon the existing environment, public and review agency input, anticipated environmental effects and methods of minimizing negative effects and maximizing positive effects. This section focuses on the identification of alternative design concepts for the preferred servicing solutions chosen in the previous steps.

The short-listed wastewater servicing solutions recommended for further development and evaluation in the Class EA process are:

Wastewater Treatment Alternative Solutions:

- Wastewater Alternative Solution A: Expand existing St. George WPCP with existing outfall location
- Wastewater Alternative Solution B: Expand existing St. George WPCP with discharge to the Grand River
- Biosolids Management Solution:
- Biosolids Management Alternative Solution A: Expand Aerobic Digestion at St. George WPCP and Dewater at Paris WPCP

The development and evaluation of the wastewater treatment alternatives and biosolids management are discussed in more detail in Section 10.2 and Section 10.3, respectively.

10.2 Identification of Wastewater Treatment Alternative Design Concepts

Multiple technology solutions that can achieve the proposed effluent limits are available. The specific process configuration, consistent with the effluent requirements and site constraints, will be developed during the conceptual design phase, following the completion of Phase 4 of the Class EA process. Table 26 presents the proposed effluent criteria and a list of treatment technologies that can potentially be used to achieve the required level of treatment for each parameter.

Table 26 Proposed Effluent Criteria and Corresponding Treatment Technologies

Parameter	Concentration (mg/L) Objective	Concentration (mg/L) Limit	Technologies to Achieve
cBOD-5	5	7	<ul style="list-style-type: none"> Extended aeration, conventional activated sludge, or fixed film processes with filtration Membrane bioreactor
Total Suspended Solids	5	10	<ul style="list-style-type: none"> Extended aeration, conventional activated sludge, or fixed film processes with filtration Membrane Bioreactor
Total Phosphorus			
Grand River Discharge	0.20	0.40	<ul style="list-style-type: none"> Tertiary filtration with chemical addition Biological phosphorus removal
Fairchild Creek Discharge	<0.10	0.10	<ul style="list-style-type: none"> Membrane filtration/bioreactors Two-stage filtration
Total Ammonia Nitrogen			
May 1 to October 31	1.0	1.2	<ul style="list-style-type: none"> Extended Aeration Conventional activated sludge or fixed film processes with nitrification Membrane Bioreactor with nitrification
November 1 to April 30	2.0	2.5	
Nitrate			
Fairchild Creek Discharge	10	-	<ul style="list-style-type: none"> Biological nutrient removal (BNR) configuration Membrane bioreactors with BNR aeration configuration
<i>E. coli</i>	150 CFU/100 mL	200 CFU/100 mL	<ul style="list-style-type: none"> UV Ozone Chlorination/dechlorination
Chlorine Residual	Absent	0.002	

10.2.1 General Site Constraints

The St. George WPCP is located in a residential area accessed by a driveway off a residential street. The existing treatment works are located in a fenced portion of the wastewater treatment plant property, with most processes located within a ring road. The closest residence shares the driveway with the plant and is located immediately to the northwest of the plant property; a residential neighbourhood is located further northwest of the plant. The relative location of the St. George WPCP and the neighbouring residences is depicted in Figure 16.



Figure 16 St. George WPCP and Neighbouring Residences

The St. George WPCP is located at the edge of the regional flood level; the existing plant is constructed on an elevated pad above the adjacent natural wetlands and the finished floor elevation of the main control building is above the regional flood elevation. Plant expansion would likely require some expansion of the plant to the area south of the existing ring road that would impact the flood plain. Construction in the flood plain

will require flood proofing similar to that used in the existing plant, and there may be opportunities to compensate (e.g., through re-grading land adjacent to the plant entrance road).

There is space available within the existing site for expansion to the treatment process. The most conservative layout in terms of footprint requirements is an expansion based on the existing treatment process configuration. This scenario is depicted in Figure 17. This layout is conservative as it is anticipated that the effluent limits presented in Table 26 would require advanced technologies (e.g., membrane bioreactors), which may have a smaller footprint.

Some development beyond the plant ring road may be required. However, the impacts on the surrounding residential community will be limited, as no additional tankage is envisioned between the existing facility and the residential development. Expansion of process tankage could be focused south of the plant; the area south of the plant is within the flood plain and is unlikely to undergo residential development.

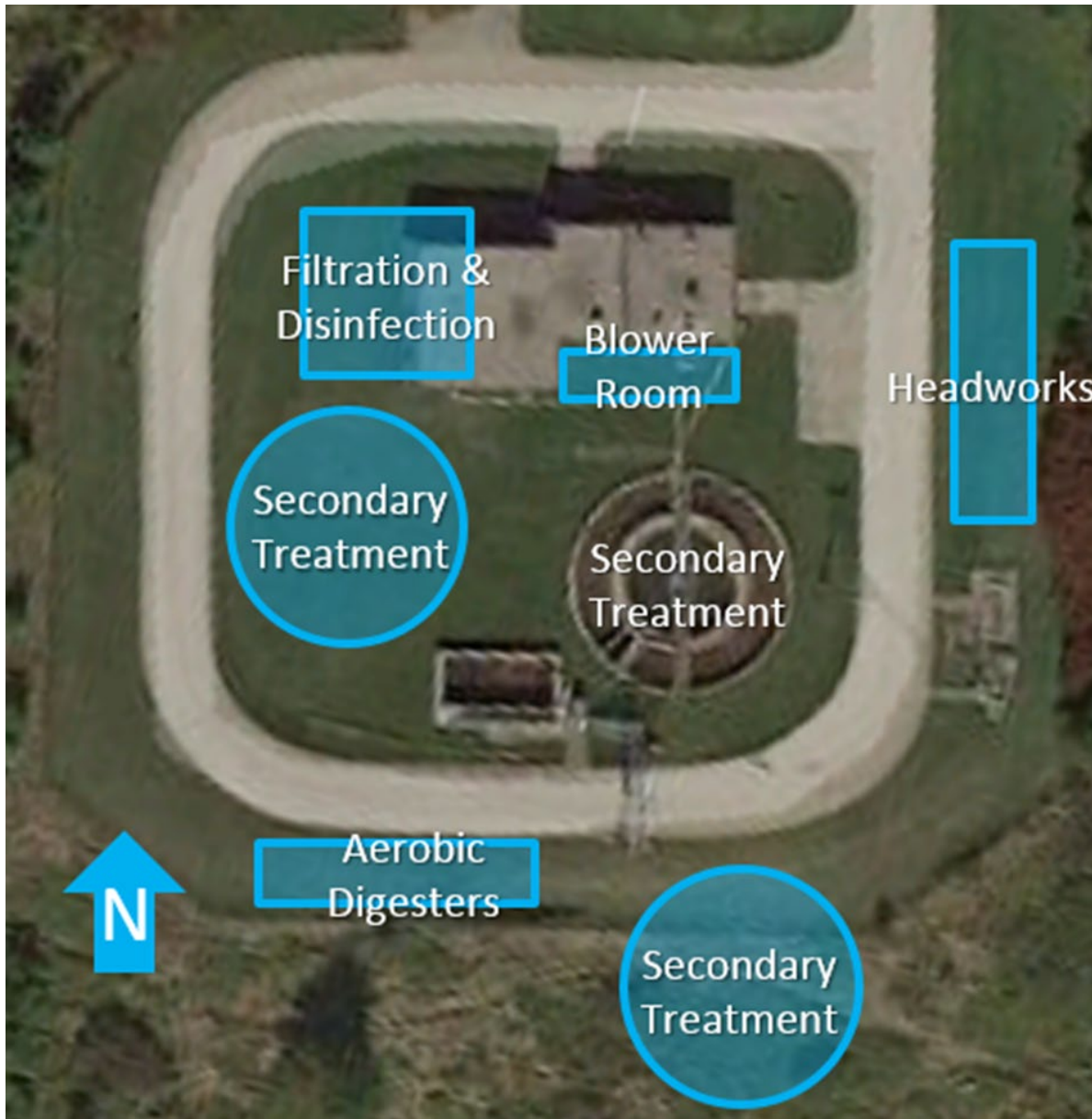


Figure 17 Potential Conceptual Site Layout

10.2.2 Wastewater Treatment Alternative A: Expand existing St. George WPCP with existing outfall location

General Description

Wastewater Alternative A is based on expanding the existing St. George WPCP at the current site, and maintaining the existing outfall discharge location to the unnamed tributary of Fairchild creek. For this alternative, the County would complete the necessary upgrades to existing structures, equipment and processes and construct the new or retrofitted process works required to increase the plant capacity.

Key considerations for this option include:

- Provides additional capacity for future growth in St. George for a 25 year planning horizon
- Addresses plant process limitations
- Utilizes existing infrastructure
- All works within existing plant property
- Significant capital investment
- Assimilative capacity of the receiving stream limits ultimate capacity of the plant
- Requires advanced treatment processes and increased overall operational complexity

Effluent Requirements

The effluent criteria for an expanded St. George WPCP under this option was determined through consultation with the MECP, as shown in Table 26. Strict effluent criteria, especially related to TP and denitrification, will be required and will be the basis for technology selection for this option.

Design Concept

It is anticipated that the effluent limits will require significant modifications to the existing process configuration. In particular, the total nitrogen limit will require an anoxic selector (e.g., using the existing sludge holding tank). The stringent TP limits will require a more robust system, such as advanced two-stage filtration or membranes; an intermediate pumping station may be required for these technologies. Some advanced technologies have a smaller footprint which may have site development benefits.

Based on preliminary assimilative capacity study results (HESL, 2017), the ultimate capacity of the plant is limited by the assimilative capacity of the receiving stream, and is equal to the projected capacity needs for the 25-year planning period of 3,900 m³/d. Future capacity expansions at this site, beyond the 25 year planning period, would require more advanced treatment or a new outfall to another receiving body. The treatment process selection will determine operational complexity and footprint requirements.

Due to strict TP and nitrate objectives identified in ACS for the existing outfall at unnamed tributary, a memo was prepared in June 2018 assessing the feasibility of a new forcemain discharging downstream of the existing outfall into Fairchild Creek (referred to as forcemain option 2-3 described in Section 10.2.3). If this option is pursued, a new assimilative capacity study should be performed for the new outfall.

The specific process configuration would be developed during the design phase (beyond the scope of the current Class EA Study), consistent with the effluent

requirements and site constraints. Opportunities for phasing construction was considered.

Infrastructure and Land Requirements

Wastewater Alternative A requires major upgrades and expansion to the existing St. George WPCP. It may be possible to reuse existing infrastructure at the St. George WPCP (e.g., conversion of existing circular plant to membrane bioreactors).

With the appropriate technology selection, land is available for expansion within the existing County-owned plant site to upgrade the plant to provide the design average day flow (ADF) of 3,900 m³/d for the 25-year planning horizon.

Potential for Phasing Capacity to Match Growth

The capacity upgrade can be phased to match growth. Expansion to the proposed 3,900 m³/d is equivalent to more than tripling the current installed capacity; therefore, it may be desirable to phase construction based on population growth projections.

Potential Environmental Impacts

Potential environmental impacts may be associated with the following components:

- Surface water protection
- Greenhouse gases
- System redundancy and flexibility
- Operational complexity
- Ease of implementation
- Need for new infrastructure
- Natural and archaeological heritage
- Regulatory approvals

An overview of the potential environmental impacts of Wastewater Treatment Alternative A is presented in Table 27.

Table 27 Potential Environmental Impacts for Wastewater Treatment Alternative A

Indicator Criteria	Description
Surface Water Protection	The St. George WPCP currently discharges to a stranded oxbow of an unnamed tributary to Fairchild Creek, which has seasonal dry periods when 100% of flow is St. George WPCP effluent. The existing St. George WPCP is considered to be an advanced wastewater treatment plant, and the discharge has been demonstrated to be non-toxic. The year-round discharge of effluent to the stranded oxbow provides benefits compared to running dry. However, the

Indicator Criteria	Description
	limited assimilative capacity of the receiving stream will ultimately limit the capacity of this plant to 3,900 m ³ /d.
Greenhouse Gases	Greenhouse gas generation will be limited to the wastewater treatment plant process. The use of membranes or a high headloss filtration process (which may necessitate intermediate pumping) would increase energy requirements compared to conventional treatment.
System Redundancy and Flexibility	The upgraded treatment plant would be designed to include provisions for system redundancy and flexibility.
Operational Complexity	More complex treatment compared to the current process is likely to be required but will be determined based on technology selection.
Ease of Implementation	Construction will be constrained to within the existing WPCP site. Construction will be staged to minimize process disruption during construction. Ease of implementation will be based on final process selection; conversion of existing tanks to new processes may require complex construction sequencing. Risks are anticipated to be manageable.
Need for New Infrastructure	It may be possible to reuse significant portions of infrastructure from the existing plant, depending on process configuration selection.
Natural & Archaeological Heritage	Construction will be constrained to the existing WPCP site, which is previously disturbed and retains little to no archeological potential, minimizing potential for impacts.
Regulatory Approvals	All works occur on the existing WPCP site. MECP approval is required to expand the plant capacity.

Potential Social and Community Impacts

Potential social and community impacts may be associated with the following components:

- Health and Safety
- Noise and Traffic During Construction
- Public Perception
- Aesthetics
- Land Use
- Construction Duration and Ease of Implementation
- Odours
- Noise (long term)
- Truck Traffic (long term)

- An overview of the potential social and community impacts of Wastewater Alternative A is presented in Table 28.

Table 28 Potential Social and Community Impacts for Wastewater Treatment Alternative A

Indicator Criteria	Description
Health and Safety	Negligible impacts to public. Impacts to operators are based on the final process selection but are anticipated to be negligible.
Noise and Traffic During Construction	Increased traffic through the adjacent subdivision and on the plant access road during the construction period. Construction noise will impact neighbours. Impact will be focused on the existing plant site area.
Public Perception	Construction will be constrained to the existing WPCP site, limiting impact to public. Where possible, new works will be constructed within the existing fence line and south and east of the existing plant to minimize impact on neighbours to the northwest.
Aesthetics	Upgrades to the plant would be restricted to the existing site and have minimal impacts on aesthetics. Tree removals will be minimized, and trees will be replaced as required. Aesthetic impacts will be considered in the design of new works.
Land Use	Construction would be constrained to the St. George WPCP site. Selection of advanced treatment technology may prioritize compact footprints.
Construction Duration and Ease of Implementation	The overall construction duration of Alternative A is anticipated to be lower than Alternative B due to the more limited scope of included works. Construction would be confined to the existing WPCP site. Ease of implementation will be based on final process selection; conversion of existing tanks to new processes may require complex construction sequencing. Design and construction duration may be extended due to process selection and procurement requirements for advanced treatment.
Odours	The upgrades would not be anticipated to cause an increase in plant odours. New headworks facilities would be designed with improved odour control measures. No significant difference between Alternative A and B is anticipated. Pre and Post Expansion Odour Modelling is recommended to confirm odour reduction compared to existing conditions.
Noise (long term)	Process upgrades will address current noise concerns and no increase in WPCP noise is anticipated; no significant difference between Alternative A and B is anticipated. Pre and Post

Indicator Criteria	Description
	Expansion Noise Modelling is recommended to confirm noise reduction compared to existing conditions.
Truck Traffic (long term)	Increased truck traffic is anticipated due to increased plant capacity and associated biosolids hauling requirements; no significant difference between Alternative A and B is anticipated.

10.2.3 Wastewater Treatment Alternative B: Expand existing St. George WPCP with discharge to the Grand River

General Description

Wastewater Alternative B is based on expanding the existing St. George WPCP at the current site, with a new outfall constructed to the Grand River, which is approximately 8.5 km away from the plant. For this alternative, the County would complete the necessary upgrades to existing structures, equipment and processes and construct the additional process works required to increase the plant capacity.

Key considerations for this option include:

- Provides additional capacity for projected future growth in St. George for the 25 year planning horizon, and to potentially accommodate ultimate development build out demands
- Addresses plant process limitations
- Utilizes existing infrastructure and site
- Maintains similar level of operational complexity as the existing plant
- Requires land purchase for outfall easement
- Requires a pumping station to convey effluent to the Grand River
- Significant capital investment for plant upgrades, land purchase, and pumping station
- Potential delays for the additional Class EA investigations (including assimilative capacity assessment and outfall routing selection), land acquisition, and approvals

Effluent Requirements

An assimilative capacity study of the Grand River at the proposed new discharge point is required for this option. The effluent criteria for an expanded St. George WPCP under this option would be determined through consultation with the MECP.

Based on effluent requirements for recent upgrades to existing wastewater treatment plants (WWTPs) that discharge to the Grand River, a TP treatment objective of 0.2 mg/L and limit of 0.4 mg/L, and no total nitrogen limit is required for this option.

Design Concept

Wastewater Treatment Plant

The Grand River has a significantly greater assimilative capacity than the unnamed tributary of Fairchild Creek, to which the St. George WPCP currently discharges. Therefore, although the expanded plant in this alternative would be designed to achieve the design ADF of 3,900 m³/d, future expansion to a higher flow rate (possibly the ultimate build out capacity) could potentially be accommodated by the receiving body. Preferences related to future expansion potential should be considered during the process selection, because available footprint may become a limiting factor in the ultimate site capacity.

A secondary treatment plant with tertiary filtration, similar to the existing St. George WPCP process, is expected to provide an appropriate level of treatment for this scenario. The specific process configuration would be developed during the design phase (beyond the scope of the current Class EA).

Outfall

This alternative would require land acquisition for the construction of the new effluent forcemain and outfall. Significant additional studies would be required in the current Class EA, including an assimilative capacity study of the Grand River and outfall routing selection. Additional environmental and other approvals will be required for construction.

An initial investigation of potential forcemain routes was conducted as part of the Class EA study. The following sections provide details of the desktop investigation of potential forcemain alignments conducted.

Forcemain Route Alternative Considerations

The following considerations have been taken into account during the preliminary investigation of the forcemain alignment alternatives:

- Potential traffic impacts associated with forcemain construction

- Impacts of forcemain construction on residents and local businesses in St. George and the surrounding areas
- Impacts of forcemain construction on the natural environment
- Location of effluent outfall at the Grand River and potential property acquisition requirements.

The sections below outline each of the considerations in more detail.

Overall Cost of Construction and Traffic Impacts

In general, forcemain installation and construction along unpaved, gravel roadways was noted as the most cost-effective option for the proposed forcemain alignment. The main cost savings are generated from reduced restoration costs involved in reinstatement of the travelled laneway as well as potentially decreased construction durations due to reduced daily vehicle traffic typically encountered on local roadways.

Where forcemain alignment on gravel roads was not possible, secondary paved roads were considered. Highways under MTO jurisdiction were not considered as alignment options due to increased traffic impacts, increased construction costs and anticipated difficulties obtaining a forcemain corridor within a MTO right-of-way.

Natural Environment Impacts of Forcemain Construction

Potential construction impacts on wetlands and regulated areas within the Grand River Watershed were considered during selection of the potential forcemain alignments. The GRCA Grand River Watershed Viewer web utility was used to assess and quantify the length of GRCA regulated areas and wetlands along each of the proposed alignment options. In addition, the web utility was used to quantify Grand River Drainage Network crossings along each respective alignment option to further assess potential impacts to the natural environment. Only the drainage network shown on the web utility were considered.

Property Acquisition Requirements

The proposed forcemain alignments were selected to minimize potential property acquisitions, which may be required to construct the forcemain and the outfall at the bank of the Grand River. Potential property acquisition requirements were minimized by selecting forcemain routes along existing public rights-of-way to a location where the distance between the public right of way and the bank of the Grand River is minimized.

Potential Outfall Locations

Based on a general review of the Study Area, three potential outfall locations on the Grand River were identified. The identified outfall locations were selected to minimize

property acquisitions. The general locations were determined to be near Braeside Camp and near the community of Glen Morris, and one directly to Fairchild Creek.

Potential Forcemain Routing

An investigation of potential forcemain alignments led to the following three (3) alignments:

1. Forcemain Route Alternative 2-1 – Braeside Camp Outfall: This alignment starts at the St. George WPCP along Victor Boulevard to Main Street South, then follows southerly along Main Street South to German School Road, then westerly along German School Road to East River Road.
2. Forcemain Route Alternative 2-2 – Glen Morris Outfall: This alignment follows Victor Boulevard from the St. George WPCP to Main Street South, then northerly along Main Street South to Glen Morris Road, then westerly along Glen Morris Road to Princess Street, then northerly on Princess Street to East River Road, then westerly along East River Road to Forbes Street, then from intersection of East River Road and Forbes Street to terminus of Forbes Street.
3. Forcemain Route Alternative 2-3 – Fairchild Creek Outfall: This option discharges directly to Fairchild Creek (rather than to the existing unnamed tributary discharge point) shown as alternative 2-3.

The three (3) forcemain route alternatives described above are graphically shown in Figure 18.

Wastewater Treatment Alternative B requires major upgrades and expansion to the St. George WPCP, an effluent pumping station, and a forcemain and outfall to the Grand River. The expansions to the treatment plant and the new effluent pumping station would all be located on the St. George WPCP site. With the appropriate technology selection, land is available for expansion within the existing County-owned plant site to upgrade the plant to provide the design ADF of 3,900 m³/d for the 25-year planning horizon. The wastewater treatment plant upgrades would occur on the existing St. George WPCP site.

Property acquisition will be required for the forcemain and outfall. Acquisition requirements can be minimized by prioritizing forcemain routes on public right of ways, but cannot be eliminated.

Potential for Phasing Upgrades

As with Wastewater Alternative A, the capacity upgrade can be phased to match growth. Expansion to the proposed 3,900 m³/d is equivalent to more than tripling the current installed capacity. Therefore, it may be desirable to phase construction based on population growth projections.

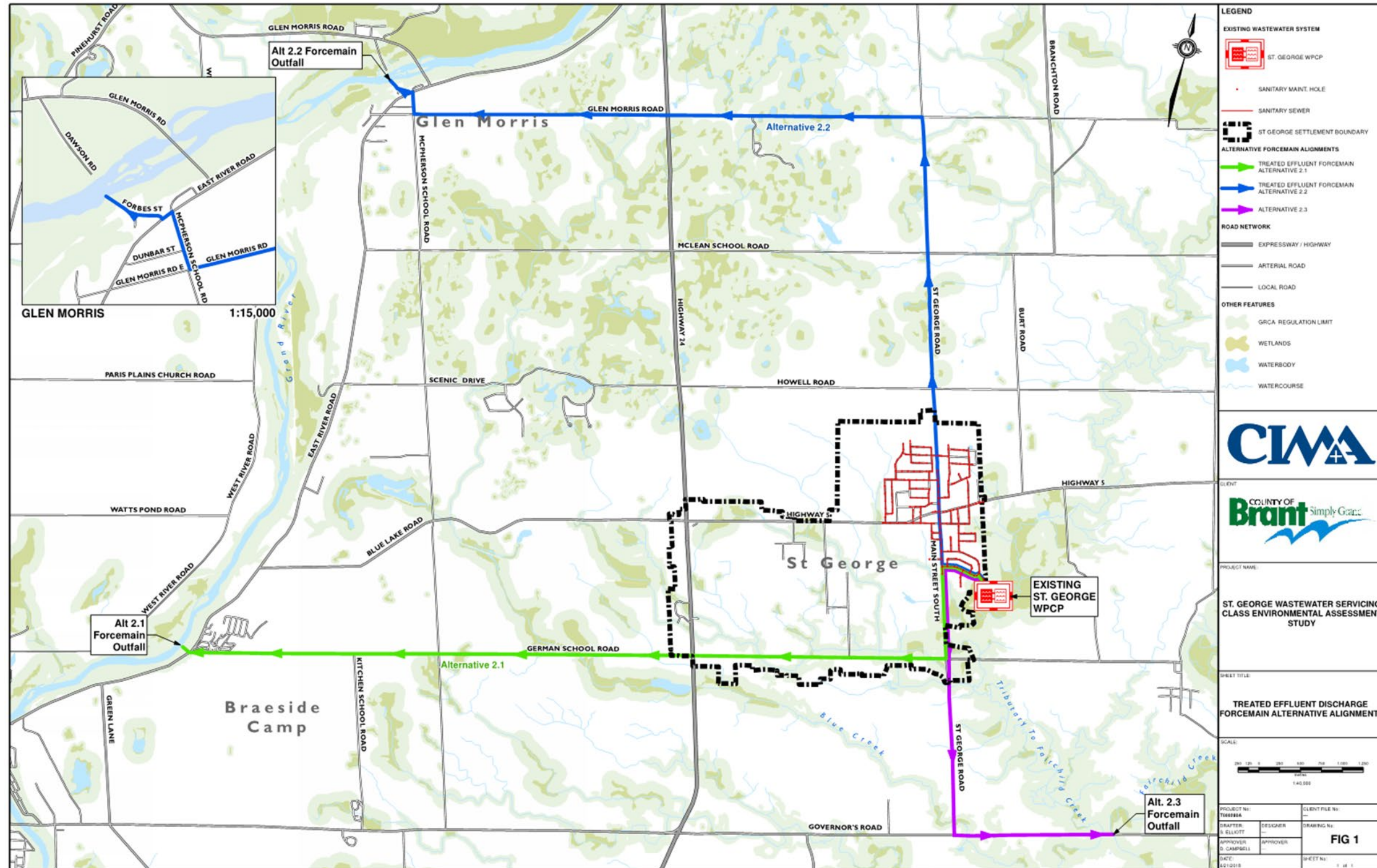


Figure 18 Potential Alternative Forcemain Alignments for Grand River or Fairchild's Creek Outfall

Potential Environmental Impacts

Potential environmental impacts may be associated with the following components:

- Surface water protection
- Greenhouse gases
- System redundancy and flexibility
- Operational complexity
- Ease of implementation
- Need for new infrastructure
- Natural and archaeological heritage
- Regulatory approvals

An overview of the potential environmental impacts of Wastewater Servicing Alternative B is presented in Table 29.

Table 29 Potential Environmental Impacts for Wastewater Treatment Alternative B

Indicator Criteria	Description
Surface Water Protection	This option is based on an effluent outfall to the Grand River. The Grand River has a greater assimilative capacity than the current receiving stream. The stranded oxbow to which the St. George WPCP currently discharges will be seasonally dry if the effluent is discharged to a different location.
Greenhouse Gases	Greenhouse gas generation will be generated for the wastewater treatment plant process and the effluent pumping station.
System Redundancy and Flexibility	The upgraded treatment plant would be designed to mitigate the process issues currently experienced at the plant, including lack of redundancy and controls and poor preliminary treatment.
Operational Complexity	No major changes to operational complexity of the WPCP are anticipated compared to current system, but will be determined based on technology selection. Operation of an effluent pumping station is expected to be required.
Ease of Implementation	Moderate risks to the environment during construction due to effluent outfall construction. Construction will be staged to minimize process disruption during construction.
Need for New Infrastructure	It may be possible to reuse significant portions of infrastructure from the existing plant, depending on process configuration

Indicator Criteria	Description
	selection. New outfall and effluent pumping station required; significant land acquisition required.
Natural & Archaeological Heritage	Moderate concerns due to effluent outfall construction and potential disruption to previously undisturbed areas with archaeological potential. Construction would be required along the length of the effluent outfall corridor. Additional investigations of natural and archaeological heritage are required. The route will generally follow existing easements along regional roadways, minimizing potential impacts.
Regulatory Approvals	Significant land acquisition requirements. Significant permits will be required for new outfall location and in water works. Significant consultation with and permitting from the Grand River Conservation Authority are expected. MECP approval is required to expand the plant capacity.

Potential Social and Community Impacts

Potential social and community impacts may be associated with the following components:

- Health and Safety
- Noise and Traffic During Construction
- Public Perception
- Aesthetics
- Land Use
- Construction Duration and Ease of Implementation
- Odours
- Noise (long term)
- Truck Traffic (long term)

An overview of the potential social and community impacts of Wastewater Servicing Alternative B is presented in Table 30.

Table 30 Potential Social and Community Impacts for Wastewater Treatment Alternative B

Indicator Criteria	Description
Health and Safety	Negligible impacts to public. Impacts to operators are based on the final process selection (beyond scope) but are anticipated to be negligible.
Noise and Traffic During Construction	Increased traffic through the adjacent subdivision and on the plant access road during the construction period. Increased traffic and potential for traffic disruption and construction along roadways, based on forcemain routing. Construction noise will impact neighbours at the plant and along outfall route. Special consideration will have to be taken for construction within the residential areas.
Public Perception	Construction will be required through existing residential areas and land acquisition will be required for the new forcemain route and outfall. Public perception surrounding this construction may be negative. Construction will also be required at the existing St. George WPCP site. Where possible, new works will be constructed within the existing fence line and south and east of the existing plant to minimize impact on neighbours to the northwest.
Aesthetics	Upgrades to the plant would have minimal impacts on aesthetics. Outfall structure may have visual impacts. Tree removals will be minimized where practical; removed trees will be replaced.
Land Use	WPCP expansion will occur on the existing St. George WPCP site. Land acquisition would be required for the outfall forcemain and structure, including an easement in the Grand River.
Construction Duration and Ease of Implementation	The construction duration is expected to be longer due to the need for new forcemain, outfall and pumping station. In water works construction window is very limited.
Odours	The upgrades would not be anticipated to cause an increase in plant odours. New headworks facilities would be designed with improved odour control measures. No significant difference between Alternative A and B is anticipated. Pre and Post Expansion Odour Modelling is recommended to confirm odour reduction compared to existing conditions.
Noise (long term)	Process upgrades will address current noise concerns and no increase in WPCP noise is anticipated; no significant difference between Alternative A and B is anticipated. Pre and Post Expansion Noise Modelling is recommended to confirm noise reduction compared to existing conditions.

Indicator Criteria	Description
Truck Traffic (long term)	Increased truck traffic during operation is anticipated due to increased plant capacity and associated biosolids hauling requirements; no significant difference between Alternative A and B is anticipated.

10.3 Identification of Biosolids Management Alternative Design Concepts

Only one (1) feasible biosolids management alternative was identified – Biosolids Management Alternative Solution A: Expand Aerobic Digestion at St. George WPCP and Dewater at Paris WPCP

A discussion on site constraints at the St. George WPCP is presented in Section 10.2. There is space available within the existing site boundaries for expansion to the biosolids treatment process. Potential areas available for expansion are identified in Figure 17. Expansion south of the ring road is anticipated to be required.

10.3.1 Biosolids Management Alternative Solution A: Expand Aerobic Digestion at St. George WPCP and Dewater at Paris WPCP

General Description

Biosolids Alternative A is based on the construction of new aerobic digesters at the St. George WPCP, sized to fully stabilize sludge produced by the St. George WPCP at the 25 year planning horizon design flow. The biosolids would be hauled by truck to the Paris WPCP and added to the process immediately upstream of the dewatering centrifuges. Key considerations of Biosolids Management Alternative A included:

- Space available within existing footprint of St. George WPCP to expand aerobic digestion
- Utilizes existing available dewatering capacity at the Paris WPCP and does not restrict future Paris WPCP expansion; space is available (and has been allocated for) a second centrifuge at the Paris WPCP, if required
- Aerobic digestion at the St. George WPCP allows supernating to occur at the plant at which the sludge was produced, which reduces haulage
- Reduced odours of hauled materials (fully stabilized sludge)
- May require a small blend tank at Paris to stabilize dewatering operation with two (2) different sludges
- High liquid biosolids haulage requirements.

Design Concept

The specific process configuration would be developed during the conceptual design phase (beyond the scope of the current Class EA). It was anticipated that a similar aerobic digestion concept configuration currently used would be implemented.

Infrastructure and Land Requirements

Additional sludge treatment capacity is required at the St. George WPCP. No change in infrastructure is required at the Paris WPCP.

All upgrades would occur on the existing St. George WPCP site.

Potential for Phasing Capacity

The capacity upgrade can be phased to match growth. Expansion to the proposed 3,900 m³/d is equivalent to more than tripling the current installed capacity. Therefore, it may be desirable to phase construction based on population growth projections.

Potential Environmental Impacts

As discussed for the wastewater treatment alternatives, potential environmental impacts may be associated with the following components:

- Greenhouse Gases
- System redundancy and flexibility
- Operational complexity
- Ease of implementation
- Need for new infrastructure
- Natural and archaeological heritage
- Regulatory approvals

An overview of the potential environmental impacts of Biosolids Management Alternative A is presented in Table 31.

Table 31 Potential Environmental Impacts for Biosolids Management Alternative A

Indicator Criteria	Description
Greenhouse Gases	Greenhouse gas generation will be associated with the biosolids stabilization process and trucking requirements.
System Redundancy and Flexibility	Improves biosolids treatment process capacity and redundancy at the St. George WPCP.
Operational Complexity	No change to operational complexity
Ease of Implementation	Construction will be constrained to the existing WPCP site. Construction will be staged to minimize process disruption

Indicator Criteria	Description
	during construction. Short term interruptions to sludge processing do not pose a major risk to the treatment process.
Need for New Infrastructure	Utilizes existing available dewatering capacity at the Paris WPCP and does not restrict future Paris WPCP expansion; space is available (and has been allocated for) a second centrifuge at the Paris WPCP, if required.
Natural & Archaeological Heritage	Construction will be constrained to existing WPCP sites, minimizing potential for impacts.
Regulatory Approvals	MECP ECA approval will be required.

Social and Community Impacts

As discussed for Alternative A, potential social and community impacts may be associated with the following components:

- Health and safety
- Noise and traffic during construction
- Public perception
- Aesthetics
- Land use
- Construction duration and ease of implementation
- Odours
- Noise (long term)
- Truck Traffic (long term)

An overview of the potential social and community impacts of Biosolids Management Alternative A is presented in Table 32.

Table 32 Potential Social and Community Impacts for Biosolids Alternative A

Indicator Criteria	Description
Health and Safety	Negligible impacts to public or operator health and safety.
Noise and Traffic During Construction	Increased traffic through the adjacent subdivision and on the plant access road during the construction period. Construction noise will impact neighbours.
Public Perception	Construction will be constrained to the existing WPCP site. Where possible, new works will be constructed within the existing fence line.
Aesthetics	Upgrades to the plant would be restricted to the existing site and have minimal impacts on aesthetics.

Indicator Criteria	Description
Land Use	Construction would be constrained to the St. George WPCP site. May require a small blend tank at Paris to stabilize dewatering operation with two (2) different sludges.
Construction Duration and Ease of Implementation	Short construction duration. Construction is expected to be completed in conjunction with the other upgrades to the treatment process. All construction works will occur on the existing WPCP site.
Odours	Aerobic digestion has low to moderate odour potential. Odours during transport will be low due to full stabilization of the sludge. Pre and Post Expansion Odour Modelling is recommended to confirm odour reduction compared to existing conditions.
Noise (long term)	No noise concerns anticipated. Any new blowers will have sound attenuating enclosures. Pre and Post Expansion noise Modelling is recommended to confirm noise reduction compared to existing conditions.
Truck Traffic (long term)	Truck haulage from the St. George WPCP to the Paris WPCP will increase with increasing plant flow. Aerobic digestion at the St. George WPCP allows supernating to occur at the plant at which the sludge was produced, which reduces haulage requirements.

10.4 Preliminary Cost Estimates

Preliminary estimates of capital, operating and maintenance costs and life cycle costs were developed for each alternative design concept. Capital costs include development and construction of new facilities or expansion of existing facilities, major process and treatment equipment, instrumentation, and standby power supply. Operating and maintenance costs accounted for include power, chemical usage and other replacement and labour costs. Multiple technology solutions that can achieve the anticipated effluent limits are available. The specific process configuration, consistent with the effluent requirements and site constraints was beyond the scope of the Class EA process. Therefore, the wastewater treatment alternative design concept cost estimates were high-level estimates based on typical wastewater treatment plants.

The following general assumptions were made when developing cost estimates:

- Cost estimates were based on 2017 construction costs. Inflation and escalation to account for actual expected prices at the time of construction are not accounted for

- Estimates of probable capital costs were developed on a conceptual design level and based on prices and data in CIMA’s possession, as well as previous experience from projects of similar scope
- There were capital expenditure associated with the upkeep and maintenance of the facilities
- All taxes (including the 13% HST) were excluded
- Life cycle costs were estimated based on:
 - A 20-, 40- and 60-year amortization period
 - An inflation rate of 2% and an interest rate of 6% to give a market/discount rate of 4%

Estimates for probable capital, operating and life cycle costs are summarized in Table 33. Detailed cost calculations are included in Appendix H.

Table 33 Wastewater Servicing Alternative Design Concepts – Cost Estimates

Alternative Design Concepts	Capital Cost	Annual Operating & Maintenance Cost	20-Year Life Cycle Costs
Wastewater Alternative A: Expand existing St. George WPCP with existing outfall location	\$31,600,000	\$500,000	\$39,600,000
Wastewater Alternative B: Expand existing St. George WPCP with discharge to the Grand River	\$31,800,000	\$320,000	\$37,200,000
Biosolids Alternative Solution A: Expand Aerobic Digestion at St. George WPCP and Dewater at Paris WPCP	\$3,000,000	\$60,000	\$4,000,000

10.5 Evaluation of Wastewater Design Concepts

The detailed evaluation process followed in this step is consistent with the evaluation methodology developed for this project, as described in Section 9.3. Each alternative design concept was assessed under each criterion and assigned a score out of 5 points. The scores were totaled for each option. The alternative design concept that scored the highest is considered to provide the most overall benefits to this project and thus, has been selected as the preliminary preferred wastewater servicing design concept for the St. George settlement area.

In addition to the Assimilative Capacity Study completed for the unnamed tributary to the Fairchild Creek, other supporting studies were completed as part of this Class EA study to substantiate the development and evaluation of wastewater servicing alternative solutions and design concepts. Individual studies and assessments included a Cultural Heritage Assessment, and Stage 1 Archaeological Assessment. The findings and recommendations of these studies were considered in the relative evaluation of the water servicing design concepts and the identification of available mitigation measures. Copies of the stand-alone reports for each study can be found in the appendices.

10.5.1 Wastewater Treatment

A summary of the overall scores obtained for each alternative design concept, and the ranking based on such scores are summarized in Table 34. The complete evaluation of the alternative design concepts, including the scoring rationale and individual scores are shown in detail in Table 35.

Table 34 Summary of Evaluation Scoring and Ranking – Treatment Design Concepts

Alternative Design Concepts	Overall Score	Overall Ranking
Wastewater Alternative A: Expand existing St. George WPCP with existing outfall location	83.6	1
Wastewater Alternative B: Expand existing St. George WPCP with discharge to the Grand River	68.8	2

The results of detailed evaluation indicate that Wastewater Alternative A (Expand existing St. George WPCP with existing outfall location) is the highest-ranking option. Consistent with the evaluation methodology and the results, Alternative A has been selected as the preliminary preferred wastewater servicing concept for the St. George settlement area.

10.5.2 Biosolids Management

Only one (1) viable option is available for biosolids management:

Biosolids Management Alternative A: Expand Aerobic Digestion at St. George WPCP and Dewater at Paris WPCP.

An individual assessment of this design concept was completed with the main objective to rationalize potential impacts resulting from implementation of this option. This option was selected as the preferred concept. The results of the individual assessment, including the scoring rationale and scores are shown in detail in Table 36

Table 35 Wastewater Treatment Alternative Evaluation Matrix

Criteria	Wastewater Alternative A: Expand existing St. George WPCP with existing outfall location Rationale	Score 0 to 5	Weighted Score	Wastewater Alternative B: Expand existing St. George WPCP with Discharge to the Grand River Rationale	Score 0 to 5	Weighted Score
Category: Environmental Weight: 40						
Surface Water Protection	The St. George WPCP currently discharges to a stranded oxbow of the unnamed tributary of Fairchild Creek, which has seasonal dry periods when 100% of flow is St. George WPCP effluent. The existing St. George WPCP is considered to be an advanced wastewater treatment plant, and the discharge has been demonstrated to be non-toxic. The year-round discharge of effluent to the stranded oxbow provides benefits compared to running dry. However, the limited assimilative capacity of the receiving stream will ultimately limit the capacity of this plant to 3,900 m ³ /d.	5.0	5.0	This option is based on an effluent outfall to the Grand River. The Grand River has a greater assimilative capacity than the current receiving stream. The stranded oxbow to which the St. George WPCP currently discharges will be seasonally dry if the effluent is discharged to a different location.	5.0	5.0
Greenhouse Gas (GHG) Generation	Greenhouse gas generation will be limited to the wastewater treatment plant process. The use of membranes or a high headloss filtration process (which may necessitate intermediate pumping) would increase energy requirements and GHGs compared to conventional treatment.	3.0	3.0	Greenhouse gas generation will be generated for the wastewater treatment plant process and the effluent pumping station, required to convey the wastewater effluent to the new outfall.	3.0	3.0
System Redundancy and Flexibility	The upgraded treatment plant would be designed to include provisions for system redundancy and flexibility.	5.0	5.0	The upgraded treatment plant would be designed to mitigate the process issues currently experienced at the plant, including lack of redundancy and controls and poor preliminary treatment. The addition of a single forcemain would not have redundancy for emergency situations.	3.0	3.0
Operational Complexity	More complex treatment compared to the current process is likely to be required but will be determined based on technology selection.	2.0	2.0	No major changes to operational complexity of the WPCP are anticipated compared to current system but will be determined based on technology selection. Operation of an effluent pumping station is expected to be required.	4.0	4.0
Ease of Implementation	Construction will be constrained to within the existing WPCP site. Construction will be staged to minimize process disruption during construction. Ease of implementation will be based on final process selection; conversion of existing tanks to new processes may require complex construction sequencing. Risks are anticipated to be manageable.	3.0	3.0	Moderate risks to the environment during construction due to effluent outfall construction. Construction will be staged to minimize process disruption during construction.	3.0	3.0
Need for New Infrastructure	It may be possible to reuse significant portions of infrastructure from the existing plant, depending on process configuration selection.	5.0	5.0	It may be possible to reuse significant portions of infrastructure from the existing plant, depending on process configuration	2.0	2.0

Criteria	Wastewater Alternative A: Expand existing St. George WPCP with existing outfall location Rationale	Score 0 to 5	Weighted Score	Wastewater Alternative B: Expand existing St. George WPCP with Discharge to the Grand River Rationale	Score 0 to 5	Weighted Score
				selection. New outfall and effluent pumping station required; significant land acquisition required.		
Natural and Archaeological Heritage	Construction will be constrained to the existing WPCP site, which is previously disturbed and retains little to no archaeological potential, minimizing potential for impacts. However, additional assessment will be required to confirm. Based on the Stage 1 archaeological assessment, there are some areas to the west of the existing property that may retain archaeological potential, but these areas are not proposed to be used for future plant processes.	4.0	4.0	Moderate concerns due to effluent outfall construction and potential disruption to previously undisturbed areas with archaeological potential. Construction would be required along the length of the effluent outfall corridor. Additional investigations of natural archaeological and cultural heritage are required. The route will generally follow existing easements along regional roadways, minimizing potential impacts.	2.0	2.0
Regulatory Approvals	All works occur on the existing WPCP site. MECP approval is required to expand the plant capacity.	4.0	4.0	Significant land acquisition requirements. Significant permits will be required for new outfall location. MECP approval is required to expand the plant capacity.	1.0	1.0
	Sub-total Score – Environmental Indicators		31.0			23.0
Category: Social Weight: 40						
Health and Safety	Negligible impacts to public. Impacts to operators are based on the final process selection (beyond scope) but are anticipated to be negligible.	5.0	4.4	Negligible impacts to public. Impacts to operators are based on the final process selection (beyond scope), but are anticipated to be negligible.	5.0	4.4
Noise and traffic (during construction)	Increased traffic through the adjacent subdivision and on the plant access road during the construction period. Construction noise will impact neighbours. Impact will be focused on the existing plant site area.	4.0	3.6	Increased traffic through the adjacent subdivision and on the plant access road during the construction period. Increased traffic and potential for traffic disruption and construction along roadways, based on forcemain routing. Construction noise will impact neighbours at the plant and along outfall route. Special consideration will have to be taken for construction within the residential areas.	2.0	1.8
Public Perception	Construction will be constrained to the existing WPCP site, limiting impact to public. Where possible, new works will be constructed within the existing fence line and south and east of the existing plant to minimize impact on neighbours to the northwest.	5.0	4.4	Construction will be required through existing residential areas and land acquisition will be required for the new forcemain route and outfall. Public perception surrounding this construction may be negative. Construction will also be required at the existing St. George WPCP site. Where possible, new works will be constructed within the existing fence line and south and east of the existing plant to minimize impact on neighbours to the northwest.	4.0	3.6
Aesthetics	Upgrades to the plant would be restricted to the existing site and have minimal impacts on aesthetics. Tree removals will be	5.0	4.4	Upgrades to the plant would have minimal impacts on aesthetics. Outfall structure may create visual impacts relative to existing	2.0	1.8

Criteria	Wastewater Alternative A: Expand existing St. George WPCP with existing outfall location Rationale	Score 0 to 5	Weighted Score	Wastewater Alternative B: Expand existing St. George WPCP with Discharge to the Grand River Rationale	Score 0 to 5	Weighted Score
	minimized, and trees will be replaced as required. Aesthetic impacts will be considered in the design of new works.			natural look. Tree removals will be minimized where practical; removed trees will be replaced.		
Land Use	Construction would be constrained to the St. George WPCP site. Selection of advanced treatment technology may prioritize compact footprints.	5.0	4.4	WPCP expansion will occur on the existing St. George WPCP site. Land acquisition would be required for the outfall forcemain and structure, including an easement in the Grand River.	3.0	2.7
Construction Duration	Overall construction duration of Alternative A is anticipated to be shorter than Alternative B due to the more limited scope of included works. Construction would be confined to the existing WPCP site. Ease of implementation will be based on final process selection; conversion of existing tanks to new processes may require complex construction sequencing. Design and construction duration may be extended due to process selection and procurement requirements for advanced treatment.	3.0	2.7	The construction duration is expected to be longer due to the need for new forcemain, outfall and pumping station. In water works construction window is very limited and extensive consultation with the conservation authority is expected to be required to determine mitigation measures for in-water work.	1.0	0.9
Odours	The upgrades would not be anticipated to cause an increase in plant odours. New headworks facilities would be designed with improved odour control measures. No significant difference between Alternative A and B is anticipated. Pre and Post Expansion Odour Modelling is recommended to confirm odour reduction compared to existing conditions.	3.0	2.7	The upgrades would not be anticipated to cause an increase in plant odours. New headworks facilities would be designed with improved odour control measures. No significant difference between Alternative A and B is anticipated. Pre and Post Expansion Odour Modelling is recommended to confirm odour reduction compared to existing conditions.	3.0	2.7
Noise	Process upgrades will address any noise concerns and no increase in WPCP noise is anticipated; no significant difference between Alternative A and B is anticipated. Pre and Post Expansion Noise Modelling is recommended to confirm noise reduction compared to existing conditions.	5.0	4.4	Process upgrades will address current noise concerns and no increase in WPCP noise is anticipated; no significant difference between Alternative A and B is anticipated. Pre and Post Expansion Noise Modelling is recommended to confirm noise reduction compared to existing conditions.	5.0	4.4
Truck Traffic	Increased truck traffic is anticipated due to increased plant capacity and associated biosolids hauling requirements; no significant difference between Alternative A and B is anticipated.	3.0	2.7	Increased truck traffic during operation is anticipated due to increased plant capacity and associated biosolids hauling requirements; no significant difference between Alternative A and B is anticipated.	3.0	2.7
	Sub-total Score – Social Indicators		33.8			25.8
Category: Economic Weight: 20						
Life Cycle Cost	20-year LCC \$39,600,000	4.7	18.8	20-year LCC \$37,200,000	5.0	20.0
	Sub-total Score – Economic Indicators		18.8			20.0
	Total Overall Weighted Score (out of 100)		83.6			68.8

Table 36 Biosolids Management Alternative Evaluation Matrix

Criteria	Biosolids Management Alternative Solution A: Expand Aerobic Digestion at St. George WPCP and Dewater at Paris WPCP Rationale	Score 0 to 5	Weighted Score
Category: Environmental Weight: 40			
Surface Water Protection	N/A	-	-
Greenhouse Gas (GHG) Generation	Greenhouse gas will be generated for the biosolids stabilization process and trucking requirements.	4.0	4.6
System Redundancy and Flexibility	Improves biosolids treatment process capacity and redundancy at the St. George WPCP.	5.0	5.7
Operational Complexity	No change to operational complexity	5.0	5.7
Ease of Implementation	Construction will be constrained to the existing WPCP site. Construction will be staged to minimize process disruption during construction. Short term interruptions to sludge processing do not pose a major risk to the treatment process.	5.0	5.7
Need for New Infrastructure	Utilizes existing available dewatering capacity at the Paris WPCP and does not restrict future Paris WPCP expansion; space is available (and has been allocated for) a second centrifuge at the Paris WPCP, if required.	5.0	5.7
Natural and Archaeological Heritage	Construction will be constrained to existing WPCP sites, minimizing potential for impacts.	5.0	5.7
Regulatory Approvals	MECP ECA approval will be required.	5.0	5.7
		Maximum Sub-total Score	38.9
Category: Social Weight: 40			
Health and Safety	Negligible impacts to public or operator health and safety.	5.0	4.4
Noise and traffic (during construction)	Increased traffic through the adjacent subdivision and on the plant access road during the construction period. Construction noise will impact neighbours.	3.0	2.7
Public Perception	Construction will be constrained to the existing WPCP site. Where possible, new works will be constructed within the existing fence line.	5.0	4.4
Aesthetics	Upgrades to the plant would be restricted to the existing site and have minimal impacts on aesthetics.	5.0	4.4
Land Use	Construction would be constrained to the St. George WPCP site. May require a small blend tank at Paris to stabilize dewatering operation with two (2) different sludges	5.0	4.4
Construction Duration	Short construction duration. Construction is expected to be completed in conjunction with the other upgrades to the treatment process. All construction works will occur on the existing WPCP sites (St. George and Paris).	5.0	4.4
Odours	Aerobic digestion has low to moderate odour potential. Odours during transport will be low due to full stabilization of the sludge.	5.0	4.4
Noise	No noise concerns anticipated. Any new blowers will have sound attenuating enclosures.	5.0	4.4
Truck Traffic	Truck haulage from the St. George WPCP to the Paris WPCP will increase with increasing plant flow. Aerobic digestion at the St. George WPCP allows supernating to occur at the plant at which the sludge was produced, which reduces haulage	3.0	2.7
		Maximum Sub-total Score – Community / Social	36.4
Category: Economic Social Weight: 40			
Life Cycle Cost	20-year LCC \$4,000,000	5.0	20.0
		Maximum Sub-total Score – Economic	20.0
		Total Overall Maximum Weighted Score (out of 100)	95.3

10.6 Sensitivity Analysis

To gain more confidence in the preferred recommended wastewater treatment solution selected in the previous step, a sensitivity analysis was completed. The sensitivity analysis helps to verify the robustness of the evaluation process and the consistency of the evaluation results when variables of the evaluation methodology are subjected to modifications. This test ensures that the preferred recommended solution is appropriate before making final decisions.

Two (2) scenarios were considered in the analysis. The first scenario included consideration to different time periods for the life cycle costs (20-year consistent with the original assumption, 40-year and 60-year) for each option. The second scenario included consideration to changes in the weighting factors, where each of the main categories were changed to equally distributed weighting factors of 33.3% (environmental 33.3%, Social 33.3% and Financial 33.3%).

10.6.1 Various Life Cycle Costs – Sensitivity Analysis Results

The sensitivity analysis exercise was completed assuming that all other individual scores assigned within the environmental and social categories remained unchanged. The scores assigned within the economic category are adjusted to reflect the changes in the life cycle costs for each scenario.

The calculated life cycle costs for each alternative wastewater design concept are summarized in Table 37. The evaluation results, assuming the different time periods for the life cycle costs in addition to the original 25-year life cycle costs, are summarized in Table 38.

Table 37 Life Cycle Costs Summary

Alternative Design Concepts	20-Year LCC \$ Million	40-Year LCC \$ Million	60-Year LCC \$ Million
Wastewater Alternative A: Expand existing St. George WPCP with existing outfall location	\$39,600,000	\$42,900,000	\$44,600,000
Wastewater Alternative B: Expand existing St. George WPCP with discharge to the Grand River	\$37,200,000	\$39,200,000	\$40,300,000

Table 38 Life Cycle Costs Sensitivity Analysis Summary

	Wastewater Alternative A: Expand existing St. George WPCP with existing outfall location	Wastewater Alternative B: Expand existing St. George WPCP with discharge to the Grand River
Scenario 1 - Original 20-Year LCC		
Overall Score	83.6	68.8
Scenario 1 - Original 20-Year LCC		
Overall Ranking	1	2
Scenario 2 - 40-Year LCC		
Overall Score	83.1	68.8
Scenario 2 - 40-Year LCC		
Overall Ranking	1	2
Scenario 3 - 60-Year LCC		
Overall Score	82.8	68.8
Scenario 3- 60-Year LCC		
Overall Ranking	1	2

As shown in Table 38, the overall ranking remains unchanged regardless of the life cycle cost period. The results of the sensitivity analysis under this scenario demonstrate that Wastewater Alternative A – Expand existing St. George WPCP with existing outfall location continues to achieve the highest score under the three (3) different planning periods.

10.6.2 Equally Weighted Evaluation Criteria – Sensitivity Analysis Results

The weighting factors for the main criteria were changed so that each of the three (3) categories would be equally weighted within the whole evaluation. The original and additional scenarios under which the sensitivity analysis was run are shown in Table 39.

Table 39 Criteria Category Weights Sensitivity Analysis Summary

Main Criteria Category	Category Weight	Alternative A Weighted Score	Alternative B Weighted Score
Scenario 1 - Original			
Environmental	40%	31.0	23.0
Social	40%	33.8	25.8
Economic	20%	18.8	20.0
Total	100%	83.6	68.8
Overall Ranking		1	2
Scenario 2 – Equally Distributed Weight			
Environmental	33.3%	26.7	19.2
Social	33.3%	28.1	21.5
Economic	33.3%	30.3	33.3
Total	100%	85.3	74.0
Overall Ranking		1	2

As shown in Table 39, the overall ranking continues to remain unchanged regardless of the variations to the original weighting factors. The results of the sensitivity analysis under this scenario demonstrate that Wastewater Alternative A – Expand existing St. George WPCP with existing outfall location continues to achieve the highest score.

11 Preferred Wastewater Servicing Design Concept

11.1 Wastewater Treatment

Based on the results of the detailed comparative evaluation, as presented in Section 10.3, the preferred alternative design concept for the St. George settlement area is:

- Alternative A: Expand the existing St. George WPCP to 3,900 m³/d with existing outfall location to the stranded oxbow of the unnamed tributary of Fairchild creek.

Specific key advantages offered by the preferred design concept – Expand the existing St. George WPCP with existing outfall location to the stranded oxbow of the unnamed tributary of Fairchild creek, include:

- It provides enhanced system redundancy and flexibility and addresses current process limitations at the existing St. George WPCP;
- The year-round discharge of effluent to the existing stranded oxbow with seasonal dry periods provides benefits compared to running dry;
- It maximizes the use of existing infrastructure; and,
- It reduces construction duration and impacts to the general environment as works will be constrained within existing site limits.

This alternative involves completion of the necessary upgrades to existing structures, equipment and processes at the existing St. George WPCP and construct the additional process works required to increase the plant capacity. Potential areas for expansion of the existing St. George WPCP have been preliminarily identified (grey boxes), as shown in Figure 19.

Filtered treated effluent will continue to discharge (consistent with current practise) via an outfall pipe to the existing stranded oxbow of the unnamed tributary of Fairchild Creek. Effluent criteria, as agreed upon consultation with the MECP during the Class EA study, especially related to TP and nitrate will be applied to an expanded St. George WPCP, and would apply and be considered the basis for technology selection for the preferred recommended treatment solution. It is anticipated that technologies including membrane filtration/bioreactors and/or two-stage tertiary filtration will be required to achieve TP effluent requirements. Biological Nutrient Removal (BNR) aeration tank configurations will be required to achieve effluent nitrate objectives.

The specific process configuration would be developed during the design phase (beyond the scope of the current Class EA), consistent with the effluent requirements and site constraints. Opportunities for phasing construction will be considered at the time of design.

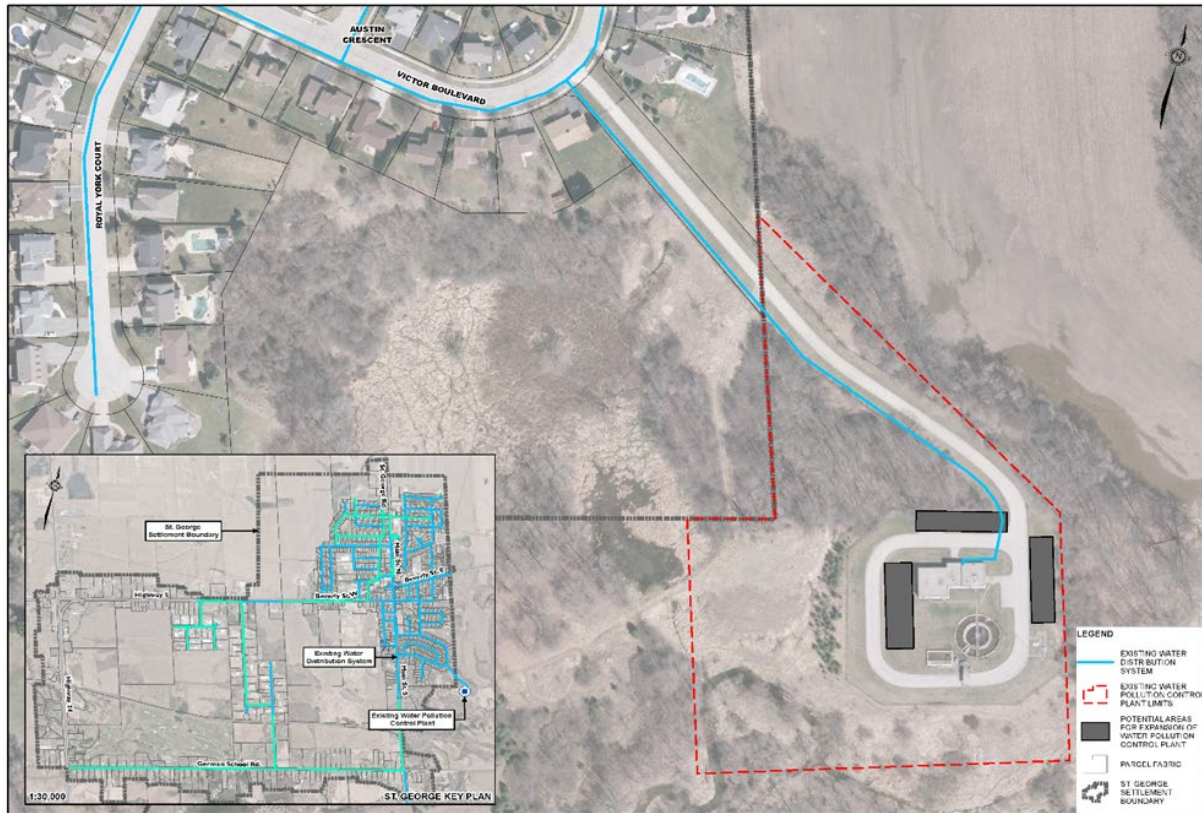


Figure 19 Preliminary Proposed Areas for Expansion – St. George WPCP Site

11.2 Biosolids Management

The preferred alternative for biosolids management at the St. George WPCP is:

- Biosolids Alternative A: Expand Aerobic Digestion at St. George WPCP and dewater at Paris WPCP

Biosolids Alternative A is based on the construction of new aerobic digesters at the St. George WPCP, sized to fully stabilize sludge produced by the St. George WPCP at the 25 year planning horizon design flow. The biosolids would be hauled by truck to the Paris WPCP and added to the process immediately upstream of the dewatering centrifuges.

The major advantages offered by the preferred design concept – Expand Aerobic Digestion at St. George WPCP and dewater at Paris WPCP, include:

- Aerobic digestion at the St. George WPCP allows supernatant to occur; thus, resulting in a reduction of biosolids haulage needs;

- Available dewatering capacity at the Paris WPCP is utilized without restricting future plant expansion. Space is available for a second centrifuge at the Paris WPCP, if required; and,
- Odours of hauled materials (stabilized sludge) are reduced.

Mutual advantages of preferred recommended design concepts for both wastewater treatment and biosolids management results in minimized potential impacts during construction to natural, socio-economic and legal/jurisdictional requirements, as proposed works are expected to be constrained within the boundaries of the existing site.

11.3 Required Permits and Approvals

Permits and approvals required as a result of the proposed works are shown in Table 40.

Table 40 Preferred St. George Wastewater Servicing Design Concept – Permits and Approvals

Approval Agency	Permit/Approval Required
Ministry of the Environment, Conservation and Parks (MECP)	<ul style="list-style-type: none"> • Amendment to Environmental Compliance Approval (ECA)
County of Brant	<ul style="list-style-type: none"> • Site Plan Approval c/w GRCA Approval • Building Permit
Utility Companies	<ul style="list-style-type: none"> • As required. • ESA

12 Proposed Mitigation of Potential Impacts and Monitoring

The following section provides a description of some of the potential impacts anticipated during construction as a result of the implementation of the preferred expansion works, described in this report, as well as some mitigation measures proposed to minimize or avoid such anticipated impacts.

As with any other construction project, there will be some potential impacts to the public and environment in areas such as noise, dust, vibration and visuals during the construction period. All construction work must be carried out in accordance with the Occupational Health and Safety Act (OHSA) and other local regulations. Specific mitigation measures, as described below, are recommended for implementation to reduce anticipated potential impacts.

12.1 Natural Environmental Features

A significant portion of the existing St. George WPCP site has been previously disturbed by the construction of the current facility. The majority of the areas surrounding the existing access driveway, paved areas building footprints have been landscaped following construction of the existing facility. There is limited vegetation on the potential areas for construction within the existing plant site; however, the proposed mitigation measures include the following:

- Tree removal will be minimized as much as possible, and trees will be replaced as required.
- A buffer zone to protect the woodlands around the outside perimeter of the plant site will be part of the design to ensure the area is not disturbed during construction.
- Construction areas will be re-planted and re-vegetated after the expansion is complete.
- Erosion and sedimentation control measures will be placed around the construction areas, where appropriate.

12.1.1 Surface Water and Aquatic Habitat Protection

The St. George WPCP currently discharges to a stranded oxbow of the unnamed tributary of Fairchild Creek, which has seasonal dry periods when 100% of the flow is the St. George WPCP effluent. The preferred recommended treatment solution will continue to discharge treated effluent into the existing outfall location.

The effluent limits proposed for the expanded St. George WPCP, as determined in consultation with the MECP, which meet provincial and federal water quality guidelines to protect the water quality of the unnamed tributary, are summarized in Table 41.

Table 41 Proposed Future Effluent Criteria

Effluent Parameter	Effluent Objectives Concentration (mg/L)	Effluent Objectives Loadings (kg/d)	Effluent Limits Concentration (mg/L)	Effluent Limits Loadings (kg/d)
cBOD ₅	5	19.5	7	27.3
Total Suspended Solids	5	19.5	10	39
Total Phosphorus	Set as based on technology ²	To be determined	0.1	0.39
Total Ammonia Nitrogen May 1 to October 31	1.0	3.90	1.2	4.68
Total Ammonia Nitrogen November 1 to April 30	2.0	7.80	2.5	9.75
pH ³	6.5 to 8.5		6.5 to 8.5	
Nitrate Nitrogen	10	39	-	-
E. coli ⁴	150 CFU/100 mL	-	200 CFU/100 mL	-
Dissolved Oxygen	>6.0	-	>5.0	-
Chlorine Residual	Absent	Absent	0.002	0.008

Notes:

1. Based on monthly average, unless otherwise noted
2. Design objective (lower than effluent concentration limit of 0.10 mg/L to be set based on the treatment technology selected and approved by the MECP).
3. Any single grab sample
4. Based on monthly geometric mean density

In addition to the effluent criteria for an expanded St. George WPCP, as shown Table 41, the MECP has indicated that treated effluent must not be acutely lethal as defined by meeting a 96 hour LC50 whole effluent toxicity using Rainbow Trout and Daphnia

magna. To meet this additional requirement, the following monitoring shall be completed:

- Effluent shall be sampled and analyzed once every three months for the first three years from the commencement of the enhanced discharge. This monitoring can be discontinued after three years if all results have passed the toxicity tests as demonstrated by a report to be submitted to the MECP, West Central Region office, for confirmation.
- Raw sewage and effluent monitoring as specified in Table 3 and Table 4 respectively in the current ECA 7620-97CPND issued on June 7, 2013 shall continue in an amended ECA to permit a discharge rate of 3,900 m³/d. The additional parameters (dissolved oxygen, nitrate-nitrogen and chlorine), as shown in Table 41 of this report, shall be added to the list in Table 4 of the amended ECA to verify compliance with the new effluent criteria.
- Receiver monitoring as specified in Table 5 of the current ECA shall continue for three years after the issuance of an amended ECA with an addition of nitrate-nitrogen to the parameter list. An upstream monitoring station shall be relocated to Burt Road. If no adverse effects are noted after three years of monitoring, receiver monitoring can be discontinued with the concurrence of MECP, West Central Region office.
- More details about monitoring and reporting shall be finalized at the approvals stage in consultation with the MECP. Appropriate consultation with the MECP Guelph District Office and West Central Region Technical Support Unit should be carried out during detailed design to finalize the details on monitoring and reporting and receive a confirmation as to the suitability of the effluent criteria.

12.2 Disturbance to Archaeological Features

Archeoworks was retained to conduct a Stage 1 Archaeological Assessment (AA) in support of the St. George Wastewater Servicing Class EA Study. The findings and recommendation of the assessment are documented in the “Stage 1 Archaeological Assessment for the St. George Water and Wastewater Servicing Municipal Class Environmental Assessments Report” (dated March 31, 2015), which can be found in Appendix G, for further reference.

The Stage 1 AA identified that a significant portion of the existing St. George WPCP site has been previously disturbed by the construction of the current facility. Paved areas, including the access driveway and the artificial embankment on which it is conveyed, as well as building footprints and its associated paved areas within the fenced areas of the facility, exhibit disturbed conditions that would have caused the removal of

archaeological potential; however, on site inspection will be required to confirm the extent and nature of the previous disturbance.

Potential construction or disturbance in areas within the existing St. George WPCP property limits that have not been subjected to ploughing in the recent past, or where ploughing is not feasible, including grassed and treed areas all located within 300 metres of the St. George Creek, will require completion of a Stage 2 test pit survey at standard five (5) metre intervals to determine the presence or absence of archaeological resources.

The St. George Creek watercourse and adjacent permanently wet areas are considered to constitute areas of low archaeological potential and must be subjected to an on-site visual survey to confirm and document their nature and extent. Only then can these areas be exempt from a Stage 2 test pit survey.

The limits of the areas within the existing St. George WPCP site that will require additional survey/investigation are clearly delineated in the Stage 1 Archaeological Assessment Report included in Appendix I.

12.3 Disturbance of Cultural Heritage Features

Unterman McPhail Associates (Unterman) was retained to conduct a Cultural Heritage Resource Assessment (CHAR) of the built heritage resources and cultural heritage landscapes in support of the St. George Wastewater Servicing Class EA Study. Unterman's findings and recommendations are documented in the "Cultural Heritage Assessment Report" (dated November 2015), which can be found in Appendix J, for further reference.

The proposed infrastructure work is expected to take place within the existing St. George WPCP site boundaries and there are no changes to the existing outfall discharge pipe. Therefore, it was concluded that there are no identified direct or indirect impacts to cultural heritage resources as a result of the proposed works.

12.4 Truck Traffic

Most of the construction activities will be limited to the existing site boundaries. Increased truck traffic will be experienced during the duration of construction from the delivery of construction equipment, construction materials and potential removal of excavated material from the site. Truck traffic is also anticipated to increase due to increased biosolids hauling requirements. The proposed mitigation measures include the following:

- Appropriate hours of work will be specified in the contract.

- Any lane closures will be completed in accordance with best practices to protect safety to the workers and to the general public.
- Residents in the area, especially the resident located to the northwest of the existing site, will be kept informed ahead of time of any road closures and anticipated timing, as well as the overall schedule of construction.
- All standard best practices for vehicle and pedestrian safety will be employed throughout the construction areas, especially throughout the access roadway that is shared with the neighbouring property to the northwest of the St. George WPCP. All construction will adhere to strict safety guidelines.

12.5 Noise and Vibration

Most of the construction activities will be localized within the existing site; however, some potential noise effects on the neighboring residential property may occur due to construction traffic and construction equipment. Where possible, new works will be constructed within the existing fence line and south and east of the existing plant to minimize impacts on neighbour to the northwest. Process upgrades will address current noise concerns identified by the neighbouring resident to the northwest of the site; however, noise during operation of the expanded treatment facility is not expected to increase. The proposed mitigation measures include the following:

- Ensuring all vehicles and construction equipment are equipped with effective muffling devices and are operated in a fashion to minimize noise in the project area.
- Throughout the construction period, the County will ensure the contractors undertake measures to reduce noise disturbances as much as possible and adhere to applicable local noise by-laws.
- Pre and Post Expansion Noise Modelling is recommended to confirm noise reduction compared to existing conditions.

12.6 Dust and Mud

Construction traffic could create additional dust and mud. There are no anticipated concerns regarding dust and mud during normal operation. The proposed mitigation measures for dust and mud include the following:

- Dust control measures such as the application of water to be implemented as required.
- The County will ensure that the contractor maintain public roadways clean and free of mud on a consistent basis.

12.7 Odours

Proposed upgrades are not anticipated to cause an increase in plant odours. New headworks facilities will be designed with improved odour control measures. Pre and Post Expansion Odour Modelling is recommended to confirm odour reduction compared to existing conditions.

12.8 Visual/Architectural

The proposed expanded building(s) will be designed to complement the architectural style of the existing buildings and use same/similar features for the expansion. The materials to be used will complement the facades of the existing buildings. Landscaping of the expanded site will be implemented, as necessary, to reduce potential for visual disturbances.

12.9 Grading and Landscaping

Expansion of the St. George WPCP would likely require expansion of the plant to the area south of the existing ring road, which would impact the flood plain. Construction in the flood plain will require flood proofing similar to that used in the existing plant, such as re-grading the land adjacent to the plant entrance road.

The site will be landscaped following construction of the expanded facilities. A landscape plan detailing proposed tree plantings may be provided as part of the final Contract Drawings, if required. The plant materials will favour native species specifically selected for aesthetics, low maintenance, resistance to insects and disease, tolerance of urban conditions, and longevity. The landscape plans would include adequate vegetated buffer areas with berms, where appropriate, and trees to block visibility to the site as much as possible from the neighbouring residential properties, especially the private property located to the northwest of the site. Tree removal will be minimized as much as practically possible. Tree replacement measures will be implemented as required.

12.10 Fuel Spills

Fuel spills may potentially occur when refuelling construction equipment. The proposed mitigation measures include the following:

- Proper construction techniques will be applied to reduce the risk of spills.
- A contingency plan for cleaning up fuel spills will be developed and ready for implementation.

- Equipment required to clean up a spill will be contractually required to be on-site at all times.

12.11 Geotechnical Considerations

Construction activities will include topsoil stripping; excavations for the new headworks, aerobic digesters, and secondary treatment tank; and stockpiling of select native materials on-site for backfilling and grading. Any surplus material generated from grading operations that is not required for filling or fine grading will be removed and disposed off-site. It is possible that additional fill will be required to be imported to site for flood proofing, subject to the recommendations in the geotechnical investigation report.

A detailed geotechnical investigation will be carried during the design phase to assist in the design and construction of the preferred alternative design concept.

12.12 Public Consultation

Schedule C of the Class Environmental Assessment planning process requires that members of the public, interest groups and review agencies are given opportunities to provide input and comments from the early stages of the Class EA Study. The project team met this requirement by providing a Notification of Study Commencement and public notices for three separate public meetings. The public notices were placed for two consecutive publications in local newspapers.

Information regarding the progress of the St. George Water Servicing Class EA Study was provided at each public meeting. Public feedback was incorporated as part of the evaluation process and considered during the selection and confirmation of the recommended water servicing design concept.

A Notice of Study Completion will be published in the local newspapers and distributed to all in the project contact list. The Notice of Study Completion will include enough information to advise the public and review agencies of the locations where the Environmental Study Report will be filed for public review, the time period to provide comments, and the opportunities to raise any major concerns to the Ontario Minister of the Environment, Conservation and Parks, and the Director of Environmental Assessment and Permissions Branch, if such concerns cannot be resolved with the County during the review period.

The County will continue to inform the public during the project design and construction phases. Project updates will be issued, as necessary, and notices will include a dedicated contact person from the County to respond to issues or concerns that may arise.

13 Class EA Phase 4 – Class EA Report Conclusions and Recommendations

Through completion of a Municipal Class EA Study, the following wastewater servicing concepts have been identified as the preferred recommended alternatives to service the projected growth and long-term servicing needs of the St. George community:

- Wastewater Treatment: Expand the existing St. George WPCP to 3,900 m³/d with existing outfall location
- Biosolids Management: Expand aerobic digestion at St. George WPCP and Dewater at Paris WPCP

Capital cost estimates for the preferred recommended alternatives are \$31.6M and \$3.0M for wastewater treatment and biosolids management, respectively. Multiple technology solutions that can achieve the anticipated effluent limits are available. The specific process configuration, consistent with the effluent requirements and site constraints was beyond the scope of this Class EA process. Therefore, the wastewater treatment alternative design concept cost estimates are high-level estimates based on typical wastewater treatment plants.

Individual assessments of the natural, socio-cultural, archaeological and geotechnical conditions were conducted to inventory and evaluate the existing conditions of the study area.

Public and agency input was sought at key stages of the Class EA process to provide the public with opportunities to comment on the project. Through the consultation process, a number of public concerns were raised by a member of the general public who lives in close proximity to the St. George WPCP and who would most likely be the most affected through construction of the proposed works. Concerns related to truck traffic, existing odours and proposed areas for expansion to reduce visual impacts were identified. No other public concerns or issues were raised in association with the preferred wastewater servicing solution.

Pre-consultation with the MECP was conducted throughout the Class EA study, mainly in association with the scope and findings of the Assimilative Capacity Study completed for the St. George WPCP. Effluent limits for the proposed expanded St. George WPCP have been established and will be considered the basis for the selection of the preferred treatment technology, to be part of the detailed design phase of the project.

Potential impacts associated with the implementation of the recommended alternative solution were identified as well as available mitigation measures. Construction of the St.

George WPCP expansion will require flood proofing if constructing south of the ring road.

Due to the nature of this project, some inevitable effects in terms of dust, noise, and truck traffic will be felt around the construction areas. However, potential social effects can be further reduced by implementation of mitigation measures outlined in this report. Therefore, no significant environmental, socio-cultural, geotechnical, archaeological or heritage resource impacts are anticipated as a result of this project.

It is recommended that the County proceed with the detailed design and construction of the preferred alternative for wastewater treatment and biosolids management, as outlined in this ESR, subject to receiving the necessary approvals. This ESR is being filed for a 30-day public review period. Given that no major objections or Part II Orders are received during the review period, the proposed works will proceed as planned.

14 References

- Archeoworks, “Stage 1 Archeological Assessment for the: St. George Water and Wastewater Servicing Municipal Class Environmental Assessments”, March 31, 2015
- Archeoworks Inc. (2015). Stage 1 Archaeological Assessment for the: St. George Water and Wastewater Servicing Municipal Class Environmental Assessments Within Lots 6-12, Concession 1; Lots 5-13, Concession 2 Lots 5-13, Concession 3; and Lots 6-13, Concession 4 Geographic Township of South Dumfries Historic County of Brant Now in the County of Brant Ontario.
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- Paris Landfill Site ECA 7755-4MKJC3
- Paris Water Pollution Control Plant ECA 4668-5NCHWF
- Paris WPCP Annual Reports – 2011, 2012, 2013
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