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APPENDICIES

1. INTRODUCTION

A Municipal Class Environmental Assessment (Class EA) was undertaken to determine the preferred servicing alternative upgrades to the York Trunk Sanitary Sewer and the proposed Paisley-Clythe Feedermain in the City of Guelph. This Project File Report presents an overview of the Study and summarizes the key findings. The report documents activities conducted to fulfill the requirements for a Schedule "B" Municipal Class EA, and includes a discussion of both the alternatives considered and the evaluation process used to identify the preferred alternatives for the sewer and forcemain. Feedback arising from public consultation conducted has also been included, with an analysis of the associated implications and potential strategies to address the concerns identified.

1.1 PURPOSE AND STUDY BACKGROUND

In 2009, the City of Guelph completed a Water and Wastewater Servicing Master Plan to identify a preferred water distribution and wastewater conveyance strategy to satisfy existing and future water and wastewater servicing needs. Among the list of recommended projects in the Water and Wastewater Servicing Master Plan, the York Trunk Sanitary Sewer and the Paisley-Clythe Feedermain were identified as projects that should be set for implementation within the 2011-2016 timeframe. In addition to these projects, the Water and Wastewater Servicing Master Plan also recommended undertaking an evaluation of the feasibility for constructing a treated sanitary effluent reuse distribution system ('purple pipe') and for implementing technology to capture energy from the City's sanitary sewer system.

A Schedule B Class EA was conducted in accordance with the Municipal Class Environmental Assessment planning process to determine the preferred servicing alternative for the York Trunk Sanitary Sewer and Paisley-Clythe Feedermain. This report documents all the steps taken in the planning process including the selection of alternatives for the projects, their subsequent evaluation, and identification of the preferred alternatives. The evaluation of the purple pipe and energy capture are presented under a separate cover.

1.2 STUDY OBJECTIVES AND SCOPE OF WORK

This Class EA Study had six key objectives:

1. Establish the servicing requirements of the York Trunk Sanitary Sewer

To investigate capacity deficiencies in the York Trunk Sanitary Sewer and to evaluate expansion and upgrade alternatives to optimize the available capacity that exists in the sewer with respect to both current and future flows.

2. Confirm the Capacity of the Existing Sanitary Sewer

There are existing sanitary sewer sections within the Study Area that may be used as part of the upgraded York Trunk Sanitary Sewer system. These sanitary sewer sections have been evaluated to confirm if they are adequate in capacity to convey future flows. Upgrades and solutions to capacity constraints have been identified.

3. Identify Trunk Sanitary Sewer Servicing Alternatives

The development of several feasible trunk sanitary sewer servicing alternatives is critical to ensuring a thorough evaluation prior to the recommendation of a preferred solution. Each alignment alternative will also result in assessing the need for twinning sections of the existing sewer versus the need for new sewer sections. Each alignment alternative is to commence near Watson Road and follow along the Eramosa River to the City's Wastewater Treatment Plant (WWTP), located west of the Hanlon Expressway.

4. Establish the Servicing Requirements of the Paisley-Clythe Feedermain

To investigate capacity requirements for the Paisley-Clythe Feedermain, a security of supply line for east-west water distribution in the City of Guelph.

5. Identify Feedermain Servicing Alternatives

The development of several feasible feedermain servicing alternatives is critical in ensuring a thorough evaluation prior to the recommendation of a preferred solution. Each alignment alternative commences at the F.M. Woods Pumping Station and extend both westward to the Paisley Reservoir and Booster Station and eastward to the Clythe Reservoir and Booster Station.

6. Evaluate the Impacts of each Trunk Sanitary Sewer and Feedermain Alternative and Select the Preferred Alternatives

Each of the trunk sanitary sewer and feedermain alignment alternatives identified will have associated environmental, social, economic and cultural impacts. Prior to evaluation, the impacts associated with each individual alternative must be identified. Technical feasibility and potential constructability issues have been confirmed in this Study by conducting the appropriate investigations. Public Information Centres and meetings with selected agencies were held to obtain essential stakeholder input. The impacts associated with each alternative were assessed and evaluated to determine which solution had the least overall impact. After conducting a thorough evaluation of each alternative, the preferred alignments have been presented to the public and, ultimately, recommended to the City for implementation.

1.3 STUDY TEAM

This Class EA Study was performed by GENIVAR in conjunction with the City of Guelph. Meetings were held with City departments and committees throughout the process to provide technical and operation feedback and to ensure all City requirements were incorporated into the study.

Key City staff includes:

- Colin Baker, P.Eng., Environmental Engineer
- Don Kudo, P.Eng., Manager of Design & Construction and Infrastructure Planning
- Majde Qaqish, P.Eng., Project Engineer

Key GENIVAR staff that are participating in the study include:

- James Witherspoon, P.Eng., LEED AP, Project Manager
- Michelle Albert, P.Eng., Environmental & Consultation Specialties Lead
- Andrew Tulk, P.Eng., Project Engineer
- Dan Reeves, M.Sc., Project Biologist
- Derek Brunner, P.Geo., Hydrogeologist

Technical expertise related to the study was also provided by Archaeological Research Associates Limited to conduct the Stage 1 Archaeological Assessment.

The sections below provide an overview of some of the key studies that have been completed or are underway that relate directly to the scope of this Study.

1.4 CITY OF GUELPH WATER AND WASTEWATER SERVICING MASTER PLAN, 2009

The City of Guelph's 2009 Master Plan study identified a preferred water distribution and wastewater conveyance strategy to support existing residents and future growth in the City. The Water and Wastewater Servicing Master Plan was prepared in accordance with the master planning guidelines defined in the Municipal Class Environmental Assessment document.

The focus of the Study was to determine the best way to optimize each system to better serve existing users and to expand the system to service future growth. Another focus of the work was to gain a better understanding of the City's water distribution and sewage collection network for the purpose of

providing recommendations to enhance the reliability, operational efficiency, and capacity of each system.

1.5 RELEVANT LEGISLATION AND REGULATIONS

Legislation and Regulations guiding planning and development in the Study Area were reviewed during Phase 1 of this Study for pertinent information related to this EA. They are described in brief in the following subsections:

1.5.1 The Planning Act, 1990

The Planning Act establishes the mechanisms and rules for land use planning in Ontario, outlining how land uses may be controlled, and who may control them. The Act sets the basis for the preparation of official plans and planning policies for future development, and it provides municipalities with local autonomy to make decisions and streamline the planning process. The Act empowers local citizens to provide their input to their municipal council and, where permitted, to appeal decisions to the Ontario Municipal Board.

Through the Act, the Province issues Provincial Policy Statements and plans (e.g. Growth Plan for the Greater Golden Horseshoe, 2006).

1.5.2 Ontario Planning and Development Act, 1994

The *Ontario Planning and Development Act, 1994* establishes the general approach by which the Minister of Municipal Affairs and Housing may cause for Development Plans to be undertaken for development planning areas. The Development Plans may include policies for economic, social and physical development with relation to the distribution and density of population within the development area, the location of employment areas, the identification of land use areas, the management of land and water resources, the control of all forms of pollution of the natural environment, the location and development of servicing, communication and transportation systems and the development and maintenance of educational, cultural, recreational, health and other social facilities. There also may be policies relating to the financing and programming of public development projects and capital works, and policies to co-ordinate planning and development among municipalities or planning boards within an area or within separate areas, among other considerations.

1.5.3 Places to Grow Act, 2005

The *Places to Grow Act 2005*, provides a framework for the Provincial government to coordinate planning and decision-making for long-term growth and infrastructure renewal in Ontario. It gives the Province the authority to designate geographical growth areas, and to develop growth plans in collaboration with local officials and stakeholders to meet specific needs across the Province. Growth plans developed under the *Places to Grow Act* integrate and build upon other initiatives such as the Greenbelt Plan, the Niagara Escarpment Plan, the Provincial Policy Statement, the *Planning Act*, municipal infrastructure planning, and source water protection planning. Growth plans may include population projections and allocations, policies, goals and criteria relating to issues such as intensification and density, land supply, expansions and amendments to urban boundaries, location of industry and commerce, protection of sensitive and significant lands (including agricultural lands and water resources), infrastructure development, affordable housing and community design.

Municipalities are required to bring their official plans into conformity with the growth plan for their area. Decisions made under the *Planning Act* and *Condominium Act* are also required to conform to applicable growth plans.

1.6 POLICIES

Provincial and local policies germane to the Study Area were reviewed during Phase 1 of this Study. They are briefly described in the following subsections:

1.6.1 Provincial Policy Statement

The Provincial Policy Statement *(*PPS) is a key component of Ontario's planning system as it sets policy direction on matters of provincial interest related to land use planning, growth management, environmental protection, and public health and safety. It aims to provide a stronger policy framework that guides communities in Ontario toward a higher quality of life and a better long-term future.

The PPS establishes the City of Guelph's role in planning for growth, intensification and redevelopment. The PPS identifies that development within designated areas must proceed based on the extension of municipal water supply and wastewater collection systems. New settlement area policies will only permit expansions where it is demonstrated that opportunities for growth are not available through intensification, redevelopment or in previously designated areas. The PPS also requires municipalities to co-ordinate and provide direction on policies with cross municipal boundaries, such as natural heritage systems and resource management. It also provides the context for the City's participation in the Growth Plan for the Greater Golden Horseshoe.

1.6.2 Growth Plan for the Greater Golden Horseshoe

The *Growth Plan for the Greater Golden Horseshoe* was prepared and approved under the *Places to Grow Act, 2005*. The *Growth Plan for the Greater Golden Horseshoe* contains a framework for implementing the Government of Ontario's vision for building stronger, prosperous communities by better managing growth to 2031. The Plan has been built upon other government initiatives including: the Planning Act reform and the Provincial Policy Statement, 2005. Though the Plan is not meant to replace municipal official plans, it works within the existing planning framework to provide growth management policy direction for the Greater Golden Horseshoe.

Specifically, the Plan establishes growth forecasts, intensification policies and targets, and development density targets for urban and Greenfield areas. It also provides guidance on issues such as transportation, infrastructure planning, land-use planning, urban form, housing, natural heritage and resource protection with the goal of promoting economic prosperity to areas within the Greater Golden Horseshoe.

1.6.3 City of Guelph Official Plan

The City of Guelph Official Plan is a statement of goals, objectives and policies intended to guide future land use activity and change that has been prepared and enacted in accordance with the provisions of the Planning Act. The policies of the Plan are intended to promote long-term community sustainability by promoting concepts and actions that are intended to achieve a sustainable social climate, economic vitality and environmental protection. It is intended to serve as a primary policy plan that sets City-wide policies. This being said, the Plan is meant to be interpreted as a statement of the City's aspirations as opposed to a regulatory document.

Of particular relevance to this project, the City of Guelph Official Plan Amendment No. 39 (Nov 2009) contains information pertaining to the City's population projections, land use designations and development policies. According to the Official Plan, the projected population target for Guelph City is 175,000 by the year 2031. Additionally, the City's Official Plan Amendment No. 42 (Jul 2010) prescribed planning policies and mapping related to the Core and Non-Core Greenlands for a Natural Heritage System that is consistent with both the Provincial Policy Statement and conforms with the Growth Plan for the Greater Golden Horseshoe.

1.7 OTHER RELATED DOCUMENTS AND PROJECTS

Several related studies were completed prior to the commencement of this Class EA Study. During Phase 1 of this Study, each of these studies was reviewed for pertinent information related to this project. A summary of each study is presented in the following subsections.

1.7.1 The Local Growth Management Strategy, 2009

The City of Guelph developed the Local Growth Management Strategy (LGMS) to identify the extent of population growth that would occur within the City of Guelph. Through the study, residential and

employment growth projections were established up to the year 2031. The work for the LGMS was completed in concurrence with the 2009 Water and Wastewater Servicing Master Plan, which utilized the population projections from this study to develop infrastructure construction timing recommendations.

Also identified in the LGMS was how population growth will occur, that is, either in Greenfield areas or as infill and intensification growth. Specifically the study revealed that while future population growth will occur within the Greenfield area, by 2015, the overall share of infill and intensification residential growth will gradually increase to 40 percent of new residential development. This finding is relevant to the current Class EA since infill and intensification projects within the City's built boundary will add additional strain to the City's infrastructure, including the York Trunk Sanitary Sewer.

1.7.2 Southwest Quadrant Water Supply Class Environmental Assessment, Ongoing

The Southwest Quadrant Class EA was spurred by recommendations made in the City of Guelph's 2006 Water Supply Master Plan. The Plan recognized water conservation as a top priority and thereby recommended that further study was needed in the 2006-2010 timeframe to determine the feasibility of optimizing groundwater use within the City. The Southwest Quadrant Class EA is underway to identify optimal ways of using existing groundwater by investigating how to increase the capacity of existing wells and installing a new well within the area.

1.7.3 Servicing Infrastructure Review Study: Guelph Correctional Centre and Surrounding Provincial Lands Properties, 1998

MTE Consultants Inc. was retained to complete a Servicing Infrastructure Review Study report for the Guelph Correctional Centre (GCC) and Surrounding Provincial Lands located within the City of Guelph. These lands are also known as the Guelph Innovation District. The study was prepared for the Ontario Realty Corporation (ORC – now Infrastructure Ontario) who was responsible for reviewing the development options for the subject lands as the GCC and the Wellington Detention Centre (WDC) were closed in 2000.

The Study provided basic recommendations for servicing to the Guelph Innovation District lands, which is roughly bounded by York Road, Victoria Road South, Stone Road and Watson Road South, in the City of Guelph. The lands were segmented into three (3) major areas and land use designations were assigned to each area, thereby determining what kind of development would take place on the land. The recommendations of the Study were to include areas for low density residential housing, light industrial and research uses, and industrial uses. Based on these lands designations, recommendations were also made with regards to the current water and wastewater infrastructure that could be used to service the Innovation District, as well as the future infrastructure that will be required to develop the area as planned.

1.7.4 City of Guelph Downtown Secondary Plan, Ongoing

The Downtown Secondary Plan will provide more specificity about how development and growth should occur in the downtown core than is currently provided in the City's Official Plan. The Plan will formulate the vision and guiding principles for future development in the City's downtown core by providing land use designations and policies that address permitted uses, density, infrastructure requirements, and directions for implementing intensification.

The Plan's goal is to ensure downtown Guelph grows and evolves in a meaningful and relevant way with a focus on developing civic, business and cultural life for all of Guelph's citizens. Some of the recommendations put forth by the plan may include planning for more housing developments, parks and recreational facilities, cultural amenities, high value employment and greater retail diversity.

1.7.5 Guelph innovation District Secondary Plan Update, July 2011

The Guelph Innovation District (GID) is a proposed development bounded by York Road, Stone Road, Watson Road, and Victoria Road. The purpose of the development is to meet the residential and

employment goals of the City of Guelph as per the *Places to Grow Act*. The design goals of the GID are to be a new kind of employment area in the City, which will:

- Strive to be carbon neutral;
- Compact, mixed use community at transit supportive densities;
- Support a wide range of industry including an agri-innovation cluster;
- Preserve Natural Heritage Systems; and,
- Showcase sustainable, green and innovative development.

Initiated in 2005, the *Secondary Plan* for the GID will identify the Land Use Plan developed by the City of Guelph in partnership with the Provincial Government and address environmental social, cultural and economic sustainability issues associated with the development. The Secondary Plan for the Guelph Innovation District is scheduled to be finalized in 2012.

1.7.6 City of Guelph Development Priorities Plan, 2010

The Development Priorities Plan (DPP) is prepared annually by the City of Guelph Community Design and Development Services department, with the assistance of the Finance department. The Plan is intended to manage the rate and timing of development in the City so that it can be used as a guiding document for City Council to establish priorities for the planning and development of future growth areas. The DPP also provides information to the development industry, individual landowners and the general public about the priorities for current and future residential and industrial development.

The objectives of the Plan include: monitoring the rate and timing of development in the City to ensure compliance with the Places to Grow densities and Council endorsed population projections and to ensure planning for an adequate supply of housing units that is consistent with the goals of the Official Plan, providing a tool to assist with integrating the financial planning of growth related capital costs with land use planning, outlining how growth will proceed over the long term in conjunction with the long term fiscal growth model, and providing growth and staging information to assist the development industry and agencies involved in development.

1.7.7 Inflow/Infiltration and York Trunk Sanitary Sewer Assessment, 2002

In 1998, the City initiated a system wide sanitary sewer flow monitoring study to assess the general condition of the sewer system and to determine the quantity of inflow and infiltration being generated. Through this study, the City was able to identify the key areas within which excessive levels of inflow and infiltration (I/I) are being generated.

The 2002 Inflow/Infiltration and York Trunk Sanitary Sewer Assessment was a study that expanded on the results of the 1998 I/I study. The purpose of the study was to determine the sources of I/I in the key areas previously identified as being most problematic in terms of the volume of I/I being generated. The study involved flow monitoring at fourteen stations, several of which were located along the York Trunk Sanitary Sewer, to evaluate the capacity of that system.

The study concluded that the York Trunk Sanitary Sewer surcharges in both dry and wet weather conditions, and that under severe wet weather periods, severe surcharging and basement flooding is possible. The recommendations from this study was that no additional connections be made to the trunk sewer until sources of I/I can be identified and remedial actions are taken to eliminate these I/I sources. Based on these recommendations, the City began investigations to identify I/I sources within the system.

1.7.8 Wastewater Collection System Inflow and Infiltration Study, 2011

XCG Consultants Limited were contracted in 2011 to complete a detailed flow monitoring program and risk assessment to evaluate Inflow and infiltration (I/I) with the City of Guelph's wastewater system, as recommended by the 2008 Water and Wastewater Servicing Master Plan, to help provide wastewater servicing to the year 2031. XCG preformed detailed flow monitoring and analysis for the entire City

wastewater system using rainfall data and dry and wet weather flow results to determine high, medium and low priority I/I repair locations.

The study area was considered to be an area of low priority, and included limited repairs, none of which are located directly on the York Trunk Sewer.

This report recommended, however, that the I/I repairs be completed in conjunction with future wastewater distribution system upgrades.

1.7.9 Rockwood Wastewater Treatment Capacity 2010 Update, Township of Guelph/Eramosa 2010

The Rockwood Wastewater Treatment Capacity 2010 Update evaluated the current and projected wastewater usage of the serviced Rockwood population. The Township of Eramosa has an agreement with the City of Guelph such that up to 1,200 m^3 per day of the wastewater from the Rockwood community will be treated at the City of Guelph WWTP. This report evaluates the required wastewater treatment volume compared to the capacity of the agreement between the City of Guelph and the Township of Eramosa.

The report presented monthly wastewater flows for Rockwood from 2006 to 2010 as well as population estimates for 2006 to 2010. The projected wastewater flows were determined based on the average daily flow rate at the time and the completion of approved wastewater allocations for subdivisions in various stages of development. Once these developments are completed the Rockwood wastewater flow will exceed the capacity of the agreement. The future growth of Rockwood would require an additional capacity of 450 m^3. Recommendations of this report were to decrease the infiltration into the system to increase capacity, and for the Township of Eramosa to request an increase in the agreement capacity by 450 m^3 from the City of Guelph.

1.7.10 MTO: Guelph-Wellington Transportation Study

The Guelph-Wellington Transportation study summarized future road improvements previously identified within the city of Guelph. The areas outlined to require road improvements include the Hanlon Expressway, Hwy 7 North to Kitchener, Hwy 6 Northerly expansion, Gordon/Wellington Street West 46 widening, Stone Road expansion between Gordon Street and Victoria Street, Watson Road widening, Clair Road widening and Victoria Road widening. Required road improvements were determined based on traffic capacity deficiencies of various areas of Guelph. The study also summarized the status of the Municipal Class Environmental Assessment for each of the identified road improvements projects.

1.7.11 Royal City Park Plant Material Management Plan, 2009

Silv-Econ Ltd. was retained to complete the Royal City Park Plant Material Management Plan. The development of the plan included a study, draft recommendations, public review and final recommendations.

The purpose of the study was to examine the historical culture of the park, the current condition of trees and surrounding vegetation and public usage of the park. The data gathered from the study was used to create a draft management plan for public review. The draft plan that was developed addressed tree maintenance, turf maintenance, removal of invasive species and other aesthetic considerations. From the draft plan, two potential 20-year management plans were presented, one of which was a more traditional cost effective plan and the second of which was a more proactive plan. The second option was chosen and the final recommended plan was developed based on public review. This final plan outlined the practices that should be applied in the next 20 years in order to maintain a healthy and diverse native tree population in the park which will contribute to public enjoyment, public safety, aesthetics and environmental benefits while maintaining the park's cultural heritage.

1.7.12 City of Guelph Brownfield Redevelopment Community Improvement Plan, Community Design and Development Services

In 2004, the City of Guelph published this document to detail the Community Improvement Plan (CIP) and key financial incentives used to facilitate the redevelopment of brownfield sites within the designated *Community Improvement Project Area* of the City of Guelph. The purpose of the CIP and financial incentives was to establish where the City envisioned cleanup and redevelopment locations and to also offset the cost associated with the site assessment and remediation of brownfield sites. Brownfield cleanup and redevelopment is already supported by several provincial legislations including the *Planning Act*, the *Municipal Act*, the *Environmental Protection Act* and the *Education Act*.

The CIP identified the *Community Improvement Project Area* as the area that is roughly bounded by Victoria Road, Collage Avenue, Hanlon Expressway and Speedvale Avenue, this project area encompasses the older section of the City including the Study Area. This document identifies the types and locations of potential Brownfield within the City of Guelph. Specifically to this report, the following types of brownfields were identified within the study area:

- Manufacturing / Chemical Plant;
- Auto Wrecking Yard/ Scrap Metal Yard/ Foundries;
- Coal /Oil/ Fuel/ Salt Storage;
- Landfill sites; and,
- Auto Service/ Gas Stations.

1.7.13 Envision Guelph: Official Plan Amendment No. 12: Natural Heritage System Amendment, 2010

In 2004, Dougan and Associates was retained by the City of Guelph to undertake the development of a Natural Heritage Strategy. The purpose of the Natural Heritage Strategy was to review and identify the locally significant natural areas and update and collect ecological field data in order to develop a draft Natural Heritage System for the City of Guelph.

The City of Guelph Official Plan Amendment No. 42, 2010 was developed from recommendations put forward as part of the Natural Heritage Strategy. The purpose of the Amendment was to replace current Core and Non-Core Greenlands System Policies and Mappings in order to establish a Natural Heritage System that is consistent with the 2005 Provincial Policy Statement and the Growth Plan for the Greater Golden Horseshoe while regarding matters of provincial interest.

York Trunk Sewer and Paisley-Clythe Feedermain Municipal Class Environmental Assessment

GENIVAR Project No. 10405017

January 18, 2012

Project File Report




1-367 Woodlawn Rd. W., Guelph, Ontario N1H 7K9
Telephone: 519.827.1453 • Fax: 519.827.1483 • www.genivar.com
Contact: James Witherspoon, P.Eng., LEED AP, Director - Municipal Infrastructure • E-mail: Jamie.Witherspoon@genivar.com

GENIVAR

Project No.:10405017

January 18, 2012

Mr. Colin Baker
City of Guelph
City Hall, 1 Carden Street
Guelph, ON N1H 3A1

Re: Project File Report
Schedule 'B' Municipal Class Environmental Assessment Study for the
York Trunk Sewer & Paisley-Clythe Feedermain

Dear Mr. Baker:

GENIVAR is pleased to present the Project File Report for the York Trunk Sanitary Sewer and Paisley-Clythe Feedermain Schedule 'B' Municipal Class Environmental Assessment (EA).

This report provides an overview of the entire Study, including the details of tasks completed for both Phase 1 and Phase 2 of the Municipal Class EA process. The preferred alignment for the York Trunk Sanitary Sewer and the preferred alignment for the Paisley-Clythe Feedermain is presented in the report. Public, agency, and First Nations correspondences, as well as the Preliminary Design of the York Trunk Sanitary Sewer and the Paisley-Clythe Feedermain are presented in the appendices of the report.

The Project File Report will be available for a 30 day public review and comment period from February 9th, 2012 to March 12th, 2012, after which, if there are no Part II Order requests, the York Trunk Sanitary Sewer and Paisley-Clythe Feedermain project will be considered approved and may proceed as presented in the Project File Report.

Yours truly,
GENIVAR Inc.

Jamie Witherspoon, P.Eng., LEED AP
Project Manager

367 Woodlawn Road West, Suite 1, Guelph, Ontario N1H 7K9
Telephone: 519.827.1453 • Fax: 519.827.1483 • www.genivar.com

EXECUTIVE SUMMARY

ES-1 Background and Justification

In 2009, the City of Guelph completed a Water and Wastewater Servicing Master Plan to identify a preferred water distribution and wastewater conveyance strategy to satisfy existing and future water and wastewater servicing needs. Among the list of recommended projects in the Water and Wastewater Servicing Master Plan, the York Trunk Sanitary Sewer and the Paisley-Clythe Feedermain were identified as projects that should be set for implementation within the 2011-2016 timeframe.

A Schedule B Class Environmental Assessment has been conducted in accordance with the Municipal Class Environmental Assessment planning process to determine the preferred servicing alternative for the York Trunk Sanitary Sewer and Paisley-Clythe Feedermain. This report documents all the steps taken in the planning process including the selection of alternatives for the projects and their subsequent evaluation. The Study involved the:

- Identification of trunk sewer servicing alternatives
- Identification of feedermain servicing alternatives
- Evaluation of the impacts for each alternative and selection of the preferred alternative
- Identification of monitoring and mitigation plans, where necessary, for the construction and post-construction phases of the project.

This Class EA Study had six key objectives:

1. Establish the servicing requirements of the York Trunk Sanitary Sewer

To investigate capacity deficiencies in the York Trunk Sanitary Sewer and to evaluate expansion and upgrade alternatives to optimize the available capacity that exists in the sewer with respect to both current and future flows.

2. Confirm the Capacity of the Existing Sanitary Sewer

There are existing sanitary sewer sections within the Study Area that may be used as part of the upgraded York Trunk Sanitary Sewer system. These sanitary sewer sections have been evaluated to confirm if they are adequate in capacity to convey future flows. Upgrades and solutions to capacity constraints have been identified.

3. Identify Trunk Sanitary Sewer Servicing Alternatives

The development of several feasible trunk sanitary sewer servicing alternatives is critical to ensuring a thorough evaluation prior to the recommendation of a preferred solution. Each alignment alternative will also result in assessing the need for twinning sections of the existing sewer versus the need for new sewer sections. Each alignment alternative is to commence near Watson Road and follow along the Eramosa River to the City's Wastewater Treatment Plant (WWTP), located west of the Hanlon Expressway.

4. Establish the Servicing Requirements of the Paisley-Clythe Feedermain

To investigate capacity requirements for the Paisley-Clythe Feedermain, a security of supply line for east-west water distribution in the City of Guelph.

5. Identify Feedermain Servicing Alternatives

The development of several feasible feedermain servicing alternatives is critical in ensuring a thorough evaluation prior to the recommendation of a preferred solution. Each alignment alternative commences at the F.M. Woods Pumping Station and extend both westward to the Paisley Reservoir and Booster Station and eastward to the Clythe Reservoir and Booster Station.

6. Evaluate the Impacts of each Trunk Sanitary Sewer and Feedermain Alternative and Select the Preferred Alternatives

Each of the trunk sanitary sewer and feedermain alignment alternatives identified will have associated environmental, social, economic and cultural impacts. Prior to evaluation, the impacts associated with each individual alternative must be identified. Technical feasibility and potential constructability issues have been confirmed in this Study by conducting the appropriate investigations. Public Information Centres and meetings with selected agencies were held to obtain essential stakeholder input. The impacts associated with each alternative were assessed and evaluated to determine which solution had the least overall impact. After conducting a thorough evaluation of each alternative, the preferred alignments have been presented to the public and, ultimately, recommended to the City for implementation.

Definition of Problem/Opportunity

This Class EA is the result of the City undertaking an infrastructure study to plan for a capacity upgrade of the existing York Trunk Sanitary Sewer and to plan for the new Paisley-Clythe Feedermain. The following sections outline the definitions of the problem and opportunity statements for both infrastructure projects considered in this Class EA.

The York Trunk Sanitary Sewer

The existing York Trunk Sanitary Sewer services existing development in the City of Guelph, but it lacks capacity for servicing future population and employment growth. In order to service the infill/intensification development planned for within the City and new development in the Guelph Innovation District, the York Trunk Sanitary Sewer will require upgrades. Therefore, the Problem/Opportunity Statement for the York Trunk Sanitary Sewer has been defined as follows:

What is the preferred method to optimize available capacity for the wastewater servicing of existing and future developments in Guelph while minimizing impacts on the natural, cultural, and social features in the Study Area?

The Paisley-Clythe Feedermain

As prescribed in the City's Water and Wastewater Servicing Master Plan, a new east-west watermain is required through the core of the City, to serve as a security of supply transmission main for the Zone 1 water supply system. Therefore, the Problem/Opportunity Statement for the Paisley-Clythe Feedermain has been defined as follows:

What is the preferred method to provide a security of supply to Zone 2 water distribution, while supporting supply within Zone 1, and to service existing and future developments in Guelph while minimizing impacts on the natural, cultural, and social features in the Study Area?

Project Need and Justification

York Trunk Sanitary Sewer

The primary justification for this infrastructure is for the capacity to service future growth planned for, in the City of Guelph, which is in accordance with the City's Official Plan. A new or upgraded trunk sanitary sewer is required to convey sanitary sewage flows from existing and new developments to the City's WWTP. The York Trunk Sanitary Sewer was identified as an infrastructure requirement during the undertaking of the City's Water and Wastewater Servicing Master Plan. Based on previous investigations led by the City, and confirmed by GENIVAR, many of the existing sections of the York Trunk Sanitary Sewer were found to be at, or approaching, maximum capacity service in its existing servicing area. Therefore, any additive capacity is not currently available within the existing system without the risk of surcharging the system.

Paisley-Clythe Feedermain

The primary justification for this infrastructure is for it to serve as a security of supply main for east-west water transmission through the City's core. A watermain is required to ensure that residents and businesses are adequately serviced in the event of a fire or feedermain break. Since there may be areas of common alignment between the water feedermain and the York Trunk Sanitary Sewer, its implementation is planned to take place concurrently with the implementation of the York Trunk Sanitary Sewer to potentially minimize the overall impacts to the natural, cultural and social environment.

ES-2 Public and Agency Consultation

Public and government review agency consultation is a requirement under the Municipal Class EA process. To meet the Class EA consultation requirements for this Schedule 'B' project, the City of Guelph ensured that the public and review agencies were informed of the Study and given the opportunity to provide input (both written and verbal) on the assessment and evaluation process for the Trunk Sanitary Sewer and Feedermain alignments. The consultation approach for this Study included communication with the public and stakeholders in the form of newspaper advertisements, meetings, direct correspondence and Public Information Centres.

ES-3 Sewer Alternatives and Alignments

One major consideration, with respect to the provision of a new trunk sewer alignment, is the feasibility of connecting it to the existing sanitary collection system. For instance, the existing sewer is very flat, with minimal fall from start to end. Any connection into the existing sewer system will be constrained by the existing inverts of the system. Due to this, significant deviation from the existing alignment is not generally feasible.

Alternative solutions and alignments were identified in the early stages of the Class EA process following a detailed review of the Study Area extending from Victoria Road along the Eramosa and Speed Rivers to the WWTP located on Wellington Street West. Routes that would be suitable for construction of the project were determined by applying set screening criteria established at the early stage of the Study. The possible routing alternatives included existing City rights-of-way, open spaces and utility corridors.

The alternatives that were evaluated are summarized below:

Do Nothing

With this option, there are no impacts to natural features resulting from construction activities, however, there is a potential impact to the natural environment in the event of a sewer surcharge or structural failure. Specifically, potential impacts within the floodplain are possible with adverse impacts to fish and aquatic habitats in the Eramosa and Speed Rivers where the existing York Trunk Sewer is located within the river or along the shoreline. The Speed River is considered a cool water fishery and various species-at-risk have been identified as being potentially present in this area.

Another consideration with this option is the potential impairment of groundwater due to exfiltration from the existing sewer pipe. The sewer is located within the two-year wellhead protection area (WHPA-B), and sections of the sewer are known to be in poor condition, though the extent of deterioration is unknown due to lack of access and the level of sewage in the pipe preventing inspection.

Ultimately, this option does not address the main concern with the York Trunk Sewer, which is lack of capacity, both in the present and in the future. This will not allow for growth in the service area, which is contrary to the City's Official Plan. In addition, it does not correct some of the other issues associated with the existing system, such as lack of access points for maintenance. Based on these facts, this alternative is not a feasible option and was removed from further consideration.

Rehabilitation of the Existing York Trunk Sewer

As with the Do Nothing option, the rehabilitation of the existing Trunk Sewer would cause limited impacts to natural features due to construction. For the most part, this work would entail the installation of cured-in-place pipe liners, or sliplining of the existing sewer. This work requires minimal excavation which would be limited to the area immediately around the manhole access points.

From a technical point of view, this option is generally difficult to implement as the condition of the existing sewer is unknown due to existing access issues and the current level of sewage in the pipes. Bypasses around each pipe run would be required to assess individual pipes to determine what rehabilitation would be required and then this would need to be repeated for the actual implementation. This would pose a risk due to the potential of sewage spills.

This option also does not address the capacity concerns in the system and surcharging will remain a concern. As with the Do Nothing option, surcharging may have detrimental impacts within the floodplain, with potential adverse impacts to fish and the Speed and Eramosa Rivers. Rehabilitation will, however, mitigate concerns related to exfiltration and potential impacts on groundwater and municipal well supplies. Based, however, on the fact that this alternative does not solve the main issue of lack of capacity in the sewer, this option was also not considered further.

Twinning and Rehabilitation of Existing Sewer

This option involves the installation of a new sewer alongside the existing sewer, or in a new alignment, where the sewer is undersized, to accommodate future increases in capacity. Sections of the existing sewer which are adequately sized but are deteriorating may be rehabilitated using cured-in-place liners, or sliplining, for example, as opposed to requiring replacement.

Partial Replacement of Existing Sewer and Twinning

This option, like the one presented above, involves the twinning of the existing York Trunk Sanitary Sewer with a new sewer that runs along the same, or a new, alignment, with some correction made for constructability, improved access for maintenance, and improved hydraulics.

The twinned sewer, combined with the existing sewer, would provide capacity for current and future flow demands. Existing sections of the sewer in poor condition may be replaced or resized, as required. The section of twinned sewer south of the F.M. Woods Pumping Station and Reservoir may be used to completely replace the existing York Trunk Sanitary Sewer, which would be abandoned, in this location to provide for future expansion southward for that facility.

Each alternative was evaluated according to their natural, social/cultural, and economic impacts in addition to their technical and operational merit. **The preferred alternative for the York Trunk Sanitary Sewer is partial replacement of existing sewer and twinning.**

ES-4 Trunk Sewer Alignment Alternatives

Based on the considerations presented above and constraints identified with respect to the ability to relocate any related sanitary services, alignments were developed for the twinning of the York Trunk Sanitary Sewer.

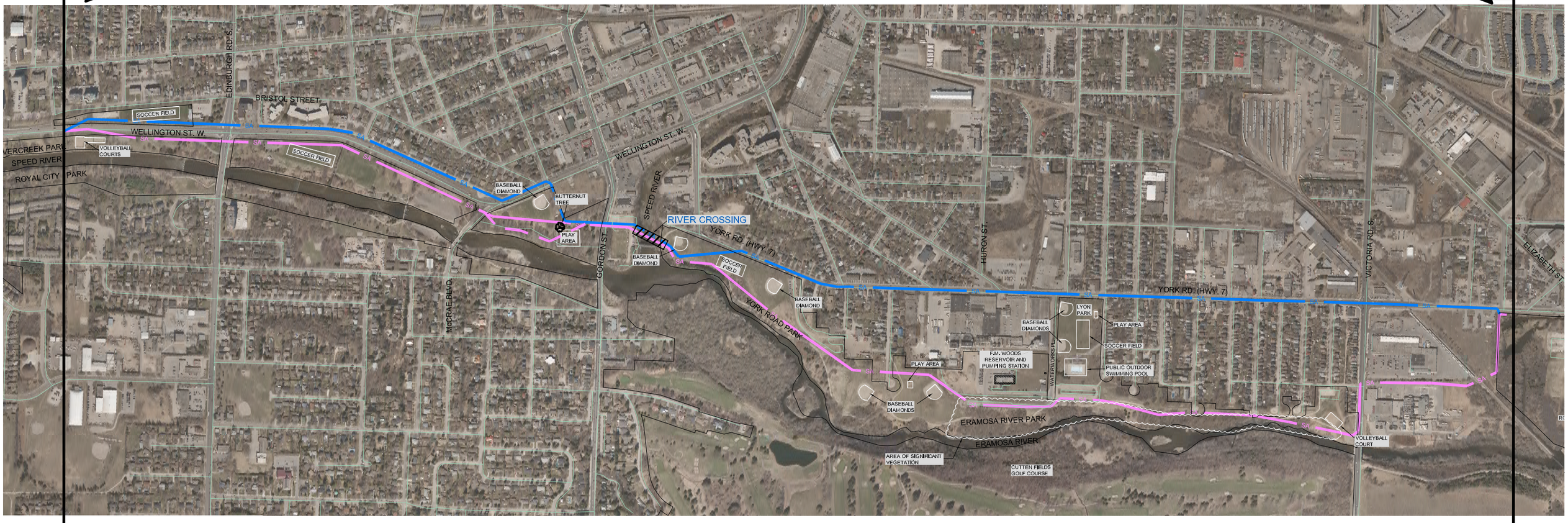
The possible routing alternatives, including existing City rights-of-way, open spaces and utility corridors, were evaluated by applying set screening criteria established at the early stage of the Study. Figure ES1 details the alignments plotted on a map.

ES-5 Feedermain Alignment Alternatives

Alternative alignments were identified in the early stages of the Class EA process following a detailed review of the Study Area from Watson Road and York Road, along the Hanlon Expressway, and to the Paisley Reservoir and Booster Station. The possible routing alternatives, including existing City rights-of-way, open spaces and utility corridors, were evaluated by applying set screening criteria established

at the early stage of the Study. The alternatives that were evaluated are shown in Figure ES.2 and Figure ES.3.

The preferred alignment for the Paisley-Clythe Feedermain is proposed to be constructed in a combined trench with the twinned York Trunk Sewer where its alignment runs parallel to the sanitary sewer system. Figures detailing the preferred Feedermain alignment and the York Trunk Sanitary Sewer alignment are presented in Figure ES.4 and Figure ES.5.



LEGEND

- SA — ALTERNATIVE ALIGNMENT NO. 1 (PREFERRED ALIGNMENT)
- ALTERNATIVE ALIGNMENT NO. 1A
- SA — ALTERNATIVE ALIGNMENT NO. 2

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YORK TRUNK SEWER
ALTERNATIVE ALIGNMENTS
FIGURE ES.1

0 200m 1000m
SCALE

GENIVAR

NORTH

PAISLEY RD.
TENNIS COURT
BASKETBALL COURTS
SOCCER FIELD
PLAY AREA
PAISLEY PUMPING STATION AND RESERVOIR
CASTLEBURY PARK
SOCCER FIELDS
PRIVATELY OWNED PROPERTY
HANLON PKWY.
SILVERCREEK PKWY. S.
EDINBURGH RD. N.
EDINBURGH RD. S.
WOOLWICH ST.
NORFOLK ST
SPEED RIVER
BRISTOL STREET
SOCCER FIELD
WELLINGTON ST. W.
SILVERCREEK PARK
VOLLEYBALL COURTS
SPEED RIVER
ROYAL CITY PARK
WASTEWATER TREATMENT PLANT
BASEBALL DIAMOND
BUTTERNUT TREE
PLAY AREA
GORDON ST.
McCRAE BLVD.
SPEED RIVER
RIVER CROSSING
YORK RD. (HWY 7)
BASEBALL DIAMOND
SOCCER FIELD
HURON ST.
BASEBALL DIAMOND
YORK ROAD PARK
PLAY AREA
F.M. WOODS RESERVOIR AND PUMPING STATION
BASEBALL DIAMONDS
BASEBALL DIAMONDS
ERAMOSA RIVER PARK

LEGEND

- ALTERNATIVE ALIGNMENT NO. 1
- ALTERNATIVE ALIGNMNET NO. 1A
- ALTERNATIVE ALIGNMENT NO. 1B
- ALTERNATIVE ALIGNMENT NO. 2 (PREFERRED ALIGNMENT)
- ALTERNATIVE ALIGNMENT NO. 2A

PAISLEY FEEDERMAIN ALTERNATIVE ALIGNMENTS FIGURE ES.2

0 200m 1000m
SCALE

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GENIVAR

LEGEND

ALTERNATIVE ALIGNMENT NO. 1

ALTERNATIVE ALIGNMENT NO. 2
(PREFERRED ALIGNMENT)

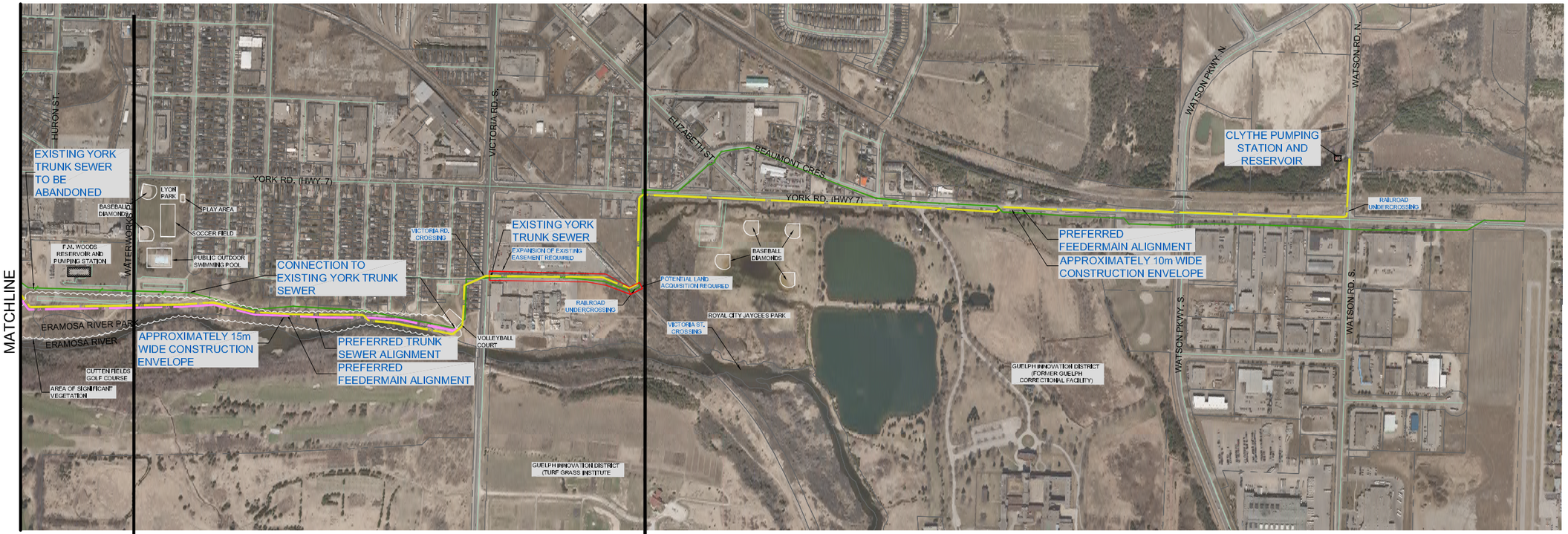
CLYTHE FEEDERMAIN ALTERNATIVE ALIGNMENTS FIGURE ES.3

0 200m 1000m
SCALE

CITY OF Guelph Making a Difference

GENIVAR

NORTH



SECTION No. 3 SECTION No. 2 SECTION No. 2 SECTION No. 1

LEGEND

- EXISTING TRUNK SEWER
- PREFERRED WATERMAIN ALIGNMENT
- PREFERRED WATERMAIN ALTERNATIVE ALIGNMENT B
- PREFERRED TRUNK SEWER ALIGNMENT
- PREFERRED TRUNK SEWER ALTERNATIVE ALIGNMENT B

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YORK TRUNK SEWER AND PAISLEY-CLYTHE FEEDERMAIN PREFERRED ALIGNMENTS
ES.4 - SHEET 1

0 100m 500m
SCALE

GENIVAR

NORTH

MATCHLINE

PAISLEY PUMPING STATION AND RESERVOIR

TENNIS COURT

BASKETBALL COURTS

PLAY AREA

SOCCER FIELD

PAISLEY RD.

HANLON PKWY.

SILVERCREEK PKWY. S.

CASTLEBURY PARK

SOCCER FIELDS

PREFERRED FEEDERMAIN ALIGNMENT

PRIVATELY OWNED PROPERTY

TEMPORARY EASEMENT MAY BE REQUIRED

APPROXIMATELY 10m WIDE CONSTRUCTION ENVELOPE

WASTEWATER TREATMENT PLANT

RAILROAD UNDERCROSSING

CONNECTION TO EXISTING YORK TRUNK SEWER

CONNECTION TO SPEED RIVER TRUNK SEWER

WELLINGTON ST. CROSSING

VOLLEYBALL COURTS

SOCCER FIELD

WELLINGTON ST. W.

SILVERCREEK PARK

SPEED RIVER

APPROXIMATELY 15m WIDE CONSTRUCTION ENVELOPE

SILVER CREEK STORM OUTFALL

ROYAL CITY PARK

EDINBURGH RD. N.

EDINBURGH RD. S.

EDINBURGH RD. CROSSING

STORM OUTFALL

BRISTOL ST.

SOCCER FIELD

PREFERRED FEEDERMAIN ALIGNMENT

PREFERRED TRUNK SEWER ALIGNMENT

WATERMAIN REALIGNMENT

EXISTING YORK TRUNK SEWER

McCRAE BLVD.

NORFOLK ST.

WOOLWICH ST.

SPEED RIVER

ES5

WELLINGTON ST. W.

BASEBALL DIAMOND

BUTTERNUT TREE

PLAY AREA

GORDON ST.

GORDON ST. CROSSING

RIVER CROSSING

YORK RD. (HWY. 7)

SOCCER FIELD

BASEBALL DIAMOND

YORK ROAD PARK

EXISTING YORK TRUNK SEWER TO BE ABANDONED

PLAY AREA

CONNECTION TO EXISTING YORK TRUNK SEWER

BASEBALL DIAMONDS

SECTION No. 5 | SECTION No. 4 | SECTION No. 4 | SECTION No. 3

LEGEND

- EXISTING TRUNK SEWER
- PREFERRED WATERMAIN ALIGNMENT
- PREFERRED WATERMAIN ALTERNATIVE ALIGNMENT B
- PREFERRED TRUNK SEWER ALIGNMENT
- PREFERRED TRUNK SEWER ALTERNATIVE ALIGNMENT B

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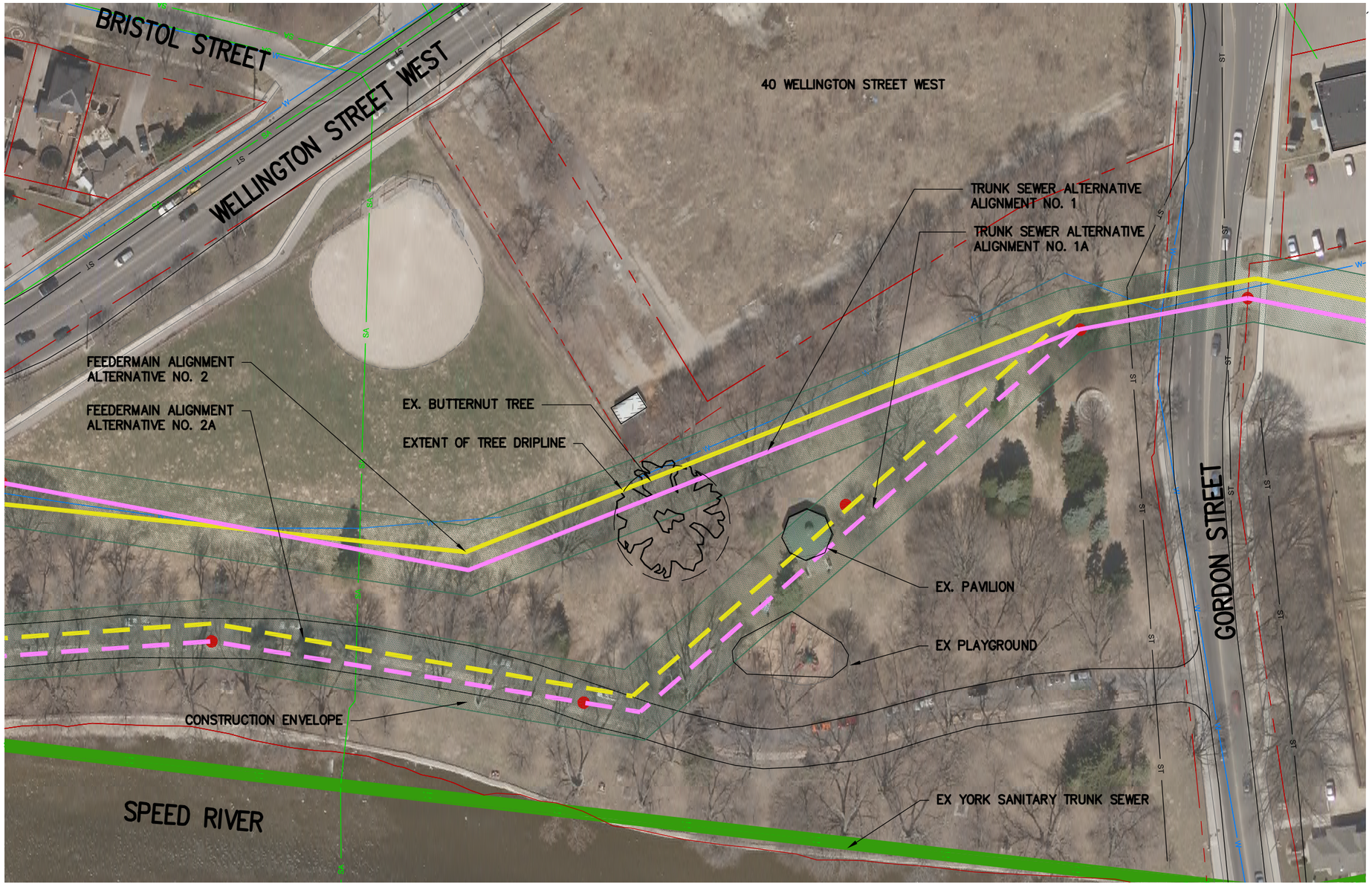
YORK TRUNK SEWER AND PAISLEY-CLYTHE FEEDERMAIN PREFERRED ALIGNMENTS
ES.4 - SHEET 2

0 100m 500m
SCALE

GENIVAR



LEGEND

- FEEDERMAIN ALTERNATIVE ALIGNMENT NO. 2
- FEEDERMAIN ALTERNATIVE ALIGNMENT NO. 2A
- TRUNK SEWER ALTERNATIVE ALIGNMENT NO.1
- TRUNK SEWER ALTERNATIVE ALIGNMENT NO. 1A

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YORK TRUNK SEWER AND PAISLEY FEEDERMAIN ALIGNMENTS THROUGH ROYAL CITY PARK

ES.5

0 100m 500m
SCALE

GENIVAR

ES-6 Environmental Impacts and Mitigation Measures

To construct the twinned York Trunk Sanitary Sewer and Paisley-Clythe Feedermain, some environmental impacts will be unavoidable. In such situations, measures will have to be taken to either minimize or offset these effects. Actions taken to reduce the effects of a certain project on the environment are called “mitigating measures”.

Key mitigation measures should include:

Protection of Vegetation

A key mitigation measure to be implemented in the park areas is to use natural heritage area buffers as setbacks. Impacts to vegetation will, for the most part, be limited to trees located within the park and along the existing roadways adjacent to the sewer and feedermain alignment. It is expected that vegetation restoration will be coordinated with the City of Guelph and the Grand River Conservation Authority. A Species-at-Risk, a Butternut tree, has been identified in Royal City Park within the proposed work area for the proposed sewer and feedermain. The tree has been identified as a retainable tree by a qualified Butternut Health Assessor and, as such, appropriate measures, as outlined by the Ministry of Natural Resources (MNR), must be followed, including approvals for its removal or for work within its defined setbacks.

Protection of Wildlife and Wildlife Habitats

Since a considerable length of both the sewer and the watermain will be constructed within park areas, it is likely that there may be an impact on wildlife inhabiting the area along the work corridor. In order to minimize the impacts to wildlife and wildlife habitat in the area, particularly species-at-risk, various mitigation strategies at both the planning and construction stage will be implemented. During all stages of the Class EA process, the routing of the sewer and the watermain have been planned in consideration of wildlife and wildlife habitat area information. The alignments for both infrastructure works were planned to minimize the impact to species-at-risk in accordance with the Species at Risk Act. Prior to the construction of the sewer and feedermain, it will be necessary to develop a detailed construction phasing plan to ensure that construction is undertaken during the timing windows recommended by MNR. Additional mitigative measures used during the construction phase include the installation of hoarding and construction fencing to prevent wildlife from entering active work areas.

Protection of Aquatic Habitats and Communities

During construction of the sewer and feedermain the greatest impacts to aquatic habitats and communities will occur at channel crossings. Impacts to aquatic habitats and communities can be minimized by restricting construction to suitable timing windows and implementing erosion and sedimentation control measures. Specific mitigation measures include:

- Scheduling river crossings around the cool water fishery (no in-water work allowed from March 15th to June 30th)
- Minimizing removal of riparian vegetation and renaturalization of the disturbed areas using native vegetation that supports existing wildlife species; and,
- Minimizing erosion and sedimentation by using effective sediment barriers downstream of the work area and erosion control blankets where necessary.

Groundwater & Subsurface Conditions

To maintain or improve the existing integrity of the groundwater and soil conditions within the sites of the future sewer and watermain, several mitigation measures can be implemented at the planning, design and construction stages. The key mitigation measures include:

- Scheduling construction during the summer and fall when groundwater levels are typically lower;

- Employing environmental management practices during construction, specifically in terms of the operation and storage of equipment;
- Locating the construction activities away from water bearing formations, where possible; and,
- Using proper dewatering techniques, including treatment of impaired groundwater and options to minimize necessary water taking.

Crossing Natural Features

The alignments for both the sewer and the watermain were designed in an attempt to minimize the number of water crossings and encroachment on wetland areas. Mitigation measures to be implemented post-construction include:

- Renaturalization of the construction zones; and,
- The maintenance of existing wildlife habitats.

Channel Crossings and Fish Habitat

To maintain natural areas surrounding channel crossings during construction, proper planning for the timing and execution of construction activities will be required to ensure the mitigation of potentially adverse effects on fish and fish habitat. Before construction activities begin:

- A schedule for the construction work will be developed which ensures that construction activities do not interfere with seasonal constraints such as high water levels, surrounding land uses, or fish spawning season;
- A spill control and emergency management plan will be established before construction begins. This plan will be implemented throughout the construction process in the event of a spill; and,
- A plan for diverting water around active construction zones will be developed to facilitate the passage of fish to unaffected areas downstream.

Immediately following construction, renaturalization of the riparian zone surrounding the channel crossing will begin. It is also expected that construction activities will minimize the need for tree removal, observe natural heritage buffers and restore river beds to pre-construction conditions or better.

Proximity to Valleylands and Flood Plains

To mitigate the impact of construction on valleylands and flood plain areas, the following mitigation measures will be employed:

- Prior to removing trees or vegetation, it may be necessary to create an inventory of work to ensure that impacts to nesting locations and breeding areas for local or migratory breeding birds are minimized;
- Minimizing tree removal and implementing a restoration plan that is consistent with the City's Natural Heritage Strategy; and,
- Replacing impacted vegetation with native species.

Parkland and Recreation Areas

Since a considerable length of the sewer and watermain will be constructed within a park area, it is imperative that that consideration is made to the staging and methods of construction activities to minimize the disruption to sports fields and park areas. That being said, construction would be better suited to take place during the late fall and early spring when the sport fields and park areas are not in use by the community. Once construction is complete, all disrupted sport fields, playgrounds, parking areas, and vegetated areas will be reinstated to their previously existing state as quickly as possible to allow for public use. Coordination with the City will we required with respect to phasing the construction around future proposed Parks works.

Archaeological Features

The Stage 1 Archaeological Assessment conducted for this study identified general areas of potential archaeological significance within the sewer and watermain Study Area. With this in mind, a Stage 2 Archaeological Assessment will have to be conducted prior to the design and construction of the sewer and watermain. A Stage 2 Archaeological Assessment involves a test-pit survey of wood lots and non-cultivated lands. Test pits are excavated by hand to subsoil in order to facilitate the identification of any subsurface cultural deposits. Any specific archaeological artefacts or features that are identified may require additional investigation through a Stage 3 Archaeological Assessment. A Stage 3 Archaeological Assessment includes the determination of the extent of an archaeological site through the excavation of test pits, and an assessment of its value with respect to cultural heritage concerns. Where required, Stage 4 mitigation plans would be developed to protect or preserve the subjects of concern.

Proximity to Built-up Areas & Private Properties

To minimize disruption to residents and business owners in close proximity to construction areas, the City will employ measures to minimize environmental impacts. For instance, noise control measures will be implemented to comply with the City's noise by-law to maintain lower decibel levels in the area to eliminate the risk of causing hearing damage, in addition to the implementation of dust control measures to lower the chance of disturbing nearby residents, business owners, pedestrians and cyclists passing by. Additionally, pedestrian walkways will be maintained by providing detours around construction sites.

Traffic Impacts During Construction

The main impact to traffic will be the increase in construction traffic for delivery of material and equipment and haulage of excess soil. In order to mitigate these impacts:

- Construction signage will be posted on the impacted roads to make motorists aware of the construction entrances;
- The location of the compound entrances for the construction activities will be selected to ensure the least disruption to traffic;
- Where compounds are located in close proximity to intersections, entrances will generally be located off a secondary road;
- During detailed design haulage routes will be identified that will limit the construction traffic to major roads to mitigate heavy trucks travelling on secondary roads where the impacts are magnified;
- Pedestrian walkways and bicycle lanes will be hoarded off and temporary road crossings provided; and,
- Traffic management plans will be developed with the City of Guelph.

Environmental Impacts During Construction

During design, environmental impacts potentially resulting from the project and specific net effects will be identified. Measures that must be taken to minimize the negative effects will be worked out such that the design can be tailored to recognize them. Contract drawings and documents will have to include special provisions to ensure the impact on the environment is minimized. It is anticipated that dewatering will take place during the construction of the trunk sanitary sewer and feedermain and potentially, there may be temporary impacts to the local groundwater system and impaired soil and groundwater conditions may be present. As a result, an Environmental Management Plan is to be developed at the detailed design stage to address potential hydrogeological and environmental challenges related to the works.

Some construction operations have potential for environmental impacts and, where these can be anticipated in the design stage, special provisions are to be written into the construction package. The provisions are to detail construction methods that are permitted and, more importantly, which are not during specific operations. Unforeseen problems that arise during construction will be addressed on the site, and the proponent's best judgment is to be used to limit negative environmental impacts.

ES-7 Additional Land Requirements

The installation of the York Trunk Sanitary Sewer and Paisley-Clythe Feedermain is completely within municipally-owned lands with the exception the existing utility easement south of York Road where the utilities turn west, at the Guelph Junction Railway, where there is currently not enough space available to install the Feedermain. This may require the purchase of land or securing of a permanent easement in this area which is currently either privately owned or administered by Infrastructure Ontario, depending on the final alignment. This will need to be reviewed with the adjacent property owners early in the design stage.

Where alignments are proposed outside of the existing right-of-ways or easements, a new permanent easement from the landowner will be required. Based on the preferred alignment for the Paisley-Clythe Feedermain, a permanent easement is anticipated to be required to expand the existing utility easement located north of the PDI plant to accommodate the new water supply feedermain.

Where work may be required on neighbouring properties during construction (staging, horizontal direction drilling staging and receiving pits, etc) a temporary easement may be required to be arranged with the property owner. A temporary easement may be required to perform the undercrossing of the Hanlon Expressway, which would require that the staging pit for the undercrossing of the Hanlon Expressway by the feedermain to be located on, or near, the Lafarge lands.

ES-8 Construction Costs and Project Phasing

Construction Costs

The base capital cost estimate for the construction of the York Trunk Sanitary Sewer is estimated at $15.6 million. This includes an additional $2.6 million contingency for dewatering, possible treatment of dewatered groundwater prior to discharge, and for disposal of potentially impaired soil.

The total capital cost for the Paisley-Clythe Feedermain is $14.9 million, including the same contingency. Performed separately, the $2.6 million contingency would also be applied to this, making the total cost for both projects, performed independently, $30.5 million.

Performed together, cost reduction due to the ability to perform the Speed River crossing, savings in mobilization fees, and a reduction in the contingency related to dewatering and soil disposal requirements, could reduce the total cost for both projects to approximately $27.9 million.

These cost estimates include estimates for engineering design and an additional contingency to address unforeseen issues during construction totalling 20%.

Project Phasing

Due to the extent of the construction, windows of construction, and yearly budgets available, the project will likely be required to be phased over several contracts. In addition, consideration must be given to available capacity within the sewer system with respect to existing and future flows and priority given to areas of work which may need upgrades sooner than others to ensure adequate servicing is available. Based on this, a preliminary phasing schedule is presented below:

Contract No. 1 – West End of the York Trunk to Speed River Crossing – 1.6 km

- → This would include the installation of the feedermain through Silvercreek and Royal City Park, and undercrossing Gordon Street to terminate in the municipally owned parking lot.

Temporary connections to existing watermains will be provided at each terminal end of the new feedermain.

- The twinned trunk sewer would follow the same alignment as above, connecting into the existing system at manhole 298. A bulkhead would be provided at the upstream terminal end. The connection to the Speed River Trunk Sewer siphon would be performed at this time.
- Estimated Construction Period assuming – 1 month ramp up and down – 5 months of active construction – July/August start – March/April Completion.
- Estimated construction cost - $ 9.2 million.

Contract No. 2 – River Crossing and East – 2.1 km

- This would include the river crossing for both services, the connection to the eastern extent of the work performed in Contract No. 1, and the extension of both services eastward, terminating just west of Victoria Road South, at the connection to the existing York Trunk Sanitary Sewer.
- The Paisley-Clythe Feedermain would be connected at the F.M. Woods Pumping Station. The temporary connection at the east end of Contract No. 1 will be removed. A new temporary connection will be provided at the eastern end of the new feedermain.
- The existing York Trunk Sanitary Sewer will be abandoned south of the F.M. Woods Pumping Station where the twinned sewer has made the existing service redundant to allow for future expansion of the Pumping Station.
- Estimated Construction Period assuming – 1 month ramp up and down – 3 months in river – 5 months construction – August/September Start (River) – Parks closed in October – April/May Completion
- Estimated Construction Cost - $9.9 million.

Contract No. 3 – Paisley Termination – 2.6 km

- This work would include the extension of the feedermain from the temporary connection at the western terminus in Silvercreek Park to the Paisley Pumping Station and Reservoir. The temporary connection from Contract No. 1 would no longer be required.
- Estimated Construction Period – 1 month ramp up and down – 4 months of active construction – work may be performed at any time of the year.
- Estimated Construction Cost – $4.7 million

Contract No. 4 – Clythe Termination – 2.6 km

- This work would include the extension of the feedermain from just west of Victoria Road South to the Clythe Pumping Station and Reservoir. The temporary connection from Contract No. 3 would no longer be required.
- Consideration should be given to coordinating the timing of this work with the future expansion of York Road from two to four lanes.
- Estimated Construction Period – 1 month ramp up and down – 4 months of active construction – work may be performed at any time of the year.
- Estimated Construction Cost - $4.1 million.

2. ENVIRONMENTAL ASSESSMENT PROCESS

This section describes the Environmental Assessment process and the specific requirements associated with this study.

2.1 ENVIRONMENTAL ASSESSMENT ACT

Ontario's *Environmental Assessment Act* (henceforth referred to as "the Act") was passed in 1975 and proclaimed in 1976. The Act requires proponents to examine and document the environmental effects that might result from major projects or activities. Municipal undertakings became subject to the Act in 1981.

The Act defines the environment broadly as:

1. Air, land or water;
2. Plant and animal life, including man;
3. The social, economic and cultural conditions that influence the life of man or a community;
4. Any building, structure, machine or other device or thing made by man;
5. Any solid, liquid, gas, odour, heat, sound, vibration or radiation resulting directly or indirect from activities of man; and,
6. Any part or combination of the foregoing and the interrelationships between any two or more of them.

The purpose of the Act is the betterment of the people of the whole or any part of Ontario by providing for the protection, conservation and wise management of the environment in the Province (RSO1990, c. 18, s.2).

As set out in Section 5(3) of the Act, an EA document must include the following:

1. A description of the purpose of the undertaking including:
   - → The undertaking;
   - → The alternative methods of carrying out the undertaking; and,
   - → Alternatives to the undertaking.
2. A description of:
   - → The environment that will be affected or that might reasonably be expected to be affected, directly or indirectly, by the undertaking or alternatives to the undertaking;
   - → The effects that will be caused or that might reasonably be expected to be caused to the environment by the undertaking or alternatives to the undertaking;
   - → The actions necessary or that may reasonably be expected to be necessary to prevent, change, mitigate or remedy the effects upon or the effects that might reasonably be expected upon the environment by the undertaking or alternatives to the undertaking; and,
   - → An evaluation of the advantages and disadvantages to the environment of the undertaking, the alternative methods of carrying out the undertaking and the alternatives to the undertaking.

2.2 PRINCIPLES OF ENVIRONMENTAL PLANNING

The Act sets a framework for a systematic, rational and replicable environmental planning process that is based on five key principles, as follows:

- → **Consultation with Affected Parties -** Consultation with the public and government review agencies is an integral part of the planning process. Consultation allows the proponent to identify and address concerns cooperatively before final decisions are made. Consultation should begin as early as possible in the planning process.

- **Consideration of a Reasonable Range of Alternatives -** Alternatives include functionally different solutions to the proposed undertaking and alternative methods of implementing the preferred solution. The “do nothing” alternative must also be considered.
- **Identification and Consideration of the Effects of Each Alternative on all Aspects of the Environment -** This includes the natural, social, cultural, technical, and economic environments.
- **Systematic Evaluation of Alternatives in Terms of their Advantages and Disadvantages, to Determine their Net Environmental Effects -** The evaluation shall increase in the level of detail as the study moves from the evaluation of alternatives to the proposed undertaking to the evaluation of alternative methods.
- **Provision of Clean and Complete Documentation of the Planning Process Followed –** This will allow traceability of decision-making with respect to the project. The planning process must be documented in such a way that it may be repeated with similar results.

2.3 MUNICIPAL CLASS ENVIRONMENTAL ASSESSMENT

Class Environmental Assessments (EAs) were approved by the Minister of the Environment in 1987 for municipal projects having predictable and preventable impacts. The Municipal Class EA document was revised and updated in 1993, 2000, and again in 2007. The Class EA Municipal Engineers Association (MEA) approach streamlines the planning and approvals process for municipal projects which have the following characteristics:

- Recurring;
- Similar in nature;
- Usually limited in scale;
- Predictable range of environmental impacts; and,
- Environmental impacts are responsive to mitigation.

The Municipal Class Environmental Assessment document, prepared by MEA (October 2000, as amended in 2007), outlines the procedures to be followed to satisfy Class EA requirements for water, wastewater and road projects. The process includes five phases:

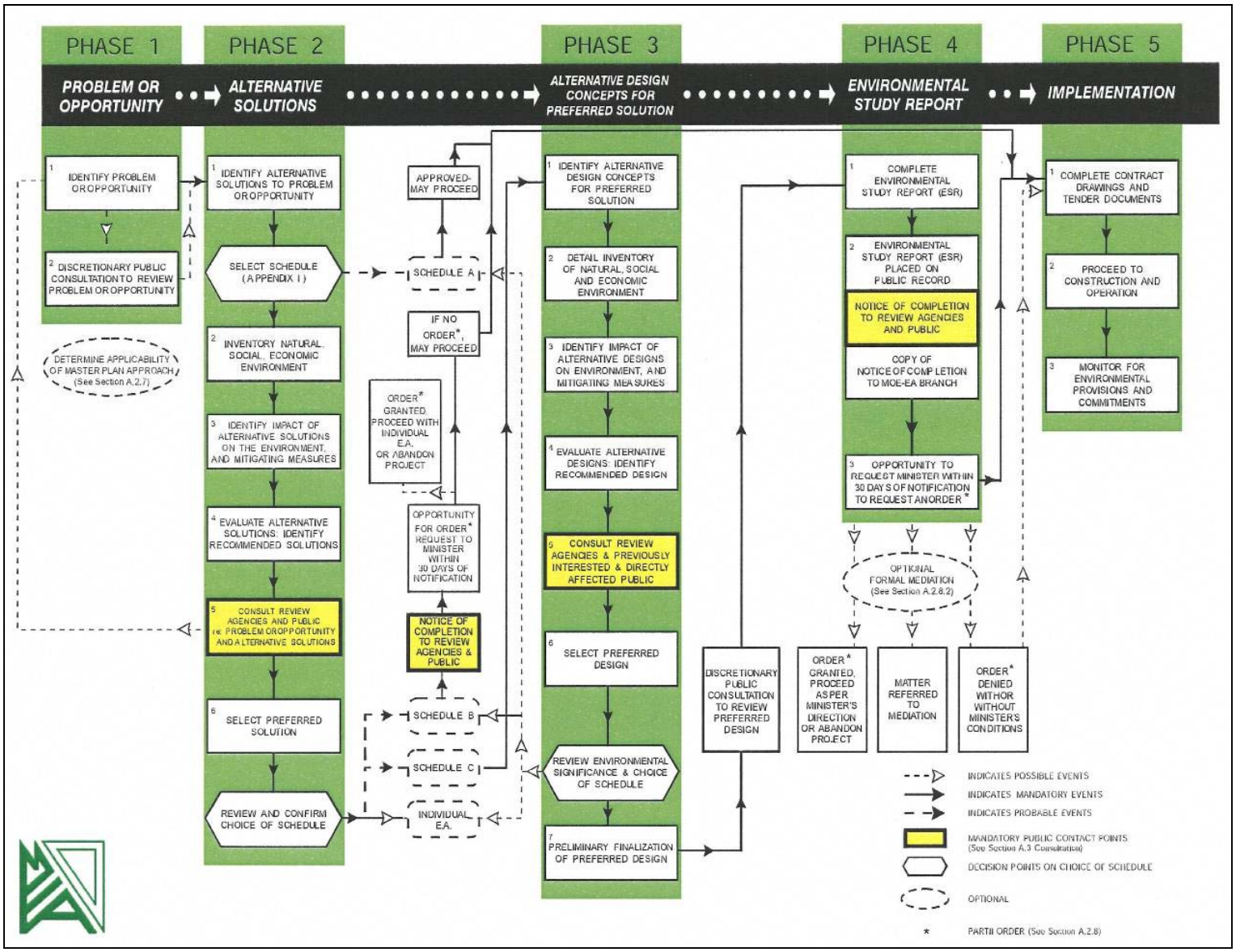
- Phase 1: Problem Definition
- Phase 2: Identification and Evaluation of Alternative Solutions to Determine a Preferred Solution
- Phase 3: Examination of Alternative Methods of Implementation of the Preferred Solution
- Phase 4: Documentation of the Planning, Design and Consultation Process
- Phase 5: Implementation and Monitoring

Public and agency consultation is integral to the Class EA planning process. Projects subject to the Class EA process are classified into four possible “Schedules” depending on the degree of expected impacts. It is important to note that the Schedule assigned to a particular project is proponent-driven. For example, if a project has been designated as Schedule “A”, the proponent can decide to comply with the requirements of a Schedule ‘B” or “C” of the MEA process based on the magnitude of anticipated impacts or the special public and agency consultation requirements specific to that particular project.

For Schedule “B” and “C” projects, the public has the opportunity to request additional investigation by filing a Part II Order Request to the Ministry of the Environment.

The Class EA process flowchart is provided in Figure 2.1.

Figure 2.1 Municipal Class EA Process



Schedule "A" Projects

Schedule "A" projects are minor operation and maintenance activities and are pre-approved without the need for further assessment. Projects with this designation are typically limited in scale and have minimal adverse environmental impacts. An example of a Schedule "A" wastewater project is the establishment of a sewage collection system and all necessary works to connect the system to an existing sewage outlet, where it is required as a condition of approval on a site plan, consent plan of subdivision, or plan of condominium approved under the Planning Act prior to construction. This type of project is pre-approved and the proponent may proceed without following the procedures set out in any other part of the Class EA process.

Schedule "A+" Projects

Schedule "A+" projects were introduced to MEAs in 2007. Similar to Schedule "A", these projects are also pre-approved, however; the difference is that, for Schedule "A+" projects, the public must be advised prior to project implementation. An example of a Schedule "A+" wastewater project would be the establishment, extension or enlargement of a sewage collection system and all necessary works to connect the system to an existing sewage or natural drainage outlet, provided all such facilities are in

either an existing road allowance or an existing utility corridor, including the use of Trenchless Technology for water crossings.

Schedule “B” Projects

Schedule “B” projects generally include improvements and minor expansions to existing facilities where there is potential for some adverse environmental impacts. These projects require the screening of alternatives for their environmental impacts and the completion of Phases 1 and 2 of the Class EA planning process. If outstanding issues remain after the public review period, any party may request that the Minister of the Environment consider a Part II Order (also known as bumping-up the project) to elevate the project to a more stringent process (Schedule “C” or an Individual Environmental Assessment). Provided no significant impacts are identified and no requests for a Part II order are received, Schedule “B” projects are approved and may proceed directly to Phase 5: Implementation. An example of a Schedule “B” wastewater project would be the establishment, extension or enlargement of a sewage collection system and all works necessary to connect the system to an existing sewage outlet where such facilities are not in an existing road allowance or an existing utility corridor.

Schedule “C” Projects

Schedule “C” projects generally include the construction of new facilities and major expansions to existing facilities. These projects are typically more complex and have the potential for significant environmental effects. As a result they proceed under full planning and documentation procedures and satisfy all five phases of the Class EA planning process. Phase 3 involves the assessment of alternative methods of carrying out the project, as well as public consultation on the preferred conceptual design. Phase 4 is the preparation of an Environmental Study Report which is filed for public review. Provided no significant impacts are identified and no requests for Part II Order or “bump-up” to an Individual Environmental Assessment are received, Schedule “C” projects are then approved and may proceed to Phase 5: Implementation. An example of a Schedule “C” wastewater project would be construction of a new sewage system, including the construction of treatment and an outfall to a receiving water body and/or a constructed wetland for treatment.

2.4 INFRASTRUCTURE ONTARIO COMPLIANCE

Where acquisition of provincially owned lands is required, the City will need to comply with the requirements of Infrastructure Ontario (I/O), which involves the application of the Ministry of Energy and Infrastructure (MEI) Class EA (amended September 2008) process. Should the I/O Class EA process be triggered, compliance can be achieved in a straight-forward manner utilizing the results from the York Trunk Sanitary Sewer and Paisley-Clythe Feedermain Class EA. It is expected that this Class EA will trigger the I/O Class EA process due to the potential need for purchasing provincially owned lands or for arranging for a temporary easement within the Guelph Innovation District during the undercrossing of the rail spur in that area, in order create a new alignment for the Paisley-Clythe Feedermain through that land. The I/O Class EA process may begin once the land required for the easement is identified, which will be confirmed when the preferred alternative is selected at the end of Phase 2 of this Study. Since the requirements of the I/O Class EA process are not as in depth as the requirements for the Municipal Class EA process, the I/O Class EA may begin after the project file for the York Trunk Sanitary Sewer and Paisley-Clythe Feedermain Class EA has been completed and filed.

2.5 CANADIAN ENVIRONMENTAL ASSESSMENT ACT COMPLIANCE

The Federal Canadian Environmental Assessment Act (CEAA) process can be triggered in respect to the project, when:

- A federal authority is the proponent of a project;
- A federal authority provides financial assistance to the proponent;
- A federal authority makes federal lands available for the project; or,

→ A federal authority issues a permit or license, or other form of approval pursuant to a statutory or regulatory provision referred to in the Law List Regulations (See Section 2.5.1).

The CEAA process is dependent on the specific trigger(s) by the project and the impacts on the environment. Unlike the Class EA process, CEAA is much more project specific and requires an understanding of the particular components of the project. However, since there is overlap with the documentation for both EA processes, the requirements can be met by one document. The consultation requirements are not as stringent for the CEAA process, but an assessment of the cumulative effects of the project must be undertaken, which is not a requirement of the Municipal Class EA process.

At this point in the process there is uncertainty as to whether the CEAA will be triggered. It is possible that CEAA may be triggered as result of the Paisley-Clythe watermain crossing an existing Canadian National (CN) rail, though the fact that the watermain will likely cross the railway will not trigger the CEAA process automatically. The CEAA process, however, will be triggered if, through consultation with the appropriate federal authorities, it is determined that the railway operations are affected due to the methods of construction planned for the watermain. During Phase 2 of the Class EA process, confirmation of any triggers for the CEAA will be made. Consultation with federal authorities will be ongoing throughout the Class EA process, with specific discussions held if a trigger is determined.

Should CEAA be triggered, the York Trunk Sanitary Sewer and Paisley-Clythe Class EA will be conducted accordingly to satisfy the CEAA requirements, which includes all required consultations with the appropriate federal authority(s) and other federal stakeholder agencies. The CEAA process is dependent on the specific trigger(s) by the project and the impacts on the environment. Unlike the Class EA process, CEAA is much more project specific and requires an understanding of the particular components of the project.

In some cases, a trigger may not be identified until the detailed design stage. Beginning consultation with federal regulatory authorities in the early stages of the study, however, will be essential to attaining input and addressing any concerns that may affect the granting of the required permits in a timely fashion.

2.5.1 Law List Regulations

Of the above four triggers listed, the only one that may be applicable to this project would be “a federal authority issues a permit or license, or other form of approval pursuant to a statutory or regulatory provision referred to in the Law List Regulations”. The following Law List Regulations may be applicable to this Study.

Transportation Canada Act

The Transportation Canada Act was created to address impacts that may occur from the operation of a rail line. Subsection 101(3) requires the ‘authorization for the construction of a road crossing or utility crossing for a railway line, or for work related to that construction, or specifying who shall maintain the crossing.’ This approval requirement may trigger the CEAA.

Fisheries Act

The Fisheries Act contains habitat and pollution protection provisions which are compulsory for all levels of government and the public. Subsection 35(1) of this Act states “no person shall carry out any work or undertaking that results in the harmful alteration, disruption or destruction of fish habitat” unless authorized by the Minister of Fisheries and Oceans Canada. Authorization under Subsection 35(2) of the Fisheries Act may be issued to permit work when adverse effects cannot be avoided. Authorization under subsection 35(2) of the Fisheries Act is also a regulatory trigger for a federal environmental assessment under CEAA. As a result, requirements of the federal EA must be met before authorization is granted. The Grand River Conservation Authority (GRCA) was consulted to determine whether authorization under the Fisheries Act is required. GRCA has indicated that they have a Memorandum of Understanding and a Level III Agreement with Department of Fisheries and Oceans (DFO) which means that the Authority can screen and process some applications on behalf of DFO. During the detailed design of the York Trunk Sanitary Sewer and Paisley-Clythe Feedermain, a

permit for each watercourse crossing is to be submitted to GRCA to determine if there is a potential Harmful, Alteration, Disruption, or Destruction (HADD) of fish habitat. The York Trunk Sanitary Sewer and Paisley-Clythe Feedermain are to be designed to prevent HADD at each watercourse crossing.

Navigable Waters Protection Act

The Navigable Waters Protection Act (NWPA) protects the public right to navigation by ensuring that works constructed in navigable waterways are regulated to minimize impacts on navigation. Subsection 5(1)(a) and 6(4) of the Act define approvals that may trigger the requirements for a federal EA under CEAA. Subsection 5(1)(a) states “No work shall be built or placed in, on, over, under, though or across any navigable water without the Minister’s prior approval of the work, its site and the plans for it”. Subsection 6(4) essentially states that the Minister may approve a work after the start of its construction. Transport Canada was consulted to determine if a permit under NWPA will be required. It is anticipated that a permit is not required as long as the terms and conditions outlined in Section 7 of the Minor Works and Water (Navigable Waters Protection Act) Order are met. However, the need for a permit is to be reviewed again during detailed design when a decision is made on the method of crossing of each watercourse.

Railway Safety Act

The Railway Safety Act was developed to ensure the safe operation of railways. Under subsection 10(1), Ministerial approval is required where (a) a proposed railway work departs from any applicable engineering standards (b) a proposed railway work is one in respect of which notice has been given under subsection 8(1) and, at the expiration of the period specified in that notice for the filing of objections, there is an outstanding objection. The proposed York Trunk Sanitary Sewer and Paisely-Clythe Feedermain will be crossing the CN Railway.

It should be noted that if the permits and approvals described below are required, it is unlikely that they will be granted by the appropriate regulatory authorities during the Class EA stage of this project since it is too early in the process. However, efforts were made to investigate the required approvals and implications to the future detailed design of the York Trunk Sanitary Sewer. Consultation with regulatory authorities was essential to attaining input and addressing any concerns that may affect the granting of the required permits. This project will not trigger the Canadian Environmental Assessment Act.

3. PHASE 1: PROBLEM DEFINITION

3.1 DEFINITION OF PROBLEM/OPPORTUNITY

This Class EA is the result of the City undertaking an infrastructure study to plan for a capacity upgrade of the existing York Trunk Sanitary Sewer and to plan for the new Paisley-Clythe Feedermain. The following sections outline the definitions of the problem and opportunity statements for both infrastructure projects considered in this Class EA.

3.1.1 The York Trunk Sanitary Sewer

The existing York Trunk Sanitary Sewer services existing development in the City of Guelph, but it lacks capacity for servicing future population and employment growth (Refer to Section 4.6, where this is detailed further). In order to service the infill/intensification development planned for within the City and new development in the Guelph Innovation District, the York Trunk Sanitary Sewer will require upgrades. Therefore, the Problem/Opportunity Statement for the York Trunk Sanitary Sewer has been defined as follows:

What is the preferred method to optimize available capacity for the wastewater servicing of existing and future developments in Guelph while minimizing impacts on the natural, cultural, and social features in the Study Area?

3.1.2 The Paisley-Clythe Feedermain

As prescribed in the City's Water and Wastewater Servicing Master Plan, a new east-west watermain is required through the core of the City, to serve as a security of supply transmission main for the Zone 1 water supply system. Therefore, the Problem/Opportunity Statement for the Paisley-Clythe Feedermain has been defined as follows:

What is the preferred method to provide a security of supply to Zone 2 water distribution, while supporting supply within Zone 1, and to service existing and future developments in Guelph while minimizing impacts on the natural, cultural, and social features in the Study Area?

3.2 NEED AND PROJECT JUSTIFICATION

3.2.1 York Trunk Sanitary Sewer

The primary justification for this infrastructure is for the capacity to service future growth planned for, in the City of Guelph, which is in accordance with the City's Official Plan. A new or upgraded trunk sanitary sewer is required to convey sanitary sewage flows from existing and new developments to the City's WWTP. The York Trunk Sanitary Sewer was identified as an infrastructure requirement during the undertaking of the City's Water and Wastewater Servicing Master Plan. Based on previous investigations led by the City, and confirmed by GENIVAR, many of the existing sections of the York Trunk Sanitary Sewer were found to be at, or approaching, maximum capacity service in its existing servicing area. Therefore, any additive capacity is not currently available within the existing system without the risk of surcharging the system.

3.2.2 Paisley-Clythe Feedermain

The primary justification for this infrastructure is for it to serve as a security of supply main for east-west water transmission through the City's core. A watermain is required to ensure that residents and businesses are adequately serviced in the event of a fire or feedermain break. Since there may be areas of common alignment between the water feedermain and the York Trunk Sanitary Sewer, its implementation is planned to take place concurrently with the implementation of the York Trunk Sanitary Sewer to potentially minimize the overall impacts to the natural, cultural and social environment.

3.3 PROJECT CLASS EA SCHEDULE

The specific requirements of the Municipal Class Environmental Assessment process depend on the type of project, its complexity, and the significance of potential environmental impacts.

The York Trunk Sanitary Sewer and Paisley-Clythe Feedermain Class EA has been designated as a Schedule "B" project for the following reasons:

- The York Trunk Sanitary Sewer project is a wastewater project which will, "establish, extend or enlarge a sewage collection system and all works necessary to connect the system to an existing sewage outlet where such facilities are not in an existing road allowance or an existing utility corridor"
- The Paisley-Clythe Feedermain project is a water project which will, "establish, extend or enlarge a water distribution system and all works necessary to connect the system to an existing system or water source, where such facilities are not in either an existing road allowance or an existing utility corridor"

Although the entire length of the trunk sewer and feedermain will not lie within existing road and utility allowances, efforts will be made to ensure that the sewer and the feedermain are constructed within existing road allowances and publicly-owned land where possible, and that the water crossings are low impact with respect to the surrounding environmental features.

3.4 PUBLIC REVIEW AND NEXT STEPS

As Schedule "B" projects, Phases 1 and 2 of the Municipal Class EA process must be completed as indicated in Figure 2.1 above, before proceeding to implementation. These phases include:

- Phase 1: Identification of the Problem or Opportunity
- Phase 2: Identification and Evaluation of Alternative Solutions

A Schedule "B" Class EA concludes with the Notice of Completion and placing of the Project File in a location accessible to the public for a mandatory 30-day review period to allow review by the public and agencies which may have an interest in this project.

This document is available for public review for 30 days commencing on February 9th, 2012 until March 12, 2012.

The Notice of Completion for this EA was published in the Guelph Tribune newspaper on February 9th, 2012 and posted on the city's website (www.guelph.ca/YorkTrunkEA). Hardcopies of the document are available for public review at:

City Hall
1 Carden Street
Guelph, Ontario, Canada N1H 3A1
Hours: Monday to Friday 8:30 am to 4:30 pm

Library – Main Branch
100 Norfolk Street
Guelph, ON N1H 4J6
Hours: Monday to Friday 9:00 am to 9:00 pm;
Saturday 9:00 am to 5:00 pm; and,
Sunday 1:00 pm to 5:00 pm.

Any comments or concerns, within the prescribed 30 day period can be directed to:

James Witherspoon, P.Eng.

GENIVAR Inc.
1-367 Woodlawn Road West,
Guelph, ON N1H 7K9

Colin Baker, P.Eng.

City of Guelph
City Hall, 1 Carden Street
Guelph, Ontario, Canada N1H 3A1

4. EXISTING CONDITIONS AND CONSIDERATIONS

This section discusses the current conditions in the overall Study Area, focusing particularly on features that may be affected by the proposed sanitary sewer and feedermain alignment alternatives.

4.1 YORK TRUNK SEWER SERVICE AREA

The service area was determined through consultation with the City of Guelph and by reviewing the existing York Trunk Sanitary Sewer alignment and planned future development in the area. As illustrated in Figure 4.1, the flows to the proposed York Trunk Sanitary Sewer will be from future development growth in South Guelph, Guelph Innovation District, and infill intensification growth within the City's core. It is uncertain that wastewater flows from the Community of Rockwood will be continue to be conveyed to the York Trunk Sanitary Sewer, per the existing arrangement between the City of Guelph and Rockwood; nevertheless, the York Trunk Sanitary Sewer is to be sized to accommodate future flows from Rockwood.

4.2 PAISLEY-CLYTHE FEEDERMAIN SERVICE AREA

As illustrated in Figure 4.2, the Paisley-Clythe Feedermain would connect the east-west extremities of the Zone 1 for supply within the Zone and for security of supply to Zone 2. This will also provide for future interconnections to the Verney Elevated Storage Tank, at the north end of the City, and the Clair Elevated Storage Tank, in the South.

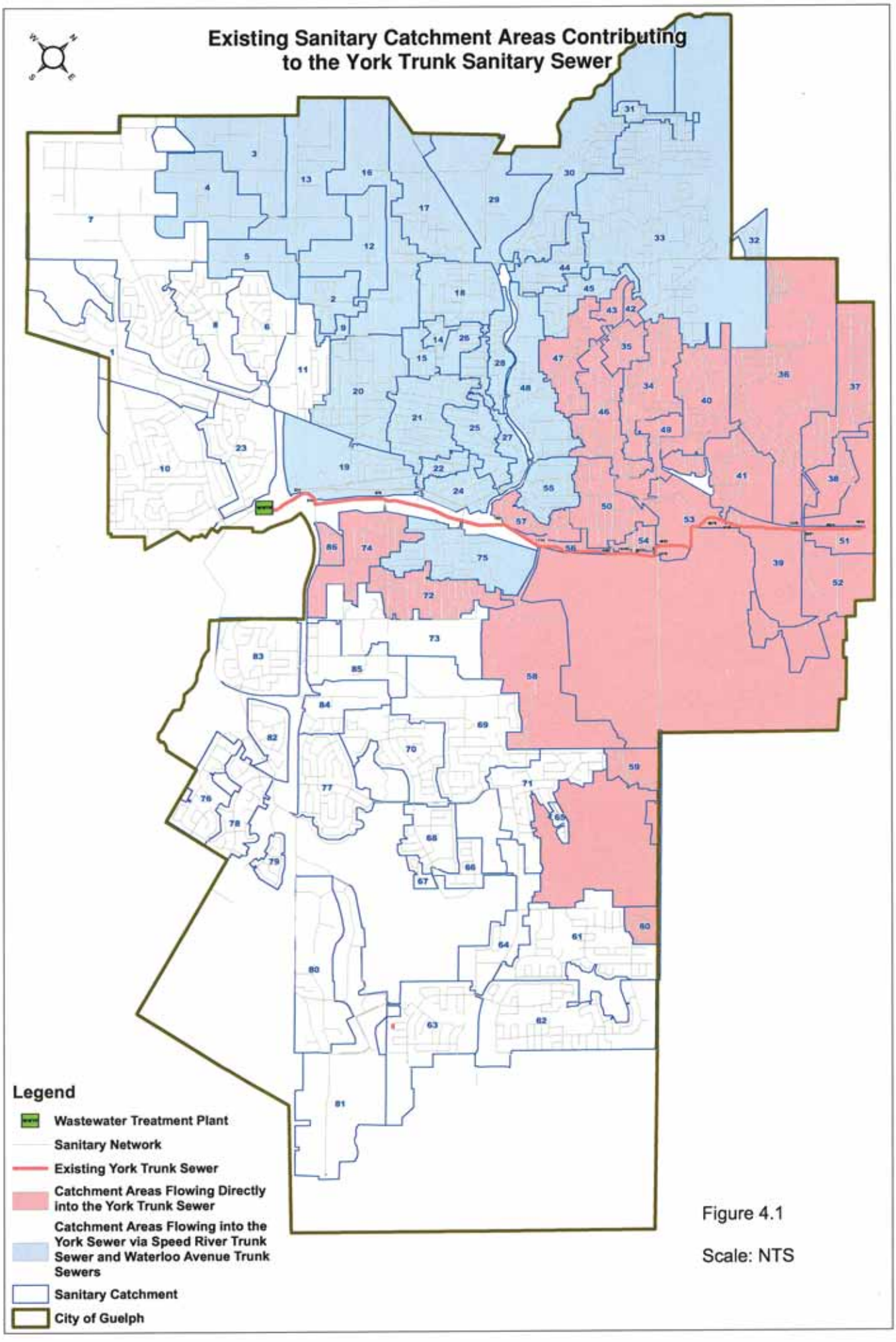
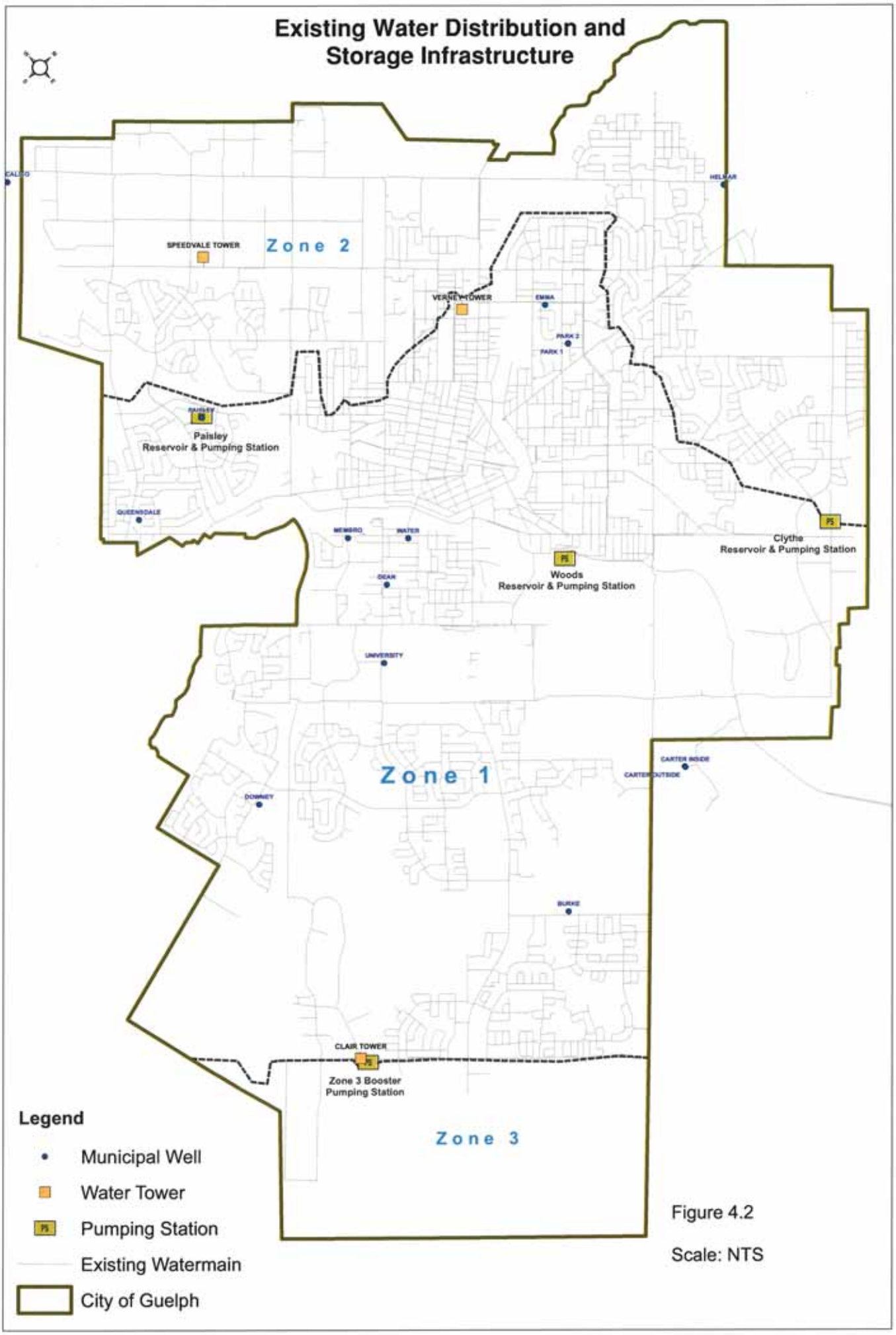


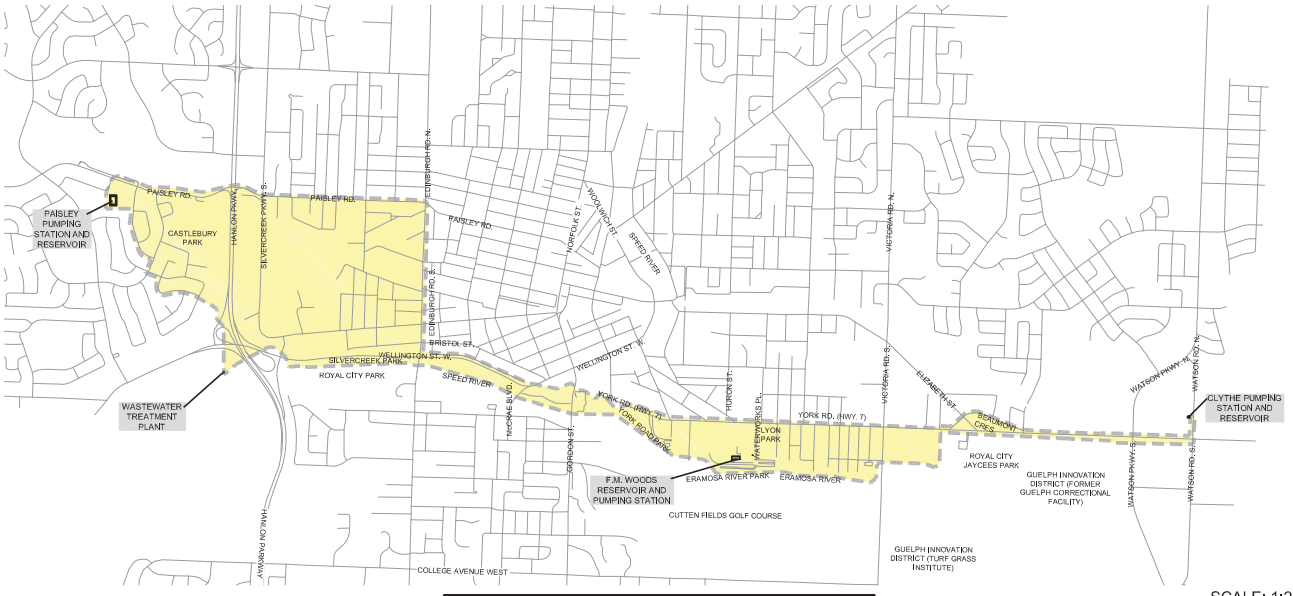
Figure 4.1

Scale: NTS


Existing Water Distribution and Storage Infrastructure
SPEEDVALE TOWER
Zone 2
VERNEY TOWER
EMMA
PARK 2
PARK 1
PAISLEY
Paisley
Reservoir & Pumping Station
QUEENSDALE
MEMORIAL
WATER
DEAN
PS
Woods
Reservoir & Pumping Station
PS
Clythe
Reservoir & Pumping Station
UNIVERSITY
Zone 1
CARTER INSIDE
CARTER OUTSIDE
DOWNEY
BURKE
CLAIR TOWER
PS
Zone 3 Booster
Pumping Station
Zone 3
Legend
Municipal Well
Water Tower
PS
Pumping Station
Existing Watermain
City of Guelph
Figure 4.2
Scale: NTS

4.3 STUDY AREA

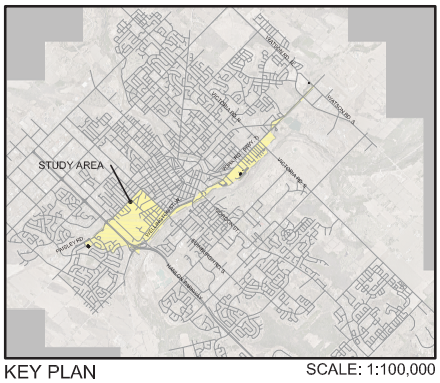
The Study Area defines the boundaries in which servicing alternatives for the York Trunk Sanitary Sewer and the Paisley-Clythe Feedermain were considered. As indicated in Figure 4.3, the Project Study Area extends approximately 8.5 kilometres from the eastern City Limit near Watson Road, and westward, along York Road and through the parkland on the north side of the Speed and Eramosa Rivers, including Eramosa River Park, Lyon Park, York Road Park, and Silvercreek Park, to the WWTP on the west side of the Hanlon Parkway. In addition, the Study Area extends northward, including the Hanlon Expressway, to the Paisley Pumping Station, located on Paisley Road.



SCALE: 1:25,000

LEGEND

STUDY AREA



KEY PLAN

SCALE: 1:100,000

YORK TRUNK SEWER AND PAISLEY-CLYTHE FEEDERMAIN STUDY AREA
FIGURE 4.3

GENIVAR

The Study Area was defined primarily based on water and wastewater conveyance requirements, and existing infrastructure and constraints (e.g. location of existing development, etc.). The area defined allows for the consideration of several alternative alignments.

4.3.1 Existing Land Uses

Land uses in the Study Area include residential, commercial, recreational, and industrial properties. In order to differentiate the broad scope of the Study Area, the area has been generally divided into five Sections:

- **Section 1 – from the City Limit down York Road to Industrial Avenue.** This section includes the York Road corridor. Land use in the area is predominantly commercial; however, some residences are located on the north side of York Road. The major commercial and industrial buildings in the area include auto dealerships, repair shops, construction equipment distributors, hardware stores and restaurants. There is one manufacturing company on York road (GMA Cover Corp.) which produces fabrics. The former Guelph Correctional Institute is located on the south side of York Road. This area is to be redeveloped as the Guelph Innovation District. The park land in the area includes two small lakes south of York Road, by Cityview Drive North, two smaller ponds, a creek, four baseball diamonds and a forested area near Industrial Avenue. Municipal services present in this area include the existing trunk sewer, distribution water mains, and storm sewers, in addition to gas, Bell, hydro, cable, etc. York Road, in this section, has been identified by the City as designated for expansion to four lanes.

- **Section 2 – from Industrial Avenue to the F.M. Woods Pumping Station.** This section encompasses both residential and some light commercial/industrial uses along York Road, as well as park and recreational land use along the Eramosa River, including Lyon Park and a section of Eramosa River Park. The main industrial usages in this area are the PDI factory on Victoria Road, the Biltmore factory outlet on Morris Street and the F.M. Woods Pumping Station and Reservoir at Waterworks Place. There are many commercial buildings which include a large plaza, three auto shops, small convenience shops, restaurants and some larger office buildings west of Victoria Road. There is one church located at Harris Street. The majority of the park land lies on the north side of the Eramosa River in Eramosa River Park. Within this section of the park there are volleyball courts, a baseball diamond, a picnic area and a long pedestrian/cyclist path which runs alongside the river. Lyon Park, which sits above Eramosa River Park, is a large recreational area between Boult Avenue and Waterworks Place. It consists of an outdoor swimming pool/community centre, two baseball diamonds, a seasonal outdoor ice rink and a playground. Other recreational land use includes the Cutten Club Golf Course on the south side of the Eramosa River, a small theatrical arts centre located on Morris Street and a large indoor skate park on at Victoria Road. Utilities in this section include the York Trunk Sewer Main, the aqueduct from the Arkell Springs Well field, water mains which run both to and from the F.M. Woods Pumping Station and Reservoir, and a communications tower located east of Victoria Road. There is a railroad which intersects York Road, east of Victoria Road.

- **Section 3 – from the F.M. Woods Pumping Station to Gordon Street.** This area consists largely of residential and recreational land; however, it also contains some industrial and commercial land. The FM Woods Reservoir and Pumping Station is located in this section. Other industrial land use includes a new industrial construction located at the end of Hood Street. The two large recreational areas in this section are Eramosa River Park and York Road Park. Recreational uses in these areas include a lawn bowling club, four baseball diamonds, soccer fields and a pedestrian/cyclist path on which lies the lattice covered bridge which spans the Speed River. A vacant lot, owned by the City, is located adjacent to Gordon Street, immediately north of the lawn bowling club. Commercial land use in this section includes an animal hospital, a commercial plaza and the Boathouse Tea Room restaurant, all of which are situated on the east side of Gordon Street. There are also some small commercial services along Wyndham Street. The two major institutional buildings in this section are a church and a school. Municipal services present in this zone include existing watermains both to and from the F.M. Woods Pumping Station and Reservoir, and the York Trunk Sanitary Sewer, in addition to various storm sewers which outlet into the Eramosa River.
- **Section 4 – from Gordon Street to Silvercreek Parkway South.** This section is composed mostly of residential and parkland with a few small commercial establishments. Royal City Park on the west side of Gordon Street features many trees and other natural features that will need to be considered; particularly, the presence of a Butternut tree which is an MNR designated Species-at-Risk. Other features include a gazebo, a large flower bed, a playground, a baseball diamond, sculptures near the river and an asphalt footpath lined with ash trees which runs east and west through the park. This area of the park abuts 40 Wellington Street West, which is currently being considered for redevelopment. This site has a pump and treat facility for impaired groundwater associated with past manufacturing activities on that property. The area south of Wellington Street West, called Silvercreek Park, is separated from Royal City Park by a historical stone bridge on McCrae Boulevard. Silvercreek Park contains many recreational features such as a soccer pitch, volleyball courts and a picnic area. Silver Creek also runs through the west end of the park, flowing into the Speed River. The area north of Wellington Street West is generally a matured residential neighbourhood which is densely built-up. There is also a soccer pitch located west of Edinburgh Road North in this area. The areas along Edinburgh Road North (Between Paisley Road and Wellington Street West) and Paisley Road (Between Silvercreek Parkway and Edinburgh Road North) are made up mostly of residential land use but there is some commercial, park and institutional land use in addition to two railroad crossings on Edinburgh Road North. The commercial land use in the area along Edinburgh Road North includes a laundromat, a commercial plaza and an optician. There are two vacant warehouses located at Raglan Street and Edinburgh Road North. Recreational areas include park land near Paisley Road in addition to Sunny Acres Park which has a playground and a splash pad. There is a church and a school located along Paisley Road at Guelph Street.
- **Section 5 – from Silvercreek Parkway South to the Paisley Road Pumping Station**. Land use in this area is primarily residential; however, there is privately owned vacant land on the west side of the Hanlon Expressway, as well as a municipal ditch and municipal right of way. Along Silvercreek Parkway there is a large section of vacant land which is planned for future development. There are also two railroads which intersect Silvercreek Parkway. The first railroad intersects Silvercreek Parkway near Paisley Road, then bridges over the Hanlon Expressway and intersects Paisley Road just west of the Hanlon Expressway. The second railroad intersects Silvercreek Parkway close to Wellington Street West, then continues southwest over the Hanlon Parkway. Just west of Silvercreek Parkway is the MTO controlled Hanlon Expressway (HWY 6) which is a four to six-lane highway. Castlebury Park lies just west of the Hanlon expressway, on the west side of the municipal drainage ditch. In this park there are two soccer pitches and the site of a future school. Other park land in this area includes Deerpath Park which houses a soccer pitch, tennis courts, basketball courts, a playground and some pedestrian/cyclist paths. This is also the location of the Paisley Pumping Station. On the north side of Paisley Road, on the west side of the Hanlon

Expressway, there is Margaret Greene Park. This park has 2 baseball diamonds, 4 tennis courts and two soccer fields. There are dense developments of residential housing located between Paisley Road, Wellington Street West and the Hanlon Expressway in addition to some small subdivisions on Hewitt Line and Service Road.

4.3.2 Potential Contaminant Sources

Based on the *City of Guelph Brownfield Redevelopment Community Improvement Plan Report*, the following section identifies the locations of potential brownfields and other potential contaminant sources within the Study Area. Refer to Figure 4.4 for a map detailing the locations of the potential sources detailed below:

4.3.2.1 Manufacturing/ Chemical Plants

These sites have been or are being used for manufacturing or as a chemical plant. These sites could have contamination resulting from previous or current land uses:

- North of York Road along the Audrey Easement to the west of Victoria Road; currently a Commercial parking lot.
- South of York Road west of Victoria and to the west of the railway tracks; currently a vacant vegetated lot.

4.3.2.2 Auto Wrecking Yard/ Scrap Metal/ Foundries

These sites could contain contamination as a result of the presence of heavy metals or fluid leachate:

- Corner of Water Street and McCrae Boulevard; currently a residential area.
- South of Wellington Street West at the intersection of Bristol Street, currently a recreational park.
- East of Gordon and South of Wellington Street West; currently a gravel parking lot.
- Corner of Ontario Street and Manitoba Street, currently residential area.
- East of Stevenson Street South, North of Beverly Street and South of the railway tracks; currently a vacant lot.
- West of Stevenson Street South of Beverly Street and south of the railway tracks; currently commercial land.
- North of York Road and east of Kingsmill Avenue; currently used for commercial and industrial uses.
- East of Victoria Road, south of Elizabeth Street and north of the railway tracks; currently a vacant vegetated lot.
- East of Victoria, north of the railway tracks, and south of Elizabeth Street, currently the site of B&F Scrap Dealers.
- North of York Road and west of Wells Street; currently the location of Standard Brass.

4.3.2.3 Coal, Oil, Fuel, Salt Storage

These are current or historical sites of salt and fuel storage within the study area:

- West of Denver Road; currently the location of a Municipal salt storage facility.
- East of Gordon Street and north of Surry Street Eas; currently a parking lot and Union Gas Office yard.
- Corner of Arthur Street South and Ontario Street; currently residential land uses.
- South of Hood Street and north of the Eramosa Rive;, currently vegetated recreational land.
- South of Victoria Road and east of Wells Road; Currently a car dealership
- North of York Road, east of Industrial Avenue; currently a car dealership.

4.3.2.4 Auto Service/Gas Station

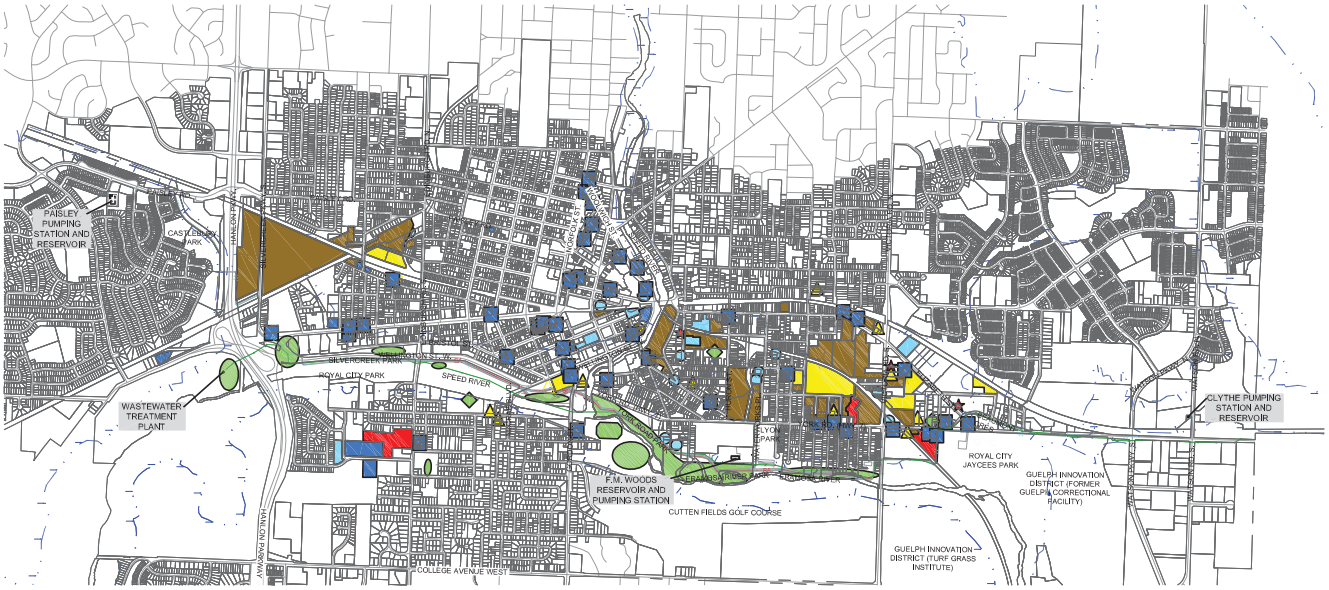
There are several sites within the Study Area used for auto servicing. These sites could potentially become contaminated through mismanagement of auto fluids:

- North of Wellington and west of the Hanlon Expressway; currently Car Lane Auto Centre.
- Intersection of Silvercreek Parkway and Waterloo Avenue; currently a church.
- Corner of Hearn Avenue and Waterloo Avenue; currently Pioneer transmission.
- Corner of Municipal Street and Denver Road; currently a Municipal maintenance yard.
- Corner of Edinburgh Road and Bellevue Street; currently residential/commercial land.
- Corner of Bristol Street and Glasgow Street; currently Hanlon's One Stop Service.
- Corner of Gordon Street and Wellington Street West, west and north on Gordon Street; currently commercial lots (Economy Lube, Van Dam Motors, Enterprise Rent-A-Car, Guelph Auto Sales and Avis Rent-A-Car)
- Corner of Gordon Street and James Street East; currently a vacant lot.
- Corner of Wyndham Street South and Howitt Street; currently Thrifty Car Rental.
- Corner of Ontario Street and Wood Street; currently a residential area.
- North of York Road and East of Smith Avenue; currently Maple Leaf Gas & Fuels.
- North of York Road and East of Hayes Avenue; currently York Auto Sales.
- To the north and south of York Road between Beaumont Crescent and Wells Street; currently used car dealerships (Maha Motors, Tony Commission and 4X4 Auto Sales).

4.3.2.5 Historical Landfill Sites

Various historical abandoned landfill sites are present in the Study Area, as identified in the *Preliminary Investigations Report of an Abandoned Landfill Sites in Guelph*, provided by the City. These are present in:

- Silvercreek Park, on the north side of the Speed River. The reporting indicated that trees in the park are generally healthy, there was no evidence of refuse at the surface, and no changes in water quality downgradient of the area were identified. The presence of methane, however, was detected. Also in this area, a second site was located on the north side of the Speed River, and south of Wellington Street West, east of Edinburgh Road, associated with channelization of the river and road construction. No evidence of refuse was observed and no evidence of methane was detected.
- Eramosa River Park, on the north side of the Eramosa River between Victoria Road and the convergence with the Speed River. The reporting indicates that leachate seepage and some staining on the river bank had been observed and high conductivity readings were present in isolated areas. No methane, however, was detected. Additional investigation of this area had been recommended.
- Bristol Street, north of the Speed River, west of Edinburgh Road and the former OPP building. Major channelization of the River had been performed in this area. Any fill placed in this area was graded and covered with topsoil and reinstated with vegetation. Some surface water quality issues were present downstream of this area, but their specific cause had not been identified. No evidence of refuse was observed and no methane was detected. The report recommended additional investigation be performed in this area, including the advancement of boreholes and groundwater monitoring.
- Waterloo Avenue, north of the Speed River and East of the Hanlon Expressway. Methane gas has been observed to be present in this area and disturbed areas on both the north and south sides of Wellington Street West are present, potentially indicative of historical fill activities. This is supported by evidence of decomposition and settling proximate to Wellington Street West and the potential presence of leachate in storm ditching in the area. The investigation recommended additional investigation.



LEGEND

- MANUFACTURING/ CHEMICAL PLANT
- AUTO WRECKING YARD/ SCRAP METAL/ FOUNDRIES
- COAL, OIL, FUEL, SALT STORAGE
- AUTO SERVICE/ GAS STATION
- LANDFILL SITES
- ESTABLISHED AND VACANT INDUSTRIAL USES

POTENTIAL CONTAMINANT SOURCES
WITHIN STUDY AREA
FIGURE 4.4

SCALE: 1:25,000

GENIVAR

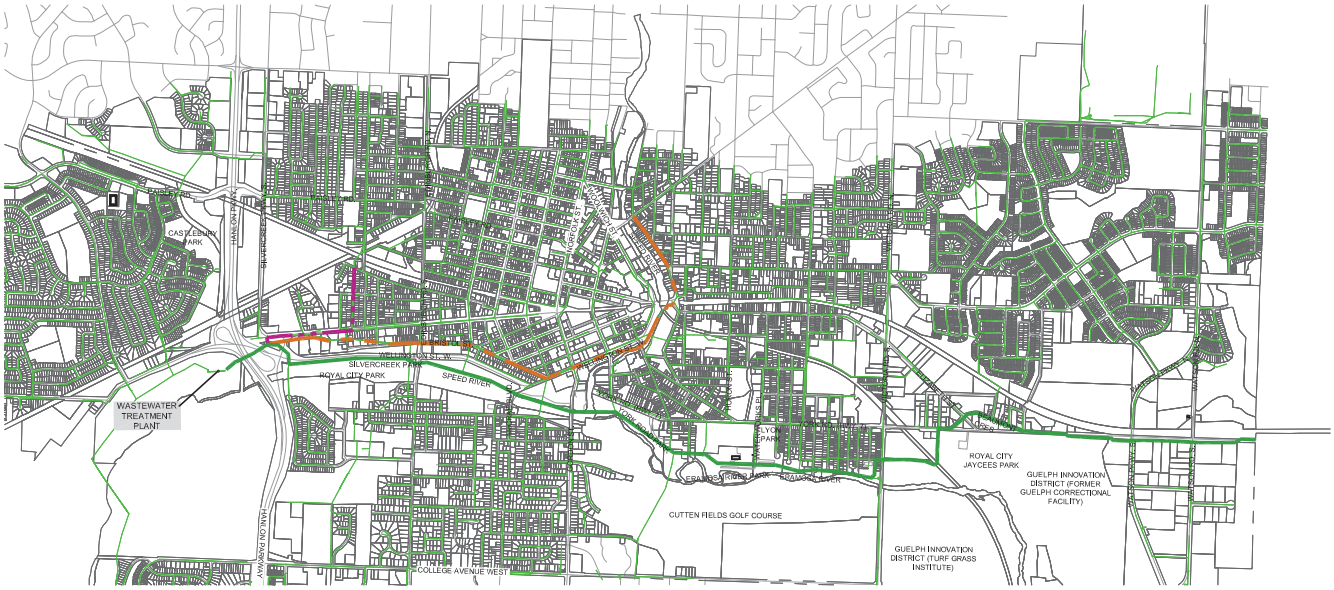
4.3.2.6 Established and Vacant Industrial Uses

These are sites of historical or current large-scale industries within the Study Area:

- East of the Hanlon Expressway, north of Wellington Avenue and south of Paisley Road; currently vegetated vacant Land (the Lafarge Lands)
- East side of Speed River and west of Arthur Street; W.C. Woods Company Limited (site is currently being redeveloped).
- Corner of York Road and Waterworks Parkway; currently Owens Corning Fibreglass.
- North of York Road from Smith Avenue to Victoria Road; currently various industrial and commercial uses.
- North of York Road and West of Wells Street; Currently vacant land.

4.3.3 Existing Wastewater Infrastructure

The City of Guelph wastewater handling system is composed of approximately 490 kilometres of sanitary sewers and six sewage pumping stations. Of these sewers, there are four major trunk sewers that service the northern half (i.e. north of Speed and Eramosa Rivers) of the City: the Waterloo, Arthur, Speed River, and York Trunks. These trunk sewers collect the flow from local collection mains and converge on the east side of the Hanlon Expressway where one large diameter pipe undercrosses the Expressway for conveyance to the Wastewater Treatment Plant (WWTP) located southwest of the intersection of the Hanlon Expressway and Wellington Street West. The WWTP discharges into the Speed River. Refer to Figure 4.5 for a schematic of the relevant trunk sewer system and infrastructure.



LEGEND

- EXISTING WATERLOO TRUNK SEWER
- EXISTING SPEED-ARTHUR TRUNK SEWER
- EXISTING YORK TRUNK SEWER
- EXISTING SANITARY SEWER

EXISTING GUELPH TRUNK SEWERS AND SANITARY INFRASTRUCTURE FIGURE 4.5

SCALE: 1:25,000

GENIVAR

The Waterloo Trunk Sewer is a short trunk sewer which services the East side of the Hanlon Expressway, north of the Speed River. It begins at the intersection of Alma Street and Inkerman Street. From there it heads south toward Waterloo Avenue from which it flows into the Guelph WWTP.

The Arthur Trunk Sewer services the downtown area of Guelph and is continuing to undergo expansion. It commences on the East side of the Speed River by the intersection of Woolwich Street and Eramosa Road. It follows the Speed River southbound until it reaches the Speed River and Eramosa River junction at which point it flows into the Speed River Trunk.

The Speed River Trunk Sewer, which starts at the junction of the Speed River and Eramosa River, follows the north side of the Speed River until its outlet at the Guelph WWTP. It services most of the north and south sides of the Speed River. Flows from the south side of the Speed River are conveyed to the north side via a siphon under the river which also crosses perpendicularly to the York Trunk Sanitary Sewer. This system has been identified as requiring upgrades due to capacity concerns. The Water and Wastewater Servicing Master Plan has identified a connection to the York Trunk as an alternative to reduce flows in that service to allow for future servicing requirements.

The York Trunk Sewer begins at the eastern Guelph City boundary. It is aligned along York Road to Victoria Road South, where it heads south toward the Eramosa River. It then follows the river through the Eramosa River and York Road Parks to the confluence of the Speed and Eramosa Rivers, where its alignment takes it into the river, with a bend under the Gordon Street Bridge to take it into the Silvercreek Park. It passes through the park and connects to the main inlet pipe which undercrosses the Hanlon Expressway, outletting at the Guelph WWTP. The York Trunk serves most of the area north of the Eramosa River and east of Huron Street, along with some isolated areas west of the intersection of Norfolk Street and Waterloo Avenue.

In addition, the York Trunk Sanitary Sewer receives approximately 1,200 cubic metres per day of sewage from the Community of Rockwood, which is discharged into the Trunk sewer at the eastern City Limit at York Road. This is collected in a storage tank in Rockwood and batch pumped in via a forcemain to the connection to the York Trunk Sanitary Sewer daily. At the connection point with the York Trunk Sanitary Sewer the sewage is flowing by gravity and is not running under pressure. A second connection is located at Victoria Road South, where sewage from the newly developed Kortright Subdivision discharges into the Trunk Sewer.

4.3.4 York Trunk Sanitary Sewer Condition

4.3.4.1 Pipe Condition

The Water and Wastewater Servicing Master Plan has identified that inspection of the manholes in the Eramosa River Park reach of the York Trunk Sanitary Sewer indicated that there is possible collapse or breakage in some sections of the sewer. Due to the high liquid level in the pipes, even during dry weather events, inspection of these pipes has been limited, and the extent of any damage and the condition of the sewer pipes is unknown.

Additionally, it has been identified by the City that the effects of high hydrogen sulphide gas levels resultant from the sewage being conveyed from Rockwood has caused deterioration of the concrete pipes and manhole structures in the easternmost section of the trunk sewer. This is most likely due to the anaerobic conditions in the Rockwood tank and forcemain followed by the subsequent discharge by gravity, which can cause the release of hydrogen sulphide.

4.3.4.2 Inflow and Infiltration

The City initiated a sanitary sewer flow monitoring program across its system to investigate capacity within the sewer pipes in 1998 in order to plan for operations both in the present and in the future. As a result of that study, the York Trunk Sanitary Sewer was assessed with respect to general condition and quantity of inflow and infiltration being generated during both dry and peak wet events. The

details of this study were presented in the Inflow/Infiltration and York Trunk Sanitary Sewer Assessment, prepared by CH2MHill in March, 2002 and in the Wastewater Collection System Inflow and Infiltration Study, prepared by XCG Consultants Ltd., in 2011.

In addition, separate CCTV and smoke test investigations were performed by the City which identified additional inflow sources into the sewer system, such as sump and rain leader connections to the sanitary sewer system.

These studies concluded that the service area of the York Trunk Sanitary Sewer generates a substantial amount of inflow and infiltration, with several sections of the sewer operating at a surcharge even during normal flow conditions. The system is currently at full capacity in the same areas and cannot accommodate any future infrastructure development in its current state without a reduction in inflow and infiltration. During wet weather events the capacity of the pipes are taxed and some reaches of the system operate at a surcharge.

The trunk sewer poses a generally low risk of basement flooding, based on the conclusions of the Inflow and Infiltration report, however, it was reported to GENIVAR by City of Guelph staff that basement flooding has been reported at properties located around Victoria Road South and York Road. Severe surcharges are possible if the system is exposed to prolonged periods of wet weather.

4.3.5 Existing Water Infrastructure

The current water distribution system in the City of Guelph consists of:

- 23 wells;
- 3 elevated storage tanks;
- 6 major in-ground storage tanks; and,
- 3 booster stations in three pressure zones.

70% of the water supplying Guelph comes from the Arkell Springs Wells and is conveyed to the FM Woods Reservoir and Pumping Station via aqueduct and then into the water distribution system. The remainder of the water supply is from the other wells which supply water to the main treatment plant.

The three pressure zones that make up the water distribution system are Zone 1, Zone 2, and Zone 3. Zone 2 is the northernmost zone, whereas Zone 1 is the central zone which contains the downtown core and extends southward to Clair Road, Zone 3 services the area south of Clair Road.

The Water and Wastewater Servicing Master Plan has identified deficiencies in the existing distribution system, including;

- Aging water mains;
- Lack of pressure in certain areas; and,
- A need for an additional distribution system south of Clair Road.

Some of the planned improvements which were recommended in the Master Plan consist of:

- Reinforcing Zone 1 with a main transmission loop;
- New east-west and north-south transmission mains in Zone 1;
- A new Zone 3 south of Clair Road complete with a booster station and storage tank;
- East-west transmission mains along Speedvale Road in Zone 2; and,
- Modifications to pressure boundaries to address high and low elevation issues.

This study is addressing the provision of a new east/west transmission main in Zone 1, as recommended in the Master Plan.

A review of the existing water distribution system in Zone 1 indicated that there is a lack of redundancy and looping within this Zone, particularly with respect to transmission of water to the Paisley and

Clythe pumping stations. In addition, the eastern portion of Zone 1 has limited pipes of greater than 300 millimetres in diameter which would provide additional capacity and flow when required. Large diameter watermains are present in the western portion of Zone 1. The imbalance of water distribution within the system has resulted in fluctuations in pressures, particularly during peak demand times however, additional redundancy would improve conveyance, which would be provided by the additional feedermain.

Further, additional redundancy is necessary to ensure the reliability of the distribution system within the Zone in the event of a watermain break or if maintenance shut-down is required.

4.3.6 Existing Utilities

In addition to the watermain and sanitary sewers present in the Study Area, and discussed above, other utilities and services expected to be encountered in the Study Area include; storm, gas, Bell, hydro, and cable.

For the most part, these are restricted to the right-of-way and private connections to properties and will not cause any significant impact on any new sanitary or feedermain installation. These can also be relocated, if required.

Storm sewers, however, are present within the municipal right-of-way and may cause some limitation with respect to available space within the right-of-way for the installation of any new utilities. Further, there are a number of storm sewer outlets along the Speed and Eramosa Rivers which cross the existing trunk sewer and will need to be considered with respect to service location, both horizontally and vertically, and with respect to constructability and maintaining storm sewer operations during any installations works in that area. In order to maintain existing storm conveyance systems, realignment, or redirection of existing storm sewers should be avoided.

Two significant crossings of storm outlets will be required at the two municipal drain outlets which undercross Wellington Street West, in the Silvercreek Park. Currently, the existing sanitary sewer is exposed as it crosses the drains. Opportunities may exist to reconfigure the municipal drains themselves, by reconfiguring their profiles and raising their outlet grades to allow the sanitary sewer to cross under the outlet channel. This may also allow for the renaturalization of the channels.

Municipal Drain Crossings of the Existing York Trunk Sewer

4.4 LAND USE PROJECTIONS

The York Trunk Sanitary Sewer and Paisley-Clythe Feedermain service area is comprised of lands designated for existing and future residential, employment, institutional, and industrial uses as identified in the City`s Official Plan and Official Plan Amendment No. 42. The 2006 and 2031 residential and employment traffic zone populations, previously developed by Watson and Associates for the Local Growth Management Study, were used to determine the infill and intensification growth areas in the City of Guelph, and are attached in Appendix A. Population phasing between 2011 and

2031 was calculated based on the assumption that the population growth between 2006 and 2031 is linear.

4.4.1 Population Projections

Since the populations were developed by traffic zones, and each traffic zone is comprised of different catchment areas, which may or may not entertain additional population and employment growth, an exercise was undertaken to determine the 2006 and 2031 populations in each catchment area within a given traffic zone. The analysis took into consideration the land use areas identified in Schedule 1 of Official Plan Amendment 42 to determine which catchment areas would have employment or residential growth. It was necessary to determine the population growth based on catchment area since the way in which the wastewater flows enter the York Trunk Sewer is based on catchment area and not traffic zones.

Residential and Employment populations within each catchment area, in a given traffic zone, was prorated based on the surface area of the catchment area within the traffic zone. In cases where a given catchment area did not appear to have any growth areas, per Schedule 1 from OPA 42, that catchment area was not allocated a population growth. Also, all Significant Natural Areas, as desin Schedule 1, were assumed not to have future growth populations. The catchment areas within each traffic zone were given a unique identification number which indicated the traffic zone and the catchment area. The format for this identification number is Traffic Zone #-Catchment Area #, as is illustrated in the figure in Appendix A. Once the residential and employment populations were allocated to each catchment area within a traffic zone, the population within a given catchment area was calculated by summing the population growth for a particular catchment area (i.e. across multiple traffic zones). This methodology was used to determine the 2006 and 2031 populations. These calculations are provided in Appendix A, which also includes the corresponding map.

4.5 WASTEWATER FLOW PROJECTIONS

Wastewater flow projections have been determined using the City of Guelph's Sanitary Sewer Design Guidelines in consultation with the City of Guelph. The intent is to design the sanitary sewer for the 2031 population projections determined through the Local Growth Management Study, which formed the basis for the population outlook used in the Water and Wastewater Servicing Master Plan. The wastewater flow projections were calculated based on the growth populations calculated for each catchment area, as described in Section 4.4.1, and the design criteria listed in Table 4.1. The wastewater flows projections were used to assess the capacity of the existing Trunk Sanitary Sewer and to develop the preliminary design of the York Trunk Sanitary Sewer upgrades. The York Trunk Sanitary Sewer will be designed to service future growth that is beyond the planning horizon (full build-out scenario). The full build-out scenario takes into account the full development of the York Trunk Sanitary Sewer service area. According to the preliminary design, the York Trunk Sanitary Sewer can provide service for a population of approximately 159,000 people. The York Trunk Sanitary Sewer was sized to allow for flows from Rockwood to continue to be pumped to the York Trunk Sanitary Sewer, if required. The calculations for the flows in the York Trunk Sewer are in the sewer design sheet which can be found in Appendix A for the years 2011, 2016, 2021, 2026, and 2031.

Some of the criteria outlined in the City's Sanitary Sewer Design Guidelines are summarized in Table 4.1 and Table 4.2.

Table 4.1 Design Flow Guidelines for Commercial, Industrial, and Institutional Development

Design Criteria	Design Flow (L/cap/Day)
Commercial	300
Industrial	300
Institutional	300

The peak domestic sewage flow was calculated using the Harmon formula as recommended by the Ministry of Environment Design Guidelines for Sewage Works (2008). This equation took into

consideration the residential design population, tributary area, peaking factor, peak extraneous flow, and average flow.

Table 4.2 City of Guelph Sanitary Sewer Design Guidelines for Residential Development

Design Parameter	Design Criteria
Average Flow	300 L/person/day
Peaking Factor	Harmon Peaking Factor
Peak Extraneous Flow – Inflow/Infiltration	0.1 L/s/Ha

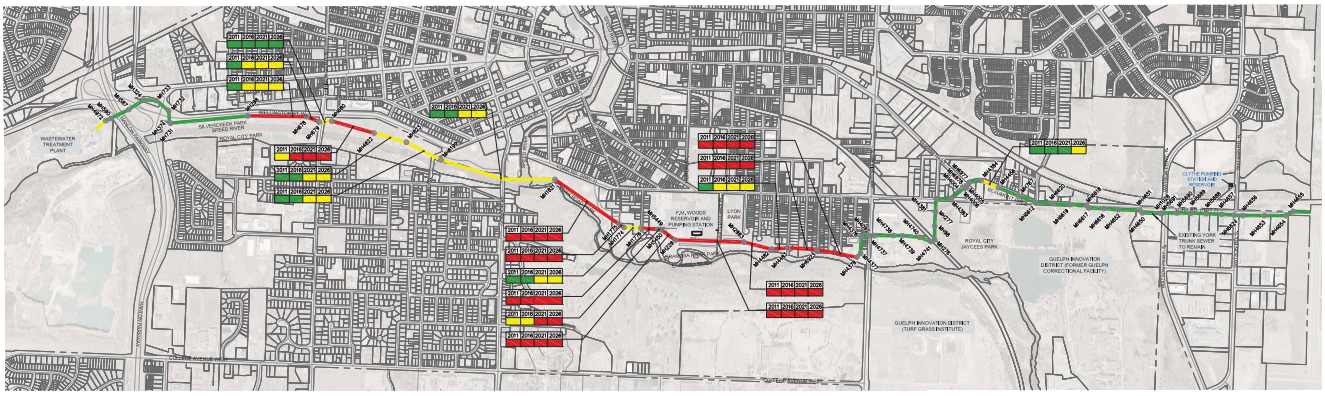
4.6 TRUNK SANITARY SEWER CAPACITY AND SYSTEM REQUIREMENTS

The York Trunk Sanitary Sewer is to have adequate capacity to accommodate wastewater flows generated from existing and future development within its service area. It is good engineering practice to also provide sufficient capacity to meet servicing requirements beyond the current planning horizon of 2031. The sizing and capacity determined for wastewater flows must provide sufficient capacity to service future growth areas. Additionally, the Community of Rockwood has been serviced by the York Trunk Sanitary Sewer since 1977. Since it is unknown whether the Community will continue to divert its wastewater flows to the Guelph WWTP, thereby requiring servicing via the York Trunk Sanitary Sewer, the sewer should be sized to accommodate future flows generated in Rockwood. Efforts are to be made, therefore, to size the trunk sanitary sewer to meet the wastewater flows projected for a full-build out scenario and the needs beyond the service area requirements.

Another significant consideration when determining the capacity requirements for the York Trunk Sanitary Sewer is that the system must be able to integrate with the existing infrastructure and not negatively impact current operation of the collection system.

4.6.1 Capacity Constraints

Based on the calculated flows, several sections of the York Trunk Sanitary Sewer were identified to be over design capacity (80% full flow capacity) based on flow projections at five year increments from 2011 to 2031, as illustrated in Figure 4.6. Refer to Appendix A for the modeling work sheets.



NOTE: FIGURE INDICATES FINAL 2031 CAPACITY CONSTRAINTS.

LEGEND

- SEWER WITH ADEQUATE CAPACITY
- SEWER WITH FULL CAPACITY (OVER 80%)
- SEWER WITH SURCHARGED (ABOVE 100% CAPACITY)
- EXISTING SANITARY MANHOLE
- CAPACITY CONSTRAINTS AT 5 YEAR INTERVALS

YORK TRUNK SEWER
CLASS ENVIRONMENTAL ASSESSMENT
2011 TO 2031 CAPACITY CONSTRAINT ANALYSIS
FIGURE 4.6

SCALE: 1:10,000

GENIVAR

4.7 NATURAL ENVIRONMENT

An overview of the natural environment within the Study Area is discussed within this section.

4.7.1 Physiography & Hydrogeological Conditions

4.7.1.1 Physiography

The Study Area is located within the Guelph Drumlin Field physiographic region (Chapman and Putnam, 1984), which consists of elongate till-covered hills with long axes oriented west to northwest. The spacing between drumlins is generally filled with materials associated with alluvial deposition. These valleys tend to run at right-angles to the trend of the hills, with interconnecting cross-valleys that occupy the deeper depressions between the drumlins. The overall pattern is of gravel terraces rimming the till-cored drumlins separated by swampy, poorly drained valleys. In addition, sand and gravel ridges cross the area, associated with sub-glacial river deposition and outwash flows from the top of glacial ice.

4.7.1.2 Surficial Geology

The Study Area is covered by silty clay Port Stanley Till with areas of glaciofluvial and glaciolacustrine sands and gravels in between. This corresponds to the drumlins (till) and intervening valleys (sand and gravel). Modern alluvial deposits are found in the vicinity of the Speed and Eramosa Rivers. In some places, these rivers have eroded away the overburden material and bedrock is exposed at ground surface. In addition, ice-contact sand and gravel associated with the Ariss Esker (near Watson and Eastview Road) and the Guelph Esker (Hanlon Parkway between Paisley and Woodlawn Road) also cross the area. To the south, a larger area of ice-contact sand and gravel associated with the Paris moraine is identified as a kame. Occasional organic deposits associated with bogs dot the area. Along the main study route, surficial materials are confined to outwash sands and gravels, recent alluvium, and shallow bedrock.

A surficial soils map for the Study Area is presented as Figure 4.7, which is based on information from the Ministry of Northern Development and Mines (MNDM) databases. Primary soil units in the site area include the following:

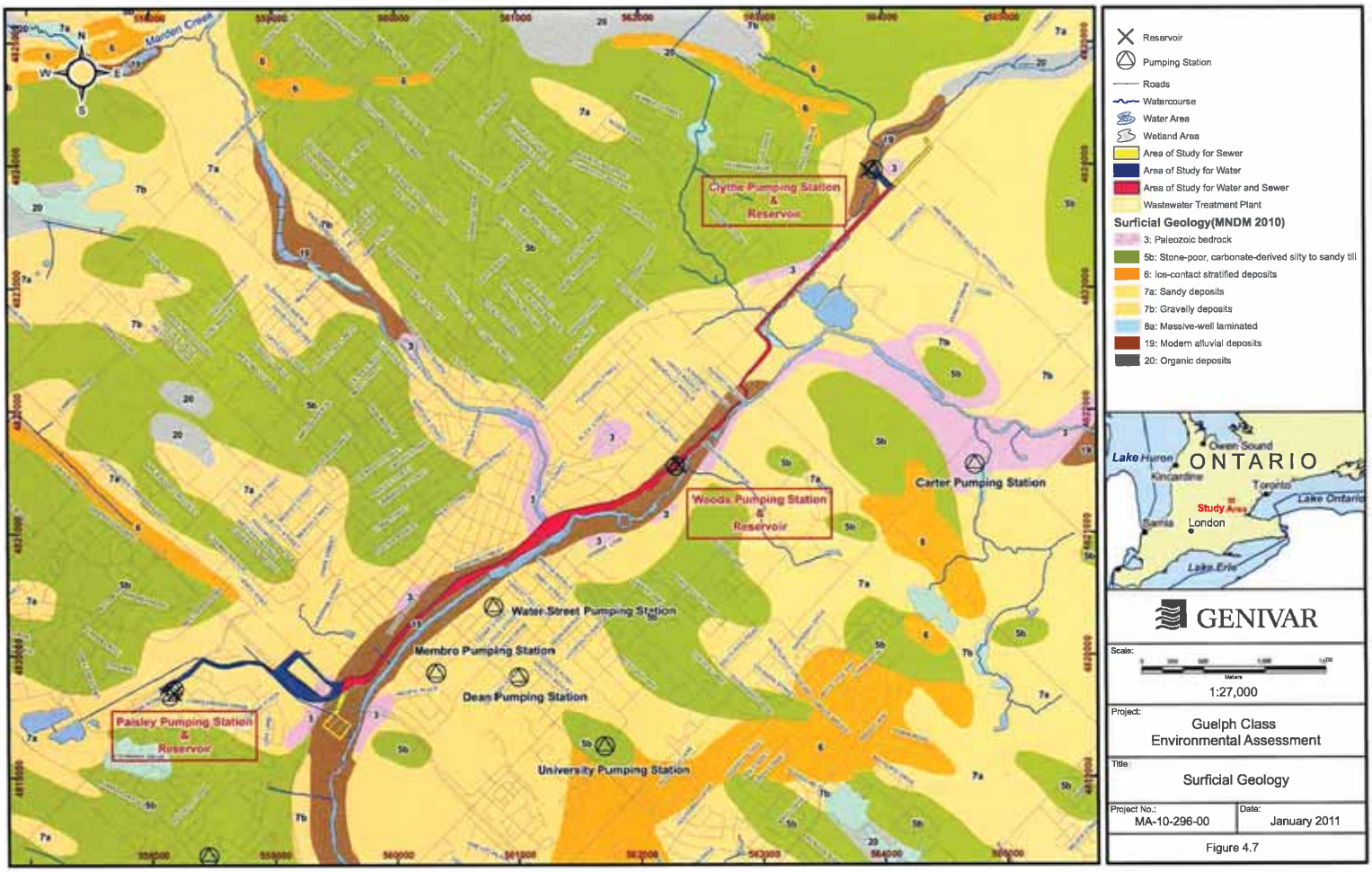
- Unit 3 (pink): Paleozoic bedrock
- Unit 5b (green): Stone-poor, carbonate-derived silty to sandy till
- Unit 7a (beige): Sandy deposits
- Unit 7b (beige): Gravelly deposits
- Unit 19 (brown): Modern alluvial deposits

4.7.1.3 Regional Geology and Hydrogeology

The subsurface geology in the area has been characterized at length. Conceptually, the stratigraphy can be subdivided into the following components:

- Modern alluvium and organic deposits
- Ice Contact Stratified Deposits
- Glacial outwash deposits
- Port Stanley Till
- Older Tills
- Bedrock

A conceptual cross-section showing the stratigraph is presented in Figure 4.8. Note that the geologic conceptualization of the bedrock has been modified since this figure was created. However, it still provides a good understanding of the relationships between the stratigraphic units in the area. Each component is described in more detail below.


Marden Creek
Clythe Pumping Station & Reservoir
Woods Pumping Station & Reservoir
Carter Pumping Station
Water Street Pumping Station
Membro Pumping Station
Dean Pumping Station
University Pumping Station
Paisley Pumping Station & Reservoir
N
S
E
W
Reservoir
Pumping Station
Roads
Watercourse
Water Area
Wetland Area
Area of Study for Sewer
Area of Study for Water
Area of Study for Water and Sewer
Wastewater Treatment Plant
Surficial Geology(MNDM 2010)
3: Paleozoic bedrock
5b: Stone-poor, carbonate-derived silty to sandy till
6: Ice-contact stratified deposits
7a: Sandy deposits
7b: Gravelly deposits
8a: Massive-well laminated
19: Modern alluvial deposits
20: Organic deposits
Lake Huron
Owen Sound
ONTARIO
Kincardine
Toronto
Lake Ontario
Study Area
Sarnia
London
Lake Erie
GENIVAR
Scale:
Meters
1:27,000
Project:
Guelph Class Environmental Assessment
Title:
Surficial Geology
Project No.:
MA-10-296-00
Date:
January 2011
Figure 4.7

Modern Alluvium and Organic Deposits

Modern alluvium consists of gravel, sand, silt and clay associated with recent deposition of sediments within the floodplains of rivers and streams. It is associated with modern watercourses in the Study Area, including: the Speed River, the Eramosa River, and Clythe Creek. In addition, in areas where water flow is sluggish, organic deposits associated with bogs and swamps tend to collect. Depending on the location, these deposits overlie till, outwash deposits, or bedrock, and are typically less than 5 metres in thickness. Generally, these deposits are water-bearing and can be considered as aquifers. However, they are not generally used for municipal supply.

Ice-Contact Stratified Deposits

Within the Study Area, two types of ice-contact stratified deposits have been identified. Eskers are thin, sinuous ridges of sand and gravel created by streams that flowed beneath glacial ice. Two eskers are present within the Study Area. The Ariss Esker is located in the eastern portion of the study alignment near Watson Road and Eastview Road. It is discontinuous, but can be traced heading north and then to the west crossing Woodlawn Road. The Guelph Esker is located along the Hanlon Parkway between Paisley Road and Woodlawn Road. These eskers have been mined extensively for sand and gravel. The second type of ice-contact stratified deposits identified within the Study Area is kames. These are sand and gravel deposits resulting from meltwater pouring off of the glacial ice. A large sand and gravel kame is located to the southeast in the vicinity of Stone Road. These units are considered aquifers, but are generally not sufficient for municipal production. They can be used to satisfy residential water demands, however.

Glacial Outwash

Glacial outwash deposits consist of sand and gravel and are deposited in former glacial spillways where water flowed during the retreat of ice sheets. In the Study Area, they are found in the vicinity of the Speed and Eramosa Rivers. These deposits have been noted up to 10 metres in thickness. The sands and gravels are considered to be aquifers, but are generally not used for municipal supply in the Study Area.

Port Stanley Till

The till was deposited beneath the glacial ice and is present throughout the area in plains and drumlins. It generally underlies the glacial outwash and ice-contact deposits. It occasionally contains isolated lenses of sand and gravel. Previous reports suggest that the till is absent in some locations, and up to 30 m thick in others. This is generally considered to be an aquitard. Sand lenses within the till may be sufficient for private water well supplies.

Older Tills

Older tills may be present in the Study Area filling depressions and valleys in the bedrock surface, and are considered to be aquitards. These tills may also be overlain by granular deposits, some of which may be sufficient for municipal production.

Bedrock

The previous and current interpretations of the bedrock units are discussed below. Groundwater flow in the bedrock is generally towards the Speed River.

Previous Understanding

The previous understanding of the bedrock composition within the study area shows dolostones of the Guelph and Amabel formations. The Guelph formation is up to 30 m thick and is a brown to buff colour. The Amabel formation was subdivided into four members, of which only the Eramosa formation and Unsubdivided Amabel formation were identified. The Unsubdivided Amabel consisted of the Wiarton and Colpoy Bay formations, which were indistinguishable in the study area. It is blue, white and grey and is about 20-25 m thick. These units are considered to be aquifers, although some considered the Eramosa member to be an aquitard (Braun et al., 1999). A heavily fractured zone within the Unsubdivided Amabel was identified as the source of much of the City's water supply. The

Amabel formation was underlain by the dolostones / shales of the Reynales formation, which were considered to be aquitards.

Current Interpretation

The current interpretation has been modified somewhat to provide additional refinement to the conceptualization of the bedrock. The definition of the Guelph formation remains intact. However, the Amabel formation has been subdivided into three separate formations, which include the Eramosa, Goat Island and Gasport Formations. The Gasport Formation is the water supply aquifer for the City, whereas the Vinemount Member of the Eramosa Formation is the most significant aquitard in the area (AquaResource, 2010). The Reynales Formation is now identified as the Cabot Head formation. The conceptualizations are outlined in Table 4.3. A conceptual cross-section is provided in Figure 4.8.

Table 4.3 Geological Conceptualization (from AquaResource, 2010)

<table>
<tr><th colspan="2">Revised Conceptualization
Formation / Member</th><th colspan="2">Previous Conceptualization
Formation / Member</th></tr>
<tr><td colspan="2">Overburden</td><td colspan="2">Overburden</td></tr>
<tr><td>Guelph Formation</td><td></td><td>Guelph Formation</td><td></td></tr>
<tr><td rowspan="2">Eramosa Formation</td><td>Reformatory Quarry Member</td><td rowspan="5">Amabel Formation</td><td rowspan="2">Eramosa Member</td></tr>
<tr><td>Vinemount Member</td></tr>
<tr><td>Goat Island Formation</td><td>Ancaster / Niagara Falls Members</td><td rowspan="3">Wiarton / Colpoy / Lions Head Members</td></tr>
<tr><td>Gasport Formation</td><td>Gothic Hill Member</td></tr>
<tr><td colspan="2">Irondequoit / Rockway / Merritton Formations</td></tr>
<tr><td colspan="2">Cabot Head Formation</td><td colspan="2">Cabot Head / Reynales Formation</td></tr>
</table>

4.7.1.4 Water Supply Wells

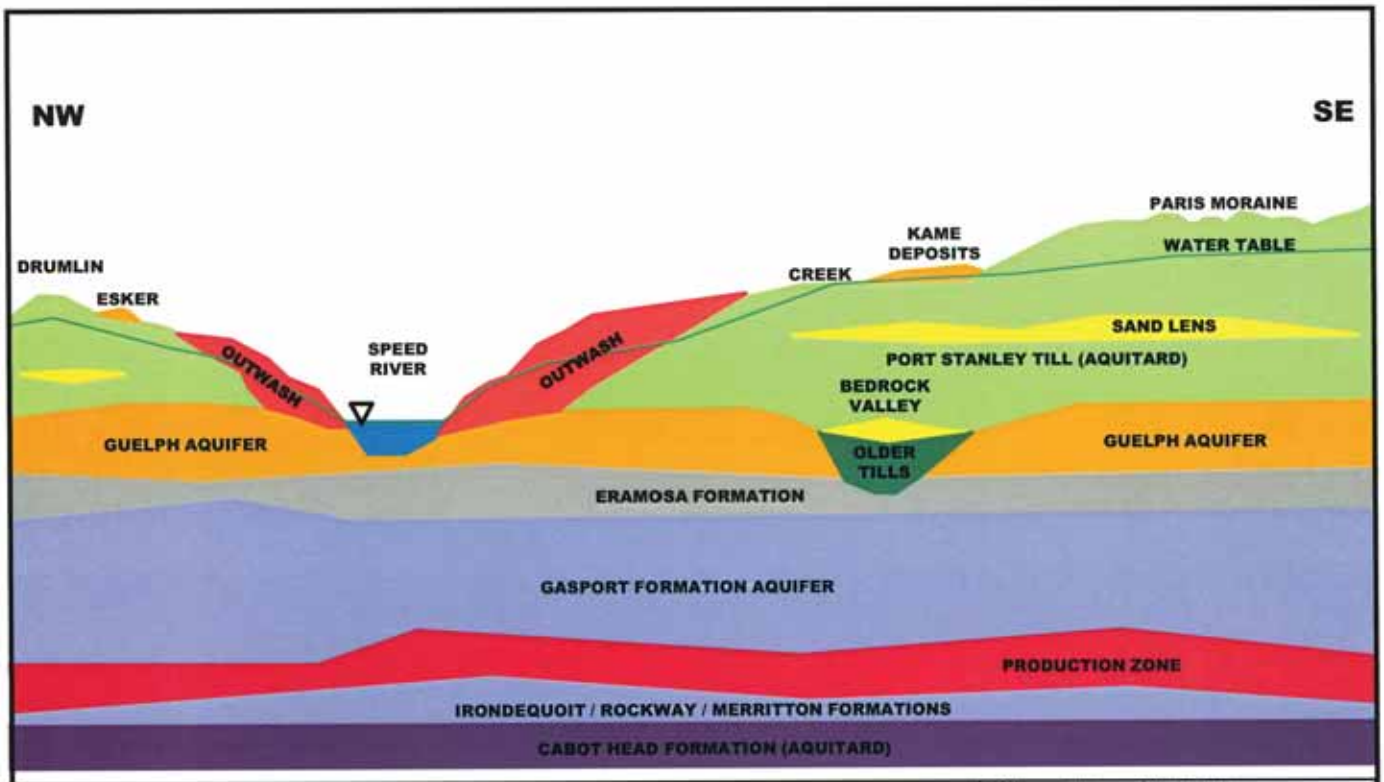
Four municipal water supply wells were noted within the Study Area:

- Paisley Road Well
- Membro Well
- Water Street Well
- Clythe Creek Well

The Paisley Road and Clythe Creek wells are at the western and eastern extents of the Study Area respectively, while the Membro and Water Street Wells are on the south side of the Speed River. All of these wells take water from the bedrock. Since residents are serviced by a municipally operated water supply, no residential wells are expected within the Study Area.

4.7.1.5 Source Water Protection

A vulnerability assessment was conducted for the water supply wells in the City of Guelph. As part of this assessment, groundwater vulnerability maps were created and capture zones were delineated (AquaResource Inc., 2010). These maps indicate that the entire alignment of the York Trunk Sanitary Sewer and the Paisley-Clythe Feedermain are expected to be within the combined 2-year capture zone for the Guelph wells. The entire alignment is also within the zone designated as where groundwater is most vulnerable to contamination.

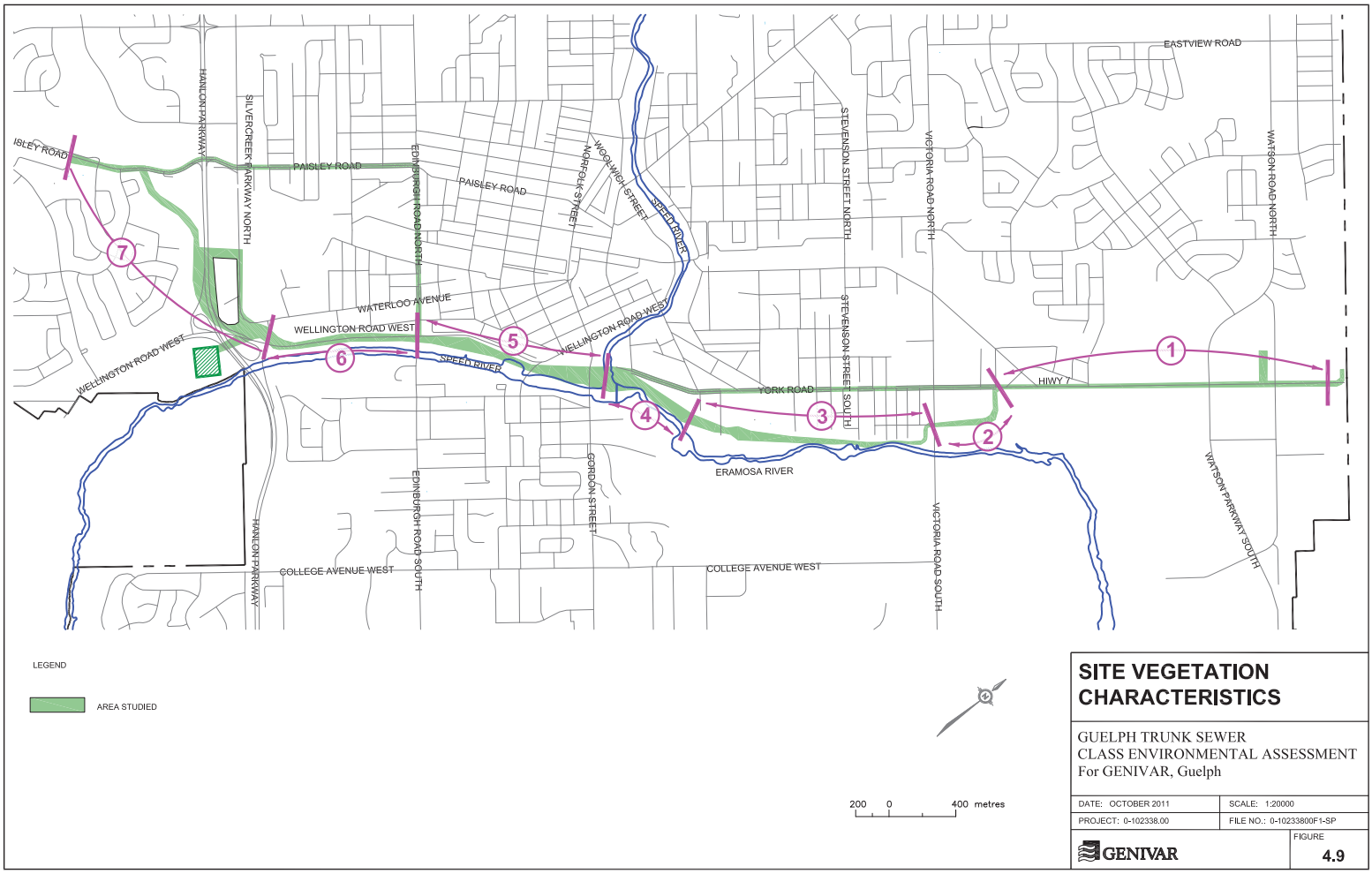


Modified from Braun Consulting Engineers, Gartner Lee Limited, and Jagger Hims Limited, 1999. Updated with information from AquaResource, 2010.

CLIENT	CONSULTANT(S): GENIVAR
PROJECT TITLE	YORK TRUNK SEWER
DRAWING TITLE	CONCEPTUAL REGIONAL CROSS-SECTION
SCALE	DATE: JANUARY 2010
PROJECT NO.: MA-10- 296-00-MA	DRAWN: Figure 4.8

4.7.2 Terrestrial Environment

The Study Area is highly disturbed in its entirety, with the majority of the Study Area being used as either roadside consisting of manicured lawn area with occasional ornamentals, or as parkland with manicured lawn with large, mature trees sporadically placed. Very small areas of early-succession forest exists in patches in some vegetation sections of the Study Area; however, the close proximity of these locations to the parkland and roadside edges, along with the steady stream of park users and traffic noise do not provide any significant habitat for species other than those that do well under anthropogenic stressors. Terrestrial habitats within the Study Area have been broken into sections based on vegetation and disturbance characteristics, as illustrated in Figure 4.9. Land use within the Study Area beyond Section 1 in the northeast was agricultural with little to no native vegetation and no mature trees present. Land use along York Road between the eastern edge of Vegetation Section 2 and the western edge of Vegetation Section 4 was mostly residential with some light industrial and commercial developments. The only natural areas along this stretch of York Road consist of manicured parkland and occasional ornamental trees. Edinburgh Road North and Paisley Road are highly developed with residential applications lining both sides of the roadways. Vegetation in this area is primarily manicured lawn with occasional ornamental trees.



SITE VEGETATION CHARACTERISTICS

GUELPH TRUNK SEWER
CLASS ENVIRONMENTAL ASSESSMENT
For GENIVAR, Guelph

DATE: OCTOBER 2011	SCALE: 1:20000
PROJECT: 0-102338.00	FILE NO.: 0-10233800F1-SP

GENIVAR

FIGURE 4.9

Vegetation Section 1

Land use in Vegetation Section 1 was generally light industrial with a smaller degree of commercial and residential applications. In general, the roadsides consisted of large manicured lawn areas with large, mature ornamentals. Ornamentals included mostly very large Sugar Maple (*Acer saccharum*), and to a lesser degree Red Pine (*Pinus resinosa*), White Spruce (*Picea glauca*), and occasional Eastern White Cedar (*Thuja occidentalis*). Trees within these areas are generally large.

Vegetation Section 2

Vegetation Section 2 of the Study Area ran behind a light industrial building and alongside a strip-mall parking lot to cross Victoria Road South. This section was the most heavily vegetated within the Study Area consisting of a mix of large and small Manitoba Maple (*Acer negundo*), as well as occasional small Sugar Maple. This area consisted of generally thicker vegetation including patches of Staghorn Sumach (*Rhus typhina*), Hawthorn (*Crataegus sp.*), and Red-Osier Dogwood (*Cornus stolonifera*) thickets.

Vegetation Section 3

Vegetation Section 3 consisted of a small park and walking trail running along the riverbank with very large, mature White Willow (*Salix alba*) and Norway Maple (*Acer platanoides*), with occasional White Ash, Manitoba Maple, and Sugar Maple. While bordered by large, mature trees, this section consisted of a 25-30 metre opening of manicured lawn area and walking path that served as a recreational area for local residents.

Vegetation Section 4

Land use in Vegetation Section 4 is parkland consisting of manicured lawn area and sporadic, mature ornamental trees. The majority of section 4 consisted of open manicured lawn with occasional planted Sugar Maple and White Ash. The areas directly adjacent to the river are more naturalized; common species included White Pine (*Pinus strobus*), Sugar Maple, Balsam Poplar (*Populus balsamifera*), White Ash, Trembling Aspen (*Populus tremuloides*), and several shrub species.

Vegetation Section 5

Parkland and pedestrian trail land use continues within Vegetation Section 5, with manicured lawn area and large, mature trees prevailing. Tree species within this area included White Ash, Silver Maple, and White Willow, and to a lesser extent White Spruce, Black Spruce (*Picea mariana*), and Sugar Maple. A single mature Butternut (*Juglans cinerea L.*) was observed in Royal City Park. The area directly southwest of Gordon Street had trees tagged suggesting an Arborist Report had been compiled for the area which may be useful for future planning. Moving southwest, more naturalized areas directly adjacent to the river (within approximately 5-10 metres) consisted of Sugar Maple, White Spruce, American Beech (*Fagus grandifolia*), White Birch (*Betula papyrifera*), Red Oak (*Quercus rubra*), Eastern White Cedar, Red Pine, White Pine, Trembling Aspen, and Balsam Poplar. While heavily disturbed, these areas had the greatest species diversity within the Study Area.

Vegetation Section 6

Section 6 consisted of heavily disturbed areas directly adjacent to Wellington Street West and Hanlon Parkway. The eastern portion of this vegetation section is continued park system with both a vehicle access and a parking area and pedestrian pathway. Vegetation was generally open, manicured lawn with occasional large, mature trees in the established park areas, and common field plants and occasional trees in the extreme western portions of this section. Common species in this area include White Spruce, White Birch, White Ash, White Willow, Manitoba Maple, Jack Pine (*Pinus banksiana*), and Eastern White Cedar.

Vegetation Section 7

Land use within Vegetation Section 7 consists of manicured lawn area, open fields and roadsides with little or no trees present. An old gravel pit exists on the lands east of the Hanlon Parkway and north of Waterloo Avenue. Early successional species including grasses, Goldenrod (Solidago sp.) and small shrubs dominate this area. To the west of the Hanlon Parkway the only existing natural areas follow the course of a municipal drain from the Hanlon Parkway to Paisley Road. Vegetation along the drain is predominantly manicured lawn and open field areas. In this section, both sides of Paisley Road are

lined by residential developments with limited lawn and roadside vegetation, and few ornamental trees.

4.7.3 Significant Wildlife Habitat

Wildlife habitat is defined as areas where plants, animals, and other organisms live and find adequate amounts of food, water, shelter, and space needed to sustain their populations. Specific wildlife habitats of concern may include areas where species concentrate at a vulnerable point in their annual life cycle; and areas which are important to migratory or non-migratory species (PPS 2005).

Wildlife habitat is referred to as significant if it is ecologically important in terms of features, functions, representation or amount, and contributing to the quality and diversity of an identifiable geographic area or Natural Heritage System (PPS 2005).

Guidelines and criteria for the identification of significant wildlife are detailed in the Significant Wildlife Habitat Technical Guide (October 2000), the Natural Heritage Reference Manual (June 1999), and the Significant Wildlife Decision Support System (OMNR 2000). Significant wildlife habitat is described under four main categories:

- Seasonal concentrations of animals,
- Rare vegetation communities or specialized habitats for wildlife,
- Wildlife movement corridors, and
- Habitats of species of conservation concern.

4.7.4 Seasonal Concentration Areas

Areas of seasonal concentrations of animals are defined as “areas where animals occur in relatively high densities at specific periods in their life cycle and/or particular seasons.” At these times, species are vulnerable to ecological interferences or weather impacts. Areas of seasonal concentration are typically small in comparison to the larger habitat areas used by species at other times of the year. The identification of habitats associated with seasonal concentrations of species is typically based on known occurrences (Natural Heritage Reference Manual, June 1999).

An assessment of the Study Area potential as a wildlife concentration area was carried out. Resources and protocols outlined in the OMNR Significant Wildlife Habitat Technical Guide (2000) were utilized to evaluate the potential for species concentration area occurrence. Suitable habitat for winter deer yards, raptor winter feeding and roosting areas, wild turkey winter range or turkey vulture summer roosting areas has not been identified in the Study Area. The study site has not been identified as a stopover, staging, breeding or nesting area for shorebirds, landbirds or colonial birds, however, overwintering areas for waterfowl have been identified by the MNR along a portion of the Speed River, from the proposed crossing west. Section 6(1) of the Migratory Birds Regulations, made under the Migratory Birds Convention Act (1994), prohibits the disturbance, destruction or taking of a nest, egg, nest shelter, eider duck shelter or duck box of a migratory bird. Site preparation activities, including removal of vegetation, should be conducted during appropriate timing windows, outside of the breeding season for migratory birds, to ensure that the requirements of the Migratory Birds Convention Act are met.

4.7.5 Rare or Specialized Habitats

Rare or specialized habitats include rare vegetation communities or concentrations of rare plant species. These specialized areas may also support rare animal species. The Study Area consisted primarily of parkland and roadside, having little forest cover and non interior habitat. In addition, the site lacked significant old growth forest features which, if present, might provide specialized habitats and food sources for other species dependent on these features. None of the above vegetation communities are designated as rare or threatened in Ontario.

Based on existing information, none of the specialized wildlife habitats listed in Table 4.4 and Table 4.5 has been identified in the Study Area, with the exception of the heavily urbanized banks of the

Speed and Eramosa rivers. Overall, it is unlikely that the Study Area contains rare or specialized habitats that may support rare or endangered species.

Table 4.4 Habitats of Rare Vegetation Communities and Specialized Wildlife

Habitat	Observations
Alvar	Not Present
Savannahs	Not Present
Cliff	Not Present
Rare Forest	Not Identified
Sand Barrens	Not Present
Great Lakes Dunes	Not Present
Prairie / Savannah / Grassland	Not Present
Riparian Zone	Present
Lake	Not Present
Shoreline	Present
Rock Barrens	Not Present
Tallus Slope	Not Present
Seep / Spring	Not Present
Cave / Mine	Not Present
Mature, Natural Conifer Stands	Not Present
Mature Oak, Oak-Hickory Stands	Not Present
Temporary Wetlands	Not Present

Table 4.5 Specialized Wildlife Habitats

Habitat	Observations
Winter Deer Yard	Not Identified
Moose Aquatic Feeding Areas	Not Identified
Mineral Licks	Not Identified
Calving Areas	Not Identified
Mink / Otter/ Marten / Fisher Denning sites	Not Identified
Foraging Areas With Abundant Mast	Not Identified
High Diversity Areas	Not Identified
Specialized Raptor Nesting Area	Not Identified
Old Growth or Mature Forest	Not Identified
Amphibian Woodland Breeding Ponds	Not Identified
High Diversity Forest Habitat	Not Identified
Cliffs	Not Identified
Turtle Nesting Habitat	Not Identified

4.7.6 Animal Movement Corridors

Animal movement corridors are defined as habitats that connect two or more wildlife habitats. Generally, the established links function as critical components allowing for the maintenance of species populations and enable wildlife groups to migrate between high ecological value areas with minimum mortality.

Several animal movement corridors have been identified by the City of Guelph's Natural Heritage System. A known amphibian crossing exists on Watson Road South north of York Road and an additional wildlife crossing opportunity may exist south of York Road, west of the Eramosa Parkway. This second crossing is associated with an ecological linkage between natural areas north and south of York Road. In addition, the riparian habitat and parkland along the Speed and Eramosa Rivers provides opportunities for animal movement through a highly developed area within the City.

4.7.7 Habitats/Species of Conservation Concern

Species of Conservation Concern generally includes the groups listed below:

- Species defined as special concern (formerly vulnerable), threatened, endangered, extirpated or extinct in Ontario;
- Species that are listed as rare or historical in Ontario based on records kept by the NHIC;
- Species whose populations are known to be experiencing significant declines in Ontario; and
- Species that have a high percentage of their global population in Ontario and are rare or uncommon in the subject area.

Based on the assessments above and reviews of available information resources, no species of Conservation Concern are known to be located in the Study Area. Based on the information provided above, the site does not appear to support Significant Wildlife Habitat.

Significant Wildlife

A geographical search for significant or endangered species presence and associated habitat was conducted using the OMNR Natural Heritage Information Centre (NHIC) database. The search revealed that five species of note had been observed within 1 km of the subject site; Blanding's Turtle (*Emydoidea blandingii*), Northern Map Turtle (*Graptemys geographica*), Milksnake (*Lampropeltis triangulum*), Eastern Ribbonsake (*Thamnophis sauritus sauritus*), and Tuberous Indian-plantain (*Arnoglossum plantagineum*). Upon further discussion with the MNR, Snapping Turtle (*Chelydra serpentina*) was also identified as having potential to be present within the Study Area. Refer to Table 4.6 below for details. The habitat preferences, protection designations, and potential impacts will be further discussed during additional phases of this project. The initial site visit did not reveal any individuals of these species, however a single Butternut tree was found within the Study Area. An assessment of the condition of the Butternut Tree was performed by the City of Guelph in July 2011, which identified this tree as being in good health. Additional field visits may be necessary to ensure individual species at risk or their preferred habitats are not present within the Study Area.

Table 4.6 Species-at-risk

Species	Global Rank	Provincial Rank	Status
Blanding's Turtle	G4	S3	Threatened
Northern Map Turtle	G5	S3	Special Concern
Snapping Turtle	G5	S3	Special Concern
Milksnake	G5	S3	Special Concern
Eastern Ribbonsnake	G5	S3	Special Concern
Tuberous Indian-plantain	G4G5	S3	Special Concern
Butternut tree	G4	S3?	Endangered

4.7.8 Watersheds and Surface Water Features

Watershed Background

The Study Area is situated within the Speed River watershed and several of its subwatersheds, including the Eramosa River, Clythe Creek and Silver Creek. There are three proposed crossings, including Clythe Creek, Silver Creek and the Speed River just north of its confluence with the Eramosa River. The Speed River crossing is expected to be a major crossing. Most of the Study Area is adjacent to the Speed and Eramosa Rivers.

Fish Communities

The Speed River through the town of Guelph supports gamefish such as Smallmouth Bass (*Micropterus dolomieu*), Largemouth Bass (*Micropterus salmoides*), Common Carp (*Cyprinus carpio*), and Northern Pike (*Esox lucius*), as well as a variety of panfish. Despite the influx of cold groundwater, the suitability of the river to support coldwater species is likely restricted by the effects of thermal loading upstream at Guelph Lake. Although identified as a cool water watercourse, the Speed River is thought to support mostly cool water species.

A tributary of the Speed River flows through an artificially straightened channel along the west side of the Hanlon expressway. In general this watercourse lacks significant riparian vegetation along much of its length and has been highly altered (straightened) for a considerable distance upstream.

The Eramosa River has not been impounded along its course, and thus abundant groundwater inputs provide suitable coldwater habitat for trout. Gamefish of the Eramosa River include Brook (*Salvelinus fontinalis*) and Brown Trout (*Salmo trutta*), as well as Smallmouth Bass and Northern Pike. The Eramosa is a cool water river that is also accessible and inhabited by cool and warm water species.

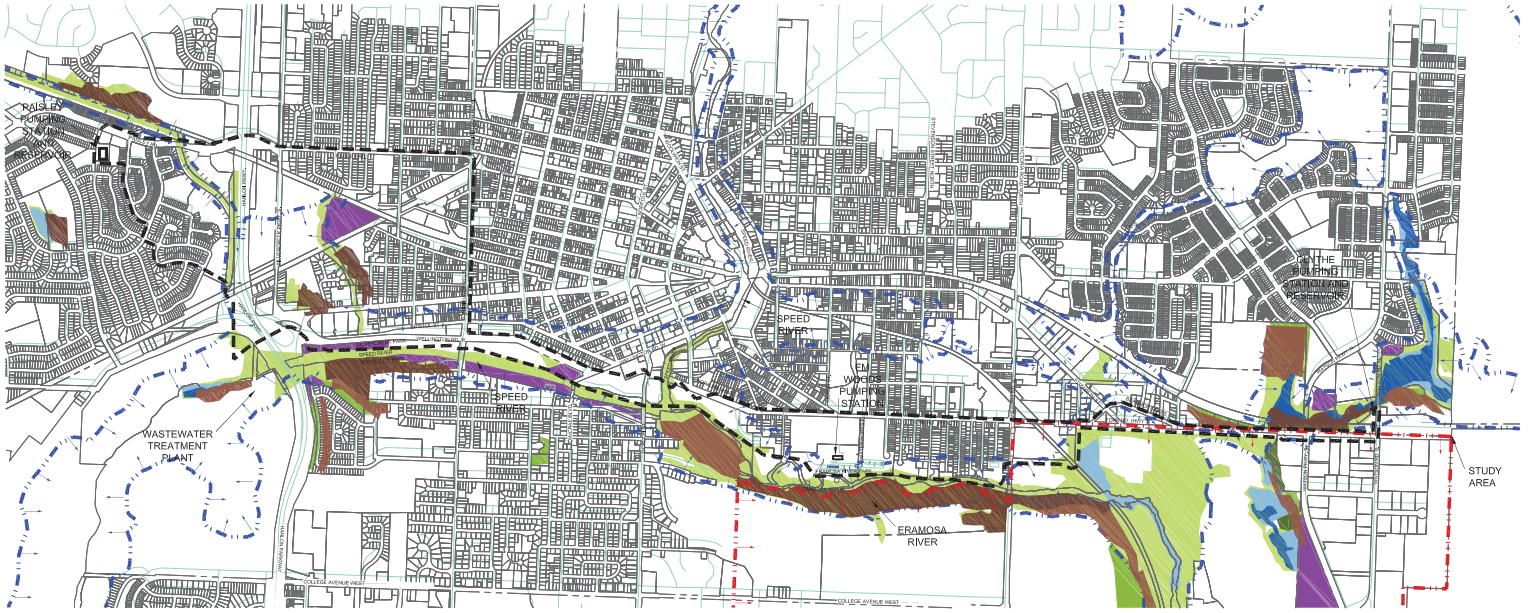
A tributary of the Eramosa River (Clythe Creek) flows southwest into the Eramosa towards the east end of the Study Area. It supports coldwater habitat north of York Blvd. South of York Blvd the channel has been straightened historically but shows signs of naturalizing, and has scattered riparian shade trees but generally lacks natural riparian habitat. A series of massive on-line ponds connect to the tributary upstream of its confluence with the Eramosa River.

4.7.9 Guelph Natural Heritage System

The City of Guelph's Natural Heritage System (NHS) is comprised of a combination of Natural Heritage Features which include: Significant Natural Areas, Ecological Linkages, Natural Areas, Restoration Areas and Wildlife Crossings. Together, these elements maintain local biological, hydrological and geological diversity, ecological functions, connectivity, support viable populations of indigenous species, and sustain local biodiversity to contribute to the City of Guelph's environmental, social, cultural and economic values.

The goals of the Natural Heritage System include, reducing the need for engineered storm water management, a reduction of air and water pollutants, moderation of the urban heat island effect, and the provision for natural and open spaces for leisure activities and aesthetic enjoyment in the City.

The area of study for the York Trunk Sewer and Paisley-Clythe Feedermain is within close proximity to the City of Guelph's Natural Heritage System, with the southern limit of the Study Area primarily in areas of the NHS and the northern limits crossing the NHS at several locations. The sections of the Study Area that are within the NHS are outlined in Table 4.7 with the limitations that apply to the specific type of Natural Heritage Feature. Refer to Figure 4.10 for details of locations of the various natural heritage features within or adjacent to the Study Area.



LEGEND

- STUDY AREA
- ARKELL SPRINGS WATER RESOURCE PROTECTION AREA
- FLOOD PLAIN

NATURAL HERITAGE SYSTEMS

- SIGNIFICANT NATURAL AREAS
- NATURAL AREAS
- ECOLOGICAL LINKAGES
- RESTORATION AREAS

SIGNIFICANT WETLANDS

- ONTARIO MINISTRY OF NATURAL RESOURCES DEFINED
- CITY OF GUELPH DEFINED

SIGNIFICANT WOODLANDS

- SIGNIFICANT WOODLANDS
- CULTURAL WOODLANDS

NATURAL HERITAGE STRATEGY FEATURES
FIGURE 4.10

SCALE: 1:10,000

GENIVAR

Table 4.7 Natural Heritage Features

Type of Natural Heritage Feature	Location within Study Area	Ability to Alter Site	Buffer + Adjacent Land
Significant Natural Areas			
Significant Wetlands		Yes	
Provincially Significant Wetlands	The Clythe Pumping Station		30m+120m
City of Guelph Significant Wetlands	Area surrounding Speed river, South of York Road and East of Victoria		15m+120m
Surface Water & Fisheries Resources		Yes	
Cool Water Fish Habitat	Speed River		30m+120m
	Stream from Lafarge lands south to Speed River		15m+120m
	Drainage ditch to the west of the Hanlon Expressway		
Significant Woodlands	North Side of York Road from Watson Road North to west of Watson Parkway North.		10m+50m
	South of Lafarge Lands, between Waterloo Avenue and Hearn Avenue		
Significant Valleylands		Yes	
Undeveloped Portions of the regulatory Flood Plain	Banks of Speed River		As Determined by EIS+50m
	Banks of stream from Lafarge Lands to Speed River		
	The Clythe Pumping Station		
	Lafarge Lands		
	Ditch along west side of the Hanlon Expressway		
Other Valleylands	Outer banks of stream from Lafarge Lands, south to Speed River		Determined by EIS+50m
Significant Wildlife Habitat		Yes	
Waterfowl Overwintering Habitat	North section of Speed river from just west of Gordon Road		Determined by EIS+50m
	Speed River west of Gordon Road		
Potential habitat For Locally Significant Species	South of Lafarge Lands, between Waterloo Avenue and Hearn Avenue		Determined by EIS+50m
Potential habitat for Provincially Significant Species	North Side of York Road from Watson Road North and Watson Parkway North.		Determined by EIS+50m
Wildlife Crossings		Yes	
Amphibian Crossing	Watson Road South, just north of York Road		0m+0m
Other Wildlife Crossing Opportunity	York Road, West of Watson Parkway North.		0m+0m
Restoration Areas			
	Lafarge Lands		0m+0m
Cultural woodlands	North Side of York Road from Watson Parkway North to Cityview Drive South.		Determined by EIS+10m

4.7.9.1 Significant Natural Areas

Development or site alterations are not permitted within Significant Natural Areas or their minimum buffers. Development or site alterations are allowed to occur on adjacent lands of Significant Natural Areas, provided that an Environmental Impact Study (EIS) or Environmental Assessment (EA) has been completed to demonstrate that there are no negative impacts on the protected Natural Heritage Features or their associated ecological functions.

General Permitted Uses of sites within the Natural Heritage System include legally existing uses, passive recreational activities, low impact scientific and educational activities, wildlife management, forest management, habitat conservation and restoration activities.

4.7.9.2 Significant Wetlands

Significant Wetlands assist with the maintenance of the ecological health of the Natural Heritage System, including moderating the flow of water, contributing to groundwater recharge, improving water and air quality, storing carbon, and providing habitat for a broad range of species.

Provincially Significant Wetlands (PSW) are at least 2 hectares in size and are identified by the OMNR. Locally Significant Wetlands (LSW) are at least 0.5 hectares in size and are typically identified by the region, local municipality and/or conservation authority. In addition to the permitted uses previously identified, essential public and private linear infrastructure are permitted to be within the established buffers of Significant Wetlands where it has been demonstrated through an EIS or EA to the satisfaction of the City, the GRCA and/or the OMNR, that there will be no negative impacts on the Significant Wetland or its ecological and hydrological functions and no feasible alternative exists.

4.7.10 Surface Water and Fish habitat

Cool water and cool water Fish Habitats are identified in the NHS to maintain and, where possible, enhance linkages and related functions among surface water features, groundwater features, hydrologic functions and natural heritage features.

In addition to the General Permitted Uses identified previously, essential public and private linear infrastructure lines and their normal maintenance are permitted within Surface Water, Fish Habitat and established buffer provided no feasible alternative exists and appropriate mitigative measures are taken to ensure impacts to fish and fish habitat are minimized.

4.7.11 Significant Woodlands

Significant Woodlands provide enhanced biodiversity, wildlife habitat, temperature moderation, erosion control, and pollution filtration. These sites are either woodlands of 1 hectare or greater (including a 10 m minimum buffer) or Woodland types ranked by the OMNR Natural Heritage Information Centre (including a 10 m minimum buffer).

4.7.12 Significant Valleylands

Protection of Significant Valleylands is important for the support of flood protection, erosion control, and passive recreational activities within Significant Valleylands. In addition to the General Permitted Uses previously identified, essential public and private linear infrastructure are permitted within the established buffers of Significant Valleylands where it has been demonstrated through an EIS or EA to the satisfaction of the City, in consultation with the GRCA and/or the OMNR, that there will be no negative impacts on the Significant Valleylands or its ecological and hydrological functions and no feasible alternative exists.

4.7.13 Significant Wildlife Habitat

These areas are established to protect and enhance the habitats of locally significant wildlife. In addition to the General Permitted Uses, essential public and private linear infrastructure are permitted to be within the established buffers of Significant Wildlife Habitat where it has been demonstrated through an EIS or EA, that there will be no negative impacts on the Significant Wildlife Habitat. Prior to

removing trees or vegetation, it may be necessary to create an inventory of work to ensure that impacts to nesting locations and breeding areas for local or migratory breeding birds are minimized.

4.7.14 Wildlife Crossing

Wildlife Crossings are identified to minimize impacts to wildlife, property damage and threats to human safety at locations where wildlife are known or likely to cross roadways. Through the installation of the York Trunk Sewer and Paisley-Clythe Feedermain, it may be necessary to employ species-appropriate mitigative measures to minimize the incidence of human-wildlife conflict, as determined through detailed study.

4.7.15 Restoration Areas

Restoration Areas are identified as opportunities to increase and/or maintain open meadow landscapes for wildlife, and to ensure diversity within the NHS, in addition to increasing the City of Guelph's tree canopy cover. There are no buffers or adjacent lands required for Restoration Areas.

4.7.16 Natural Areas

Development or Site alteration is permitted within all Identified Natural Areas, provided that it has been demonstrated through an EIS or EA that the area does not meet the criteria that would require it to be protected.

4.7.17 Cultural Woodlands

Cultural Woodlands are generally considered of less ecological value than those categorized as Significant Woodlands, however the City recognizes the environmental benefits and services they provide. Development and site alteration may be permitted in a Cultural Woodland where it has been demonstrated through an EIS or EA, to the satisfaction of the City, that the cultural woodland does not meet the criteria for one or more Significant Natural Areas and it is comprised of more than 60% non-indigenous species.

4.8 SOCIO-ECONOMIC ENVIRONMENT

4.8.1 Archaeological and Heritage Features

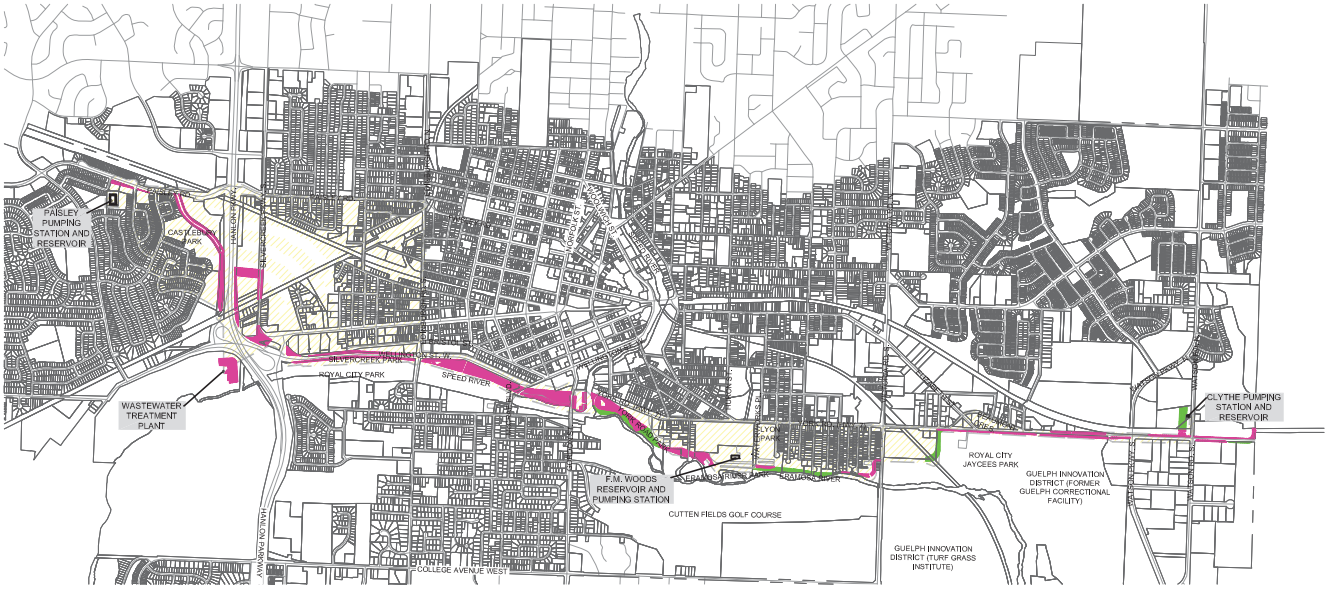
The archaeological investigation conducted has included a Stage 1 Archaeological Assessment of the areas potentially affected by the proposed improvements to the York Trunk Sanitary Sewer and the construction of the Paisley-Clythe Feedermain. The assessment was conducted in accordance with the provisions of the *Ontario Heritage Act* (R.S.O. 1990) and *Draft Standards and Guidelines for Consultant Archaeologists* (Ontario Ministry of Culture 2009). The Ministry of Tourism and Culture has been asked to review the results and recommendations presented in the report.

The Stage 1 Archaeological Assessment conducted by Archaeological Research Associates Ltd. consisted primarily of a literature search of all relevant historical, environmental, and archaeological data available for the Study Area. This report can be found in Appendix B. Sources used in the assessment included (but are not limited to) historic maps and archives, field surveys and geophysical mapping. An inventory detailing all known archaeological resources within the Study Area was identified from this assessment. This data can, in turn, was used to predict further zones of archaeological potential.

Based on the results of the Stage 1 Archaeological Assessment, the Study Area location, in its pristine state has a high archaeological potential. However, the results of the field survey confirmed that much of the project area has been developed for infrastructural commercial and recreational purposes which reduce the archaeological potential of the land. Nevertheless, it is possible that there may be some pockets within the Study Area that have been less disturbed, or missed entirely, by archaeologically-destructive impacts.

Due to the possibility for high archaeological potential in the Study Area, it is recommended that a Stage 2 Archaeological Assessment be conducted prior to or during the detailed design of the York Trunk Sanitary Sewer and Paisley-Clythe Feedermain. This assessment will confirm the presence or

absence of materials with cultural heritage value or interest on the subject lands. Areas of high and/or uncertain archaeological potential have been incorporated into the Alternative Alignment drawings presented in Section 5. Refer to Figure 4.11 for Archaeological and Heritage Features.



LEGEND

- HIGH ARCHEOLOGICAL POTENTIAL AREAS
- UNCERTAIN ARCHEOLOGICAL POTENTIAL AREAS
- STUDY AREA

YORK TRUNK SEWER AND PAISLEY-CLYTHE FEEDERMAIN AREAS OF ARCHEOLOGICAL POTENTIAL FIGURE 4.11

SCALE: 1:25,000

GENIVAR

4.8.2 Open Spaces and Recreation

The City of Guelph supports a variety of recreational activities. The predominant open space features in the Study Area are the parks located along side the Speed and Eramosa Rivers, including: Water Park, Silvercreek Park, Heritage Park, Marianne's Park, Royal City Park, York Road Park, Lyon Park, Eramosa River Park, and Royal City's Jaycees Park. These parks are used for a variety of outdoor activities including, but not limited to, soccer, hardball, ice skating (in the winter), and softball. Additionally, there are a variety of trails connecting some of the parks, including the Eramosa and Speed River Trails.

Since the parks in the Study Area host a considerable amount of outdoor recreational activity in the City, it is essential to ensure that the servicing alternatives minimize impacts on recreation within the Study Area. The sportsfield booking season is from early May to September 30th, so disturbance to sportsfield areas should be scheduled outside of those times.

4.8.3 Agricultural Environment

The City's Official Plan Amendment 42 (July 2010) indicates that most of the agricultural designated lands are located on the outskirts of the City, with a high concentration of agricultural lands in the South. Since the majority of the Study Area consists of open space recreational land within an urban district, there are no agricultural spaces within the Study Area boundaries.

4.9 FUTURE INFRASTRUCTURE PROJECTS

Future construction project currently scheduled to be performed in the Study Area include works by both the City and the MTO.

Works scheduled to be performed include:

Upgrades to the Hanlon Expressway

Works by the MTO are generally related to upgrades along Highway 6 (the Hanlon Expressway). Recently, upgrades were completed at the intersection of the Hanlon Expressway and Speedvale Avenue, Paisley Road, and Stone Road.

The Hanlon Expressway is to be improved as a four-lane divided freeway by 2021. In the interim, an EA prepared by the MTO has identified the following improvements north of Wellington Street West (within the Study Area):

- An interchange to the north of Paisley Road and grade-separation at Paisley Road;
- Grade separation at Willow Road; and,
- An interchange at Speedvale Avenue.

In addition, the following improvements have been identified south of Wellington Street West, outside of the Study Area:

- A partial interchange at College Avenue;
- A full interchange at Stone Road;
- A partial interchange at Kortright Road; and,
- A full interchange at Laird Road.

Highway 7, between Waterloo and Wellington County is to be expanded to a four lane highway after 2015, with some small expansions to be completed in 2013. Once this expansion has been completed, the Hanlon Expressway is to be extended northward to connect with Highway 7.

Development of the Lafarge Lands / Realignment of Silvercreek Parkway and CN Underpass

Located to the east of the Hanlon Expressway between Paisley road and Wellington Street West, the Lafarge Lands are a 22.2 hectare brownfield site. The development of the Lafarge lands into a

central, urban market square is proposed by Silvercreek Guelph Developments Limited and would include related works including the realignment of Silvercreek Parkway and the grade separation of the existing CN railroad tracks. This development will incorporate large and small retail units, high density residential and open space on surrounding land. The development would connect to an existing sanitary sewer located along the east side of the Hanlon Expressway.

Water Capital Projects

Several water capital and road projects under the jurisdiction of the City of Guelph are underway as a result of Guelph's Infrastructure Stimulus Projects. These projects are currently under various levels of completion, but include the installation of new watermains and sanitary sewers in addition to road improvements. The improvements within the Study Area are:

- Norfolk Street between Norwich Street and Quebec Street;
- Stevenson Street between York Road and Elizabeth Street; and,
- Wyndham Street between Carden Street and Wellington Street West.

Additional capital water projects that are not currently being constructed in conjunction with a road improvement project include:

- A watermain along Hanlon Expressway from Membro Well (located on Water Street) to Claire Road West; and,
- A watermain along Woolwich Street from Wellington to Speedvale Avenue.

Castlebury Park

Castlebury Park, located at 50 Castlebury Drive, to west of the Hanlon Expressway between Wellington Street West and Paisley Road. The park is bounded by a storm water drainage channel to the North, a future school site to the South-West and residential lots to the south-east. Castlebury Park has an area of 3.66 hectares and has been zoned as a community park. This park currently contains two intermediate sized soccer fields which have been continuously utilized since construction in 2000. The City has developed a Master Plan to address the needs of the community regarding Castlebury Park. The Master Plan includes play equipment, picnic areas, walking trails and a paved parking lot which would be constructed in 2012.

A proposed alignment of the Paisley-Clythe Feedermain is located along the south-west bank of the drainage ditch that bounds Castlebury Park. Ideally the installation of the sewer would coincide with the construction of the park improvements to limit the amount of disturbance to the local residents, if this was identified as a preferred alignment alternative.

Eramosa River Park

A new play area is proposed to be installed in Eramosa River Park, near the baseball diamonds at the southern end of Hooper Street, in spring, 2012. The proposed alignment should minimize the amount of disturbance in this area. If the alignment is required to pass proximate to the play area, trench boxes, or other means, should be employed to keep the excavation width as narrow as possible to reduce impacts on this area.

Silvercreek Park

A new skatepark is proposed to be constructed by the City in Silvercreek Park, west of Edinburgh Road South. Routing of the new services and reinstatement of the park facilities in that area should consider the future park configuration, including the relocation of the existing volleyball courts and parking facilities to accommodate the future facilities.

York Road Expansion

Traffic constraints on York Road will require that York Road be expanded to four lanes east of Victoria Road. This will have an impact on the potential location of any services to be located with that

corridor, however; it will also provide additional space for services, leading to more options with respect to location.

Traffic studies have determined that the York Road, between Wellington Street West and Watson Road will reach capacity after 2021. The York road will expand from 2-lanes to 4-lanes toward the east of the current road limits, as there are property and community constraints to widening the York road to the west. It is also proposed that York Road west of Victoria be widened from 2-lanes to 3-lanes with the installation of a center turning lane.

Guelph Innovation District

The 453 hectare parcel of land bounded by York Rd, Victoria Rd S, the York-Watson Industrial Park and the City's southern boundary is the proposed location of the Guelph Innovation District. This project will be a mixed use community including residential, commercial and industrial to showcase sustainable, green and innovative development. The development will support an economic cluster focused on green-economy and innovation sector jobs to diversify the City of Guelph's Economy.

The construction of the Innovation district is an important aspect of the future water demand of the city of Guelph, and it is necessary to take the demand into consideration when developing the new alignment of the York Trunk Sewer and Paisley-Clythe Feedermain.

5. PHASE 2: IDENTIFICATION OF ALTERNATIVE SOLUTIONS

A primary objective of Phase 2 of this Study is the identification of alternative solutions to the problems or opportunities described in Phase 1. During Phase 2, preliminary sanitary sewer and feedermain alignments were identified.

As part of Phase 2, meetings were conducted with key agencies to discuss approval requirements, examine potential environmental issues and provide general feedback on preliminary alignments. It also included conducting public information centres to give interested stakeholders an opportunity to provide input pertaining to the Study.

The focus of the Study was to determine the best way to optimize each system to better serve existing users and to expand the system to service future growth. Another focus of the work was to gain a better understanding of the City's water distribution and sewage collection networks for the purpose of providing recommendations to enhance the reliability, operational efficiency, and capacity of each system.

The alignment alternatives were identified in the early stages of the Class EA process following a detailed review of the Study Area extending approximately 8.5 kilometres from the City Limit to the east, near Watson Road, and westward, along York Road and through the parkland on the north side of the Speed and Eramosa Rivers, including Eramosa River Park, Lyon Park, York Road Park, and Silvercreek Park, to the WWTP on the west side of the Hanlon Parkway. Orthographic images and site visits were utilized to conceptually identify the alternative routes. The possible routing alternatives included existing transportation corridors, open spaces, and utility corridors.

The alternative alignments presented in the Water and Wastewater Servicing Master Plan for the Paisley-Clythe Feedermain were included in the alternatives assessed as part of this study.

5.1 KEY CONSIDERATIONS FOR SEWER ALIGNMENTS AND UPGRADES

The Water and Wastewater Servicing Master Plan had identified that the Speed River Trunk Sewer is currently operating at full capacity with little or no availability for additional flows. Further modeling, using 2031 population criteria, indicated that, for the most part, the area of concern, where flow capacity is limited, extends from approximately Victoria Road South to just west of Edinburgh Road, along the Speed and Eramosa Rivers as detailed in Section 4.6.1. As such, the primary Study Area for the trunk sewer has been limited to this area.

Within this area, a significant collector sewer of the Speed River Trunk sewer, which services the catchment area on the south side of the Speed River, includes a siphon under the Speed River and also crosses perpendicularly under the York Trunk Sanitary Sewer. It connects with the Speed River Trunk Sewer at Wellington Street West, just west of Edinburgh Road. Due to this configuration, it may be possible to relocate the connection point of this sewershed area of the Speed River Trunk Sewer to the York Trunk Sanitary Sewer in order to take some of the excess flows from the Speed River Trunk to allow for upgrades and expansion of that system. Flows from this area were included in the Sanitary Sewer Modelling Worksheets presented in Appendix A.

Also within the area of study, the existing York Trunk Sanitary Sewer alignment is located immediately south of the F.M. Woods Pumping Station and Reservoir. The City has expressed a desire to relocate the sewer in this area to allow for further expansion of the water storage facility.

One other significant consideration is the required crossing of the Speed River. The existing trunk sewer extends from York Road Park into the Speed River itself then into Silvercreek Park via an elbow under the Gordon Street Bridge. This is not an optimal arrangement and consideration should be given to an alternative alignment which will improve maintenance capability and hydraulic performance.

Given that capacity constraints are one of the prime concerns and that the existing trunk sewer is expected to be in generally good condition over most of its extent, complete replacement is not

necessary in some locations. Priority should be given to reusing the existing infrastructure to the fullest extent possible.

One major consideration, with respect to the provision of a new trunk sewer alignment, is the feasibility of connecting it to the existing sanitary collection system. Where any significant realignment is considered, existing connections to the trunk sewer will need to be realigned to flow toward the new sewer, which will require significant additional construction beyond the installation of the new trunk sewer. Additionally, the existing sewer is very flat, with minimal fall from start to end. Any connection into the existing sewer system will be constrained by the existing inverts of the system. As such, a twinned sewer in generally the same alignment as the existing York TSS is a feasible alternative.

An alternate solution would be to keep the existing York TSS infrastructure and connections and twin the sewer in an alternate location to provide additional capacity. Within the Study Area, the only feasible location for this to occur within would be along York Road, connecting to the existing sewer system just east of Victoria Road and extending to the Speed River.

Further to these considerations;

- Alignments for new infrastructure should be, wherever possible, located in publicly owned land to minimize the requirement for purchasing or expropriating property;
- Trenchless technologies may be possible to minimize impacts to roads, rivers, etc;
- Conflicts with existing infrastructure, natural and man-made features, environmentally sensitive areas, species-at-risk, etc, should be minimized and existing utility corridors used where this is possible;
- Changes in alignment (bends, elbows, etc) should be minimized to optimize the hydraulic performance of the services;
- Alignments should provide for ease of access and operations and maintenance activities;
- The alignments and recommendations provided in the Water and Wastewater Servicing Master Plan should be reviewed and considered with respect to feasibility and impacts;
- Synergy with other construction projects should be considered to minimize construction costs and time;
- Future construction should be considered to ensure any new alignments do not cause conflicts with other unrelated proposed works; and,
- Disruption to recreational facilities should be minimized by scheduling and/or routing of the alignments.

5.2 KEY CONSIDERATIONS FOR FEEDERMAIN ALIGNMENTS

The intent of the proposed feedermain is to provide an east-west connection between the Paisley and Clythe pumping stations to provide a consistent water supply from the central area of Zone 1 to the extremities of the zone which will help reduce pressure fluctuations in times of peak demand and to ensure consistent supply and back-up in the event of breaks or shut-downs in the system. In light of this, interconnections with other distribution mains should be kept to a minimum; however, some connections will be necessary.

A specific consideration will be the provision of connections for future servicing to the Clair Road Elevated Water Storage Reservoir and the Verney Street Elevated Water Storage Reservoir in order to provide adequate supply and pressure within the distribution systems that they service.

Additionally, a supply connection will be required on the east side of the F.M. Woods Pumping Station and Reservoir. Each terminal end of the feedermain, at the pumping stations, should be connected to the existing low pressure zone feed supply lines into the pumping stations. The existing piping configurations will need to be reviewed during detailed design to determine the optimal connection points.

As with the trunk sewer, a crossing of the Speed River will be required. Synergy between these two projects should be considered with respect to routing and combined trenching utilized, where feasible.

Consideration should be given to future, unrelated works, including future development, road expansions, infrastructure upgrades, etc.

Further to these considerations;

- Alignments for new infrastructure should be, wherever possible, located in publicly owned land to minimize the requirement for purchasing or expropriating property;
- Trenchless technologies may be possible to minimize impacts to roads, rivers, etc;
- Conflicts with existing infrastructure, natural and man-made features, environmentally sensitive areas, species-at-risk, etc, should be minimized and existing utility corridors used where this is possible;
- Changes in alignment (bends, elbows, etc) should be minimized to optimize the hydraulic performance of the services;
- Alignments should provide for ease of access and operations and maintenance activities;
- The alignments and recommendations provided in the Water and Wastewater Servicing Master Plan should be reviewed and considered with respect to feasibility and impacts;
- Adequate separation from other infrastructure should be provided to prevent damage in the event of a feedermain break; and,
- Future construction should be considered to ensure any new alignments do not cause conflicts with proposed works.

5.3 COORDINATION WITH FUTURE WORKS, LAND USES, AND PROJECT SYNERGY

There is the opportunity, with the alignment of the upgrades to the York Trunk Sewer System and the Paisley-Clythe Feedermain to perform the two projects in tandem due to the possible spatial relationship between the two. That is, they are both generally east/west transmission services. The considerations for each of the two projects are generally the same with respect to identifying a preferred alternative. Where possible, consideration should be given to combined trenching of these two services as this will result in cost and time savings and will also limit social, cultural, and environmental disturbances.

In addition, there may be advantages to performing phases of the works with other infrastructure projects, as identified in Section 4.9. Specifically, any work required on York Road, east of Victoria Road, can be scheduled around the future expansion of York Road to four lanes. This will reduce disturbance to local residents and businesses and result in cost savings by reducing reinstatement requirements.

Future MTO upgrades to the Hanlon Expressway may have a significant impact on the Paisley-Clythe Feedermain, which will be required to undercross the Hanlon Expressway. The construction of an interchange at Paisley Road may impact the feedermain if it is installed proximate to this area. Alternatively, it may be advantageous to install the feedermain in conjunction with the Expressway upgrades.

Additionally, proposed upgrades to park facilities may be coordinated with the new servicing alignments, particularly the future construction of a skatepark in Silvercreek Park, west of Edinburgh Road South.

Servicing requirements to the future Guelph Innovation District should be reviewed to coordinate infrastructure requirements in that area.

5.4 TRUNK SANITARY SEWER ALTERNATIVES AND ALIGNMENTS

The key considerations described above were used in conjunction with the screening criteria detailed in Section 6 to develop servicing alternatives for the York Trunk Sanitary Sewer. Within this, however, there are four possible alternatives, including Do Nothing.

The first alternative is the rehabilitation of the existing sewer through pipe repair, such as cured-in-place pipe liners, sliplining, etc. Secondly is the twinning of the sewer and the rehabilitation of sections of the existing sewer, and, thirdly, is the twinning of the sewer and the partial replacement of sections requiring upsizing or repair.

Details of each alternative are presented below:

5.4.1 Do Nothing

With this option, there are no impacts to natural features resulting from construction activities, however, there is a potential impact to the natural environment in the event of a sewer surcharge or structural failure. Specifically, potential impacts within the floodplain are possible with adverse impacts to fish and aquatic habitats in the Eramosa and Speed Rivers where the existing York Trunk Sewer is located within the river or along the shoreline. The Speed River is considered a cool water fishery and various species-at-risk have been identified as being potentially present in this area.

Another consideration with this option is the potential impairment of groundwater due to exfiltration from the existing sewer pipe. The sewer is located within the two-year wellhead protection area (WHPA-B), and sections of the sewer are known to be in poor condition, though the extent of deterioration is unknown due to lack of access and the level of sewage in the pipe preventing inspection.

Ultimately, this option does not address the main concern with the York Trunk Sewer, which is lack of capacity, both in the present and in the future. This will not allow for growth in the service area, which is contrary to the City's Official Plan. In addition, it does not correct some of the other issues associated with the existing system, such as lack of access points for maintenance. Based on these facts, this alternative is not a feasible option and was removed from further consideration.

5.4.2 Rehabilitation of the Existing York Trunk Sewer

As with the Do Nothing option, the rehabilitation of the existing Trunk Sewer would cause limited impacts to natural features due to construction. For the most part, this work would entail the installation of cured-in-place pipe liners, or sliplining of the existing sewer. This work requires minimal excavation which would be limited to the area immediately around the manhole access points.

From a technical point of view, this option is generally difficult to implement as the condition of the existing sewer is unknown due to existing access issues and the current level of sewage in the pipes. Bypasses around each pipe run would be required to assess individual pipes to determine what rehabilitation would be required and then this would need to be repeated for the actual implementation. This would pose a risk due to the potential of sewage spills.

This option also does not address the capacity concerns in the system and surcharging will remain a concern. As with the Do Nothing option, surcharging may have detrimental impacts within the floodplain, with potential adverse impacts to fish and the Speed and Eramosa Rivers. Rehabilitation will, however, mitigate concerns related to exfiltration and potential impacts on groundwater and municipal well supplies. Based, however, on the fact that this alternative does not solve the main issue of lack of capacity in the sewer, this option was also not considered further.

5.4.3 Twinning and Rehabilitation of Existing Sewer

This option involves the installation of a new sewer alongside the existing sewer, or in a new alignment, where the sewer is undersized, to accommodate future increases in capacity. Sections of the existing sewer which are adequately sized but are deteriorating may be rehabilitated using cured-in-place liners, or sliplining, for example, as opposed to requiring replacement.

5.4.4 Partial Replacement of Existing Sewer and Twinning

This option, like the one presented above, involves the twinning of the existing York Trunk Sanitary Sewer with a new sewer that runs along the same, or a new, alignment, with some correction made for constructability, improved access for maintenance, and improved hydraulics.

The twinned sewer, combined with the existing sewer, would provide capacity for current and future flow demands. Existing sections of the sewer in poor condition may be replaced or resized, as required. The section of twinned sewer south of the F.M. Woods Pumping Station and Reservoir may be used to completely replace the existing York Trunk Sanitary Sewer, which would be abandoned, in this location to provide for future expansion southward for that facility.

The twinned alignment possibilities for these two alternatives are identical and are discussed in the following section.

5.4.5 York Trunk Alternative Alignments

The key considerations described above were used in conjunction with the screening criteria to develop various alignment alternatives for the York TSS.

The existing York TSS in Section 1 does not require twinning. Option 1, which is to provide a twinned sewer in generally the same alignment as the existing York TSS does not require a connection point until just west of Victoria Road South, in Section 2. Option 2, which is to provide a twinned sewer along York Road, would connect to the existing trunk sewer at Industrial Avenue. Figure 5.1 details the alternatives and section delineations plotted on a map. A brief description of each of the alternatives, arranged by Section, follows below.

5.4.5.1 Section 2 – from Industrial Avenue to the F.M. Woods Pumping Station / Waterworks Place

Alternative Alignment No. 1

- Tie-in at Manhole 4378 west of Victoria Road in Eramosa River Park
- The new twinned sewer should be located on the south side of the existing trunk sewer due to limited space available resulting from other existing utilities in that area
- Following south of the existing York Trunk Sanitary Sewer to the F.M. Woods Pumping Station

Alternative Alignment No. 2

- Tie-in at Manhole 4381 at York Road and Industrial Avenue
- West along York Road, undercrossing the Guelph Junction Railroad spur
- Crossing Victoria Road South and continuing west along York Road to Waterworks Place

5.4.5.2 Section 3 – from the F.M. Woods Pumping Station / Waterworks Place to Gordon Street

Alternative Alignment No. 1

- West along the existing municipal easement, parallel to the Eramosa River to York Road Park, and north of the Town Lattice Covered Bridge
- Undercrossing of Speed River to the municipally owned lot north of the Guelph Lawn Bowling Club

Alternative Alignment No. 2

- West along York Road to York Road Park and south through the park to just north of the Town Lattice Covered Bridge
- Undercrossing of Speed River to the municipally owned lot north of the Guelph Lawn Bowling Club

5.4.5.3 Section 4 – from Gordon Street to Silvercreek Parkway South

Alternative Alignment No. 1

- Crossing of Gordon Street
- West through Royal City Park and Silvercreek Park, south of Wellington Street West
- Crossing Edinburgh Road
- Connection to the Speed River Trunk Sewer system siphon
- Connection to the existing York Trunk Sanitary Sewer at Manhole 298

Alternative Alignment No. 2

- Crossing of Gordon Street
- West through Royal City Park
- North along the west side of 40 Wellington Street West
- Crossing Wellington Street West
- West along the north side of Wellington Street West
- Crossing Edinburgh Road
- West along the north side of Wellington Street West
- Crossing Wellington Street West
- Connection to the existing York Trunk Sanitary Sewer at Manhole 298

Within Royal City Park, two alternate routes are available. One proceeds westward generally south of the 40 Wellington Street West site. This alignment will require the removal of the Butternut tree that is present in this area. An alternate route is to align the trunk sewer to the south side of the Butternut tree to the access road through the park, where it would turn west and follow the road before rejoining the proposed alignment. This alternative would require the demolition and future reconstruction of a wooden gazebo structure and a playground.

For the purposes of the Class EA, both alternatives are being considered in the event that the tree health changes or other issues arise that may make one the alternatives alignments in this area preferable.

5.5 FEEDERMAIN ALTERNATIVE ALIGNMENTS

The key considerations described above were used in conjunction with the screening criteria to develop various servicing alternatives for the Paisley-Clythe Feedermain. Figure 5.2 below details the alternatives plotted on a map. A brief description of each of the alternatives, arranged by Section, follows below.

5.5.1 Section 1 - from the City Limit down York Road to Industrial Avenue (Clythe Feedermain)

Only one reasonable alignment is possible in this Section due to the existing municipal right of way being located within the York Road corridor and the presence of private properties along both sides of York Road.

Alternative Alignment No. 1 (Master Plan Alternative) and Alternative Alignment No. 2

- Connection to low pressure service inlet at Clythe Pumping Station
- South on Watson Road North to York Road
- West on York to Industrial Avenue

5.5.2 Section 2 – from Industrial Avenue to the F.M. Woods Pumping Station

Alternative Alignment No. 1 (Master Plan Alternative)

- Continuing on York Road from Industrial Avenue to Waterworks Place
- South on Waterworks Place or through Lyon Park to connect to the F.M. Woods Pumping Station and Reservoir

Alternative Alignment No. 2

- South at Industrial Avenue through an existing municipal easement right-of-way to the GJR Rail line
- Undercrossing the Guelph Junction Railroad spur line west though the municipal easement between the PDI plant and the commercial development to the north **(Note: this will require the purchase of land or an easement to enable the installation of the feedermain under the rail spur)**
- Crossing Victoria Road South to Eramosa River Park
- South to the existing utility corridor in Eramosa River Park
- West along the existing utility corridor to connect to the F.M. Woods Pumping Station and Reservoir

5.5.3 Section 3 – from the F.M. Woods Pumping Station to Gordon Street (Paisley Feedermain)

Alternative Alignment No. 1 (Master Plan Alternative)

- North From the F.M. Woods Pumping Station and Reservoir to York Road
- West on York Road, to approximately the intersection with Wyndham Street South
- Southwest into York Road Park to north of the Covered Bridge
- Undercrossing of the Speed River to the municipally owned parking lot north of the lawn bowling club

Alternative Alignment No. 2

- South from the F.M. Woods Pumping Station and Reservoir to Eramosa River Park
- West to York Road Park at the Speed River north of the Covered Bridge

- Undercrossing of the Speed River to the municipally owned parking lot north of the lawn bowling club

5.5.4 Section 4 – from Gordon Street to Silvercreek Parkway South (Paisley Feedermain)

Alternative Alignment No. 1 (Master Plan Alternative)

- Undercrossing of Gordon Street
- Through Royal City Park
- Turning northwest through Royal City Park
- Turning north, undercrossing Wellington Street West
- West along Wellington Street West within the existing municipal right-of-way to the Hanlon Expressway at Waterloo Avenue

Alternative Alignment No. 1B

- West through Silvercreek Park and parallel to Wellington Street West within the existing municipal right-of-way to Edinburgh Road North
- North along Edinburgh Road North to Paisley Road
- West along Paisley Road to Silvercreek Parkway South

Alternative Alignment No. 2

- Undercrossing of Gordon Street
- West through Royal City Park and Silvercreek Park
- South of Wellington Street West
- Crossing Edinburgh Road
- Through Silvercreek Park to just east of the Hanlon Expressway
- Undercrossing of Wellington Street West to Waterloo Street and Silvercreek Parkway South

As with the proposed York Trunk Sewer alignments, two alternate routes are available through Royal City Park. One proceeds westward generally south of the 40 Wellington Street West site. This alignment will require the removal of the Butternut tree that is present in this area. An alternate route, if this is determined to not be feasible, is to align the trunk sewer to the south side of the Butternut tree to the access road through the park, where it would turn west and follow the road before rejoining the proposed alignment. This alternative would require the demolition and future reconstruction of a wooden gazebo structure and a playground. These are represented as Alternative Alignments No. 1A and No. 2A.

5.5.5 Section 5 – from Silvercreek Parkway South to the Paisley Road Pumping Station (Paisley Feedermain)

Alternative Alignment No. 1 (Master Plan Alternative)

- Undercrossing of the Hanlon Expressway
- Through Municipally owned lands to Melrose Place
- Along Melrose Place to Deerpath Drive and north along Stephanie Place
- East along Deerpath Drive to connect to the low pressure service to the Paisley Reservoir and Booster Station

Alternative Alignment No. 1A (Master Plan Alternative B)

- North along Silvercreek Parkway South to the municipal right-of-way at Paisley Road
- Undercrossing of the Hanlon Expressway

- Along Paisley Road to connect to the low pressure inlet to the Paisley Reservoir and Booster Station

Alternative Alignment No. 2

- North along Silvercreek Parkway South
- West past the CN railroad tack through Municipally owned lands and north along the west side of the former Lafarge Lands (Silvercreek Developments Site)
- North through Municipally owned lands, future easement on the Silvercreek Development Site to undercrossing of the Hanlon Expressway
- Undercrossing of the Hanlon Expressway and northwest drain
- Northwest along the northwest drain to Paisley Road
- West on Paisley Road to connect to the low pressure inlet to the Paisley Reservoir and Booster Station

5.6 CONSTRUCTION METHODS

The installation of the York Trunk Sewer and the Paisley-Clythe Feedermain will likely require a combination of various construction methods, including open-cut construction, the application of trenchless technologies, such as boring, and shoring/cofferdams for river diversion for the river crossing. The following sections provide a general overview of the methods that may be employed.

5.6.1 Open Cut Construction

Sanitary sewer and watermain construction by open-cut is a common technique that involves the excavation of a trench from the surface utilizing excavators to the required depth, with the service being installed at the design grade, and the trench then backfilled and compacted. The use of open-cut trench construction is generally limited to excavations less than 10 metres in depth due to equipment restrictions, safety concerns, and economic feasibility. As the depth of the trench increases, the excavation is temporarily supported either using trench boxes or sheeting to prevent collapse of the trench walls. Trench boxes or sheeting can also be utilized to limit the width of an excavation where spatial constraints prohibit a wide trench.

In addition, when construction is within urbanized areas, consideration must be given to the protection and support of existing underground utilities that may be impacted by the excavation, or temporary services and/or bypasses provided to maintain services.

For open-cut excavations, the soil and groundwater conditions are important factors in determining what preparatory work is required. For example, if there is a high ground water table combined with sands, silts, or gravels, the ground may require stabilizing prior to excavation. The typical method for removing groundwater is the installation of a groundwater dewatering system using well points.

Based on the profile of the existing York Trunk Sanitary Sewer alignment, the trunk sanitary sewer depth is generally in the range of three metres. The majority of any upgrades to the York Trunk Sanitary Sewer are expected to be constructed by open-cut. Boring of the undercrossing of the Speed River will, however, be assessed as an alternative.

The rate of installation for the York Trunk Sanitary Sewer, which has been preliminarily sized at between 1050 and 1200 millimetres in diameter, will be approximately 25 to 35 metres per day. As excavation progresses and the pipe in installed, the trench is backfilled, limiting the extent of the open excavation.

Where road crossings are required, the installation would generally be performed in two stages, half of the road at a time, to allow for continued traffic movement.

Open cut construction generates excess materials as the soil is excavated and replaced with the pipe. This material may sometimes be reused on site as backfill or for regrading, however, it is often

required to be removed from the site and disposed of. This may be a concern where there is the potential for environmental impairment.

For the installation of the trunk sewer and the feedermain, the following general design/construction assumptions have been made where open cut construction is the preferred installation method:

- A minimum of 1.2 metres of cover will be maintained over any new sewer pipes. It is acknowledged that this may not be possible, as it has been observed that the existing trunk sewer has limited cover in some locations.
- 1050mm diameter sewer pipes will be required east of the Speed River crossing.
- 1200mm diameter sewer pipes will be required west of, and including, the Speed River crossing.
- The feedermain will be 500mm in diameter (material to confirmed at the detailed design stage)
- A minimum of 1.8 metres of cover will be maintained over any new feedermain pipes for frost protection.
- Disturbance of existing utilities and services will be minimized.
- Newly installed services and roads will be protected and disturbance minimized.
- Where possible, in-situ repair of the existing sewer (i.e. – cured in place lining) will be examined where capacity issues are less of a concern and the condition of the pipe makes this a feasible alternative.
- Where applicable, the new feedermain and the York Trunk Sanitary Sewer would be installed in a combined trench.
- In accordance with Ministry of the Environment (MOE) guidelines, at least 2.5 metres separation will be provided between any sewers and the new feedermain. Where this is not possible, at least 0.5 metres vertical separation will be provided. At least 1.5 metres separation will be provided between all other services.
- 4 metres separation should be provided between the York Trunk Sanitary Sewer and the Paisley-Clythe Feedermain where they are installed in a combined trench to protect the services in the event of a watermain break. Alternatively, clay dikes may be considered to reduce the required separation distance.
- The area affected by any excavation will be 7 to 15 metres wide, depending on the services being installed.
- Adequate access for equipment will be possible, including clearances from overhead wires.
- Disruption to traffic will be minimized.

5.6.2 Trenchless Construction

Boring

The construction of gravity sanitary sewers and watermains by conventional tunnelling methods is a common alternative to open-cut construction. There are a number of tunnelling techniques that are used depending on the size of the pipe, material that the tunnel will be mined through and whether groundwater is a consideration. Based on the required depth of the trunk sanitary sewer, the in-situ conditions, and the length of tunnel to be constructed to complete the Speed River Crossing, the use of a Tunnel Boring Machine (TBM) would be a method of construction considered to be employed.

The conventional TBM includes a front face that comprises the cutting discs and teeth depending on the material being mined. Within the TBM casing are the motors and machinery that turn the cutting head and propel the machine forward. Generally, as the TBM moves forward, a primary liner is constructed, typically with a system of expanded steel ribs and hardwood timber lagging. This provides for the initial stabilized tunnel as the machine excavates forward. Once the tunnel mining is complete, a final liner of either cast-in-place concrete or pre-cast sewer pipe is placed in the tunnel. This is

referred to as the secondary liner and will function as the trunk sanitary sewer or as a carrier for the feedermain or other smaller pipes (i.e. – siphon).

This method of tunnelling cannot deal with excessive amounts of groundwater. If groundwater is a concern then advance dewatering will be necessary. Based on the preliminary geotechnical investigation the tunnel is expected to be within fractured zones where groundwater would be encountered. It is expected that water seepage will occur through the rock which will flow back to the shafts and be pumped out.

By completing certain sections by tunnelling, the trunk sanitary sewer and feedermain installation will have relatively minor construction related impacts on the environment. The only sign of construction will be at the shaft locations where the excavated material will be removed and the final lining system installed.

Based on the depth of installation, however, the shafts will require extensive staging areas, potentially up to 60 metres in length to allow for equipment access and pipe installation and the removal of bored materials for re-use or disposal.

Horizontal Direction Drilling

Other trenchless applications related to this project are the undercrossing of the Hanlon Expressway and various railroad undercrossings. Based on the alternative alignments, only the new feedermain would require this to be performed. With a smaller diameter pipe (approximately 500mm), horizontal directional drilling is typically employed in this instance to install a steel casing pipe through which the new service is pulled through, supported, and grouted.

Horizontal Direction Drilling (HDD) is a drilling process in which a path is drilled underground so that a utility may be placed in the bore. While the procedure changes depending on the situation, the general procedure remains the same.

Before drilling can commence, an entrance pit is dug on one side of the drill site and a receiving pit is dug on the other. The purpose of the entrance pit is to allow for the collection and recovery of the drilling fluid which the directional drilling unit uses and to allow for entry of equipment to complete a pilot bore. The purpose of the receiving hole is to allow the directional drilling unit to pull the pipe through the drill tunnel. Once the entrance pit and receiving holes are dug, the directional drilling unit bores a narrow pilot hole through the length of the tunnel via the entrance pit. A back reamer - which is fitted with a larger drill bit – is then pulled backward through the tunnel from the receiving pit to widen the bore to the desired width. As the back reamer is pulled through, the pipe to be installed is attached to the back reamer using a swivel. Once the pipe is pulled through, it is connected to the pipes on either side or left open for further work. It should be noted that the types of pipe which can be used for this application are limited to ductile materials only since they must bend to conform to the hole. Common piping materials used are PE, PVC, steel and ductile iron.

For railroad and road undercrossings, where HDD might be employed for the feedermain, the following assumptions have been made:

- A minimum of 1.8 metres of cover will be maintained over any new feedermain pipes for frost protection.
- The feedermain will be 500 mm in diameter (material to be determined during detailed design)
- The carrier pipe will be steel, and as per MTO and CN requirements
- The carrier pipe will be minimum 750 mm in diameter to accommodate the feedermain and the spacers in the carrier pipe.
- The carrier pipe will extend approximately 16 metres beyond the MTO right-of-way in either direction
- Disturbance of existing utilities and services will be minimized.
- Adequate access for equipment will be possible, including clearances from overhead wires.

- Disruption to traffic will be minimized.

5.6.3 Open Cut River Crossings

Open cut river crossing is the process in which a section of a river (or the whole river) is blocked off, isolated and dewatered in order to place a service in the ground under the river. The purpose of this is to allow a dry workspace in order for the pipe to be placed while minimizing silt and sediment release into the water which can be potentially damaging to aquatic life and habitat in the river.

The first step to complete an open cut river crossing is to isolate a section of the river using sheet piling. This allows for the river to maintain flow while creating an isolated work area. The sheet piling must be placed so that there is enough space for a safe working trench to be excavated. Once the work area is separated from the rest of the river, the work area is to be dewatered so that excavation can take place. This is typically done through means of pumping. Pumping may need to be maintained throughout the excavation if water is leaking in. Once the work area is dry, the bed of the river is then excavated. The resultant trench must be deep enough so that the flow of water does not cause the pipe to later become uncovered. This could cause the pipe to erode over time and would cause any leaks to be released directly into the stream which could be harmful to the river ecosystem. This may be mitigated by the choice of backfilling material.

Once the trench has been excavated, the pipe is placed into the trench. The trench is then backfilled and reinstated and renaturalized, as required. The enclosure is then filled with water in order to prevent a large inflow of water when sheet piling is removed. The sheet piling is then removed and the process is repeated on the other side of the river to complete the crossing.

Assumptions

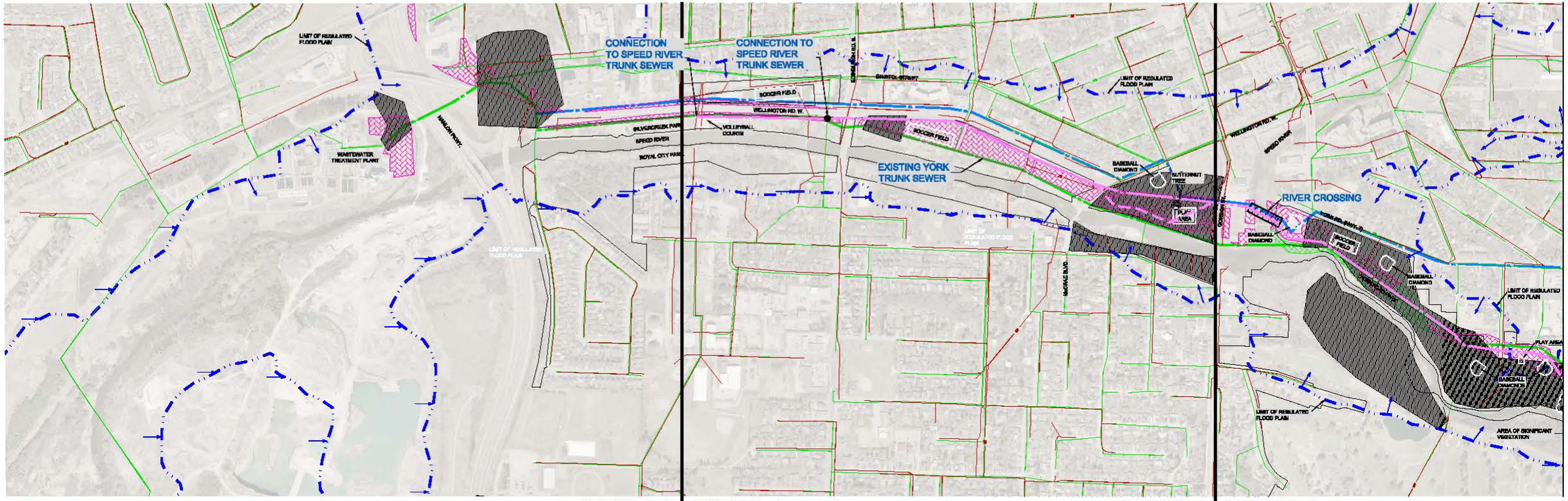
- Cuts will be made on a straight short section of the river to avoid erosion and scouring of the river bed
- Any vegetation that is removed will be replaced in order to prevent erosion
- Cuts will be made during low flow times to prevent overflowing and bed erosion
- Work will be scheduled around the cool water fishery in the Speed River
- Rock removal will be required for the trenching

1. Sheet Piling is Installed Across the River

2. Water Flow is Diverted Across the Channel, Excavation is Pumped Out

3. Construction Begins...

4. The River is Restored



LEGEND

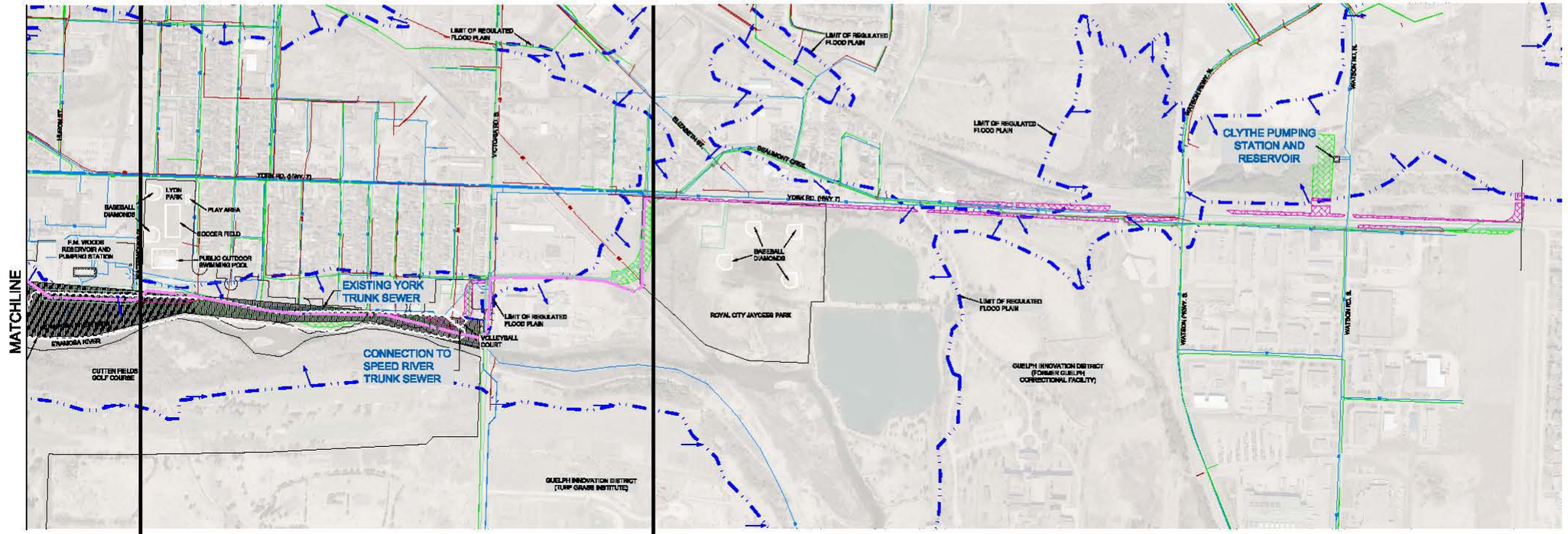
- HIGH ARCHEOLOGICAL POTENTIAL: NOT PREVIOUSLY DISTURBED
- UNCERTAIN ARCHEOLOGICAL POTENTIAL: LAND MAY HAVE BEEN AFFECTED BY ADJACENT DEVELOPMENT, REQUIRED STAGE 2 ASSESSMENT PRIOR TO CONSTRUCTION
- EXISTING SANITARY SEWER
- ALTERNATIVE ALIGNMENT NO.1
- ALTERNATIVE ALIGNMENT NO. 1A
- ALTERNATIVE ALIGNMENT NO. 2

CITY OF Guelph
Making a Difference

YORK TRUNK SEWER
ALTERNATIVE ALIGNMENTS
FIGURE 5.1

SCALE: 1:5000

GENIVAR



LEGEND

- HIGH ARCHEOLOGICAL POTENTIAL: NOT PREVIOUSLY DISTURBED
- UNCERTAIN ARCHEOLOGICAL POTENTIAL: LAND MAY HAVE BEEN AFFECTED BY ADJACENT DEVELOPMENT, REQUIRED STAGE 2 ASSESSMENT PRIOR TO CONSTRUCTION
- EXISTING SANITARY SEWER
- ALTERNATIVE ALIGNMENT NO.1
- ALTERNATIVE ALIGNMENT NO. 2

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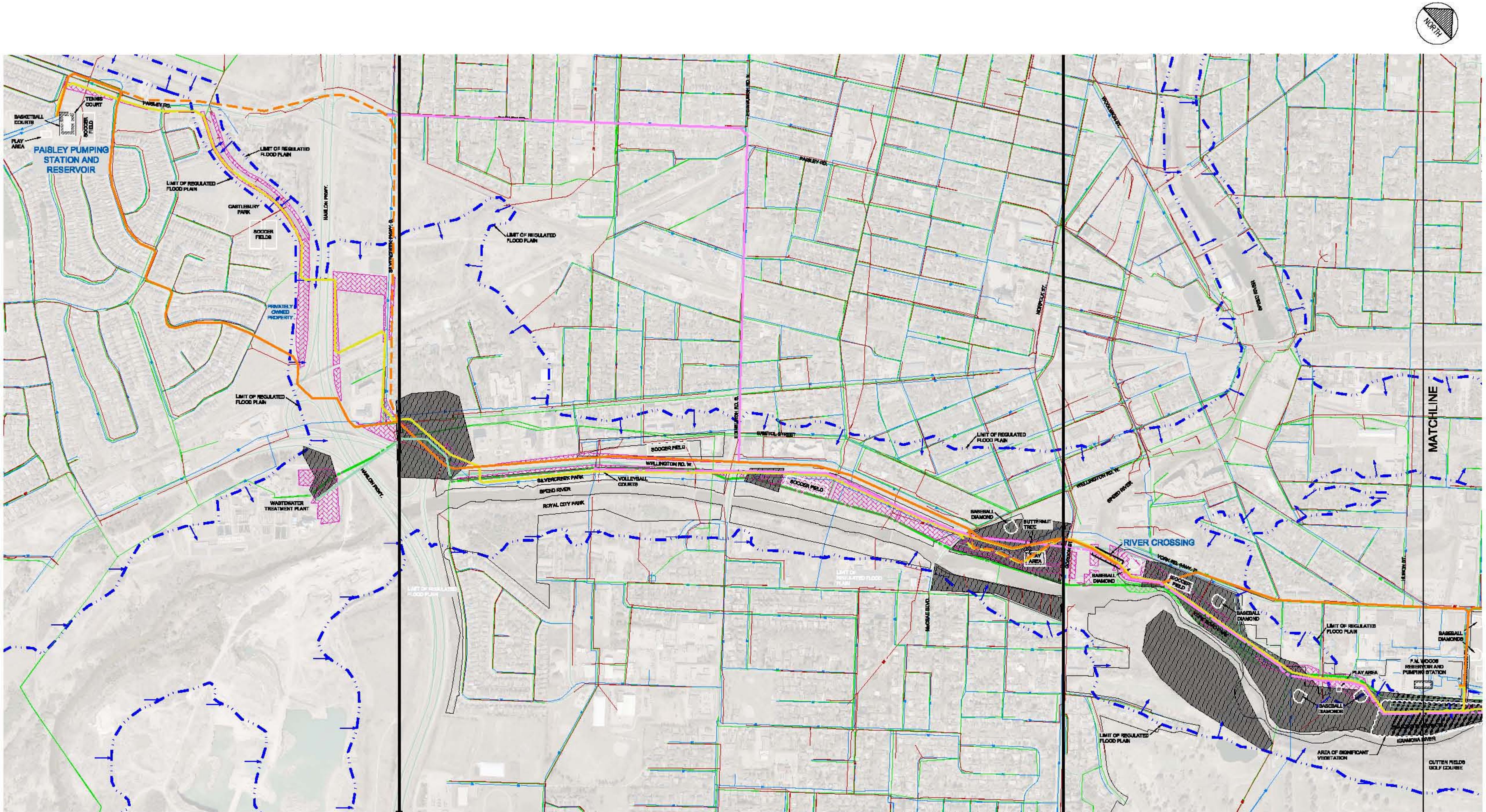
YORK TRUNK SEWER
ALTERNATIVE ALIGNMENTS
FIGURE 5.1 - SHEET 2

SCALE: 1:5000

GENIVAR


PAISLEY PUMPING STATION AND RESERVOIR
BASKETBALL COURTS
TENNIS COURT
SOCCER FIELD
PLAY AREA
PAISLEY RD.
LIMIT OF REGULATED FLOOD PLAIN
CASTLEBURY PARK
SOCCER FIELDS
PRIVATELY OWNED PROPERTY
HANLON PKWY.
WASTEWATER TREATMENT PLANT
SILVERCREEK PARK
VOLLEYBALL COURTS
SPEED RIVER
ROYAL CITY PARK
WELLINGTON RD. W.
SOCCER FIELD
BRISTOL STREET
BASEBALL DIAMOND
BUTTERNUT TREE
RIVER CROSSING
YORK RD.
BASEBALL DIAMONDS
PLAY AREA
F.M. WOODS RESERVOIR AND PUMPING STATION
AREA OF SIGNIFICANT VEGETATION
ERAMOSA RIVER
CUTTEN FIELDS GOLF COURSE
MATCHLINE
NORTH

SECTION No. 5 | SECTION No. 4

SECTION No. 4 | SECTION No. 3

LEGEND

- HIGH ARCHEOLOGICAL POTENTIAL: NOT PREVIOUSLY DISTURBED
- UNCERTAIN ARCHEOLOGICAL POTENTIAL: LAND MAY HAVE BEEN AFFECTED BY ADJACENT DEVELOPMENT, REQUIRED STAGE 2 ASSESSMENT PRIOR TO CONSTRUCTION
- ALTERNATIVE ALIGNMENT NO.1
- ALTERNATIVE ALIGNMENT NO.1A
- ALTERNATIVE ALIGNMENT NO.1B
- ALTERNATIVE ALIGNMENT NO.2
- ALTERNATIVE ALIGNMENT NO.2A

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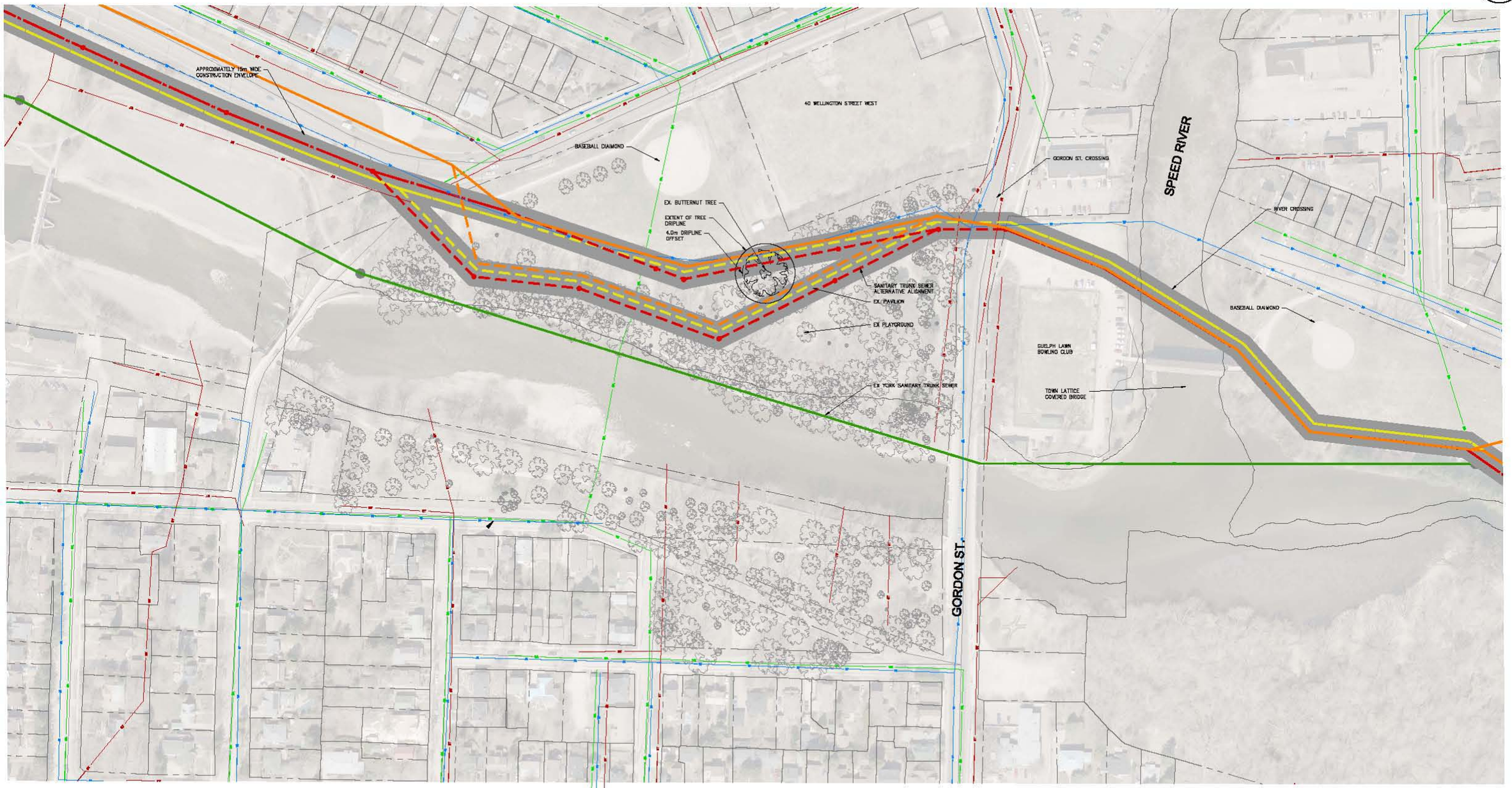
PAISLEY-CLYTHE FEEDERMAIN
ALTERNATIVE ALIGNMENTS
FIGURE 5.2

SCALE: 1:5000

GENIVAR



LEGEND

- EXISTING SANITARY TRUNK SEWER
- WATERMAIN PREFERRED ALIGNMENT
- WATERMAIN PREFERRED ALTERNATIVE ALIGNMENT
- WATERMAIN MASTER PLAN ALIGNMENT
- WATERMAIN MASTER PLAN ALTERNATIVE ALIGNMENT
- NEW SANITARY PREFERRED ALIGNMENT
- NEW SANITARY ALTERNATIVE ALIGNMENT
- EXISTING WATERMAIN
- EXISTING SANITARY SEWER
- EXISTING STORM SEWER

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YORK TRUNK SEWER AND PAISLEY-CLYTHE FEEDERMAIN ALTERNATIVE ALIGNMENTS - ROYAL CITY PARK DETAIL
FIGURE 5.3

SCALE: 1:1000

GENIVAR

6. EVALUATION OF ALTERNATIVES

6.1 APPROACH TO EVALUATION OF ALTERNATIVES

The sanitary sewer and feedermain alignments were evaluated to determine the preferred servicing alternative for the York Trunk Sanitary Sewer and Paisley-Clythe Feedermain. The alternatives were assessed according to their environmental, social, economic, cultural impacts as well as technical and operation merit. The criteria are included in an evaluation matrix to objectively assess the impacts and determine the preferred solution. Comparative assessments of the sewer and feedermain alternatives were conducted to determine which solution has the least overall impact.

The approach used to determine the preferred solution for the York Trunk Sanitary Sewer and the Paisley-Clythe Feedermain is explained below:

- **Step 1: Determine Evaluation Criteria** – Criteria must be defined upon which the alternatives will be evaluated. As mentioned above, evaluation categories for this project will include (1) impact on the natural environment, (2) impact on the social and cultural environments, (3) financial & economic impact, and (4) technical & operational merit. The individual impacts will typically fit into these four general categories. A breakdown of the impacts included under each criterion is defined in Section 6.2 of this report.
- **Step 2: Create an Evaluation System** – An evaluation system was required to evaluate each of the alternatives. This system was developed prior to determining the potential impacts associated with each alternative. During the evaluation, each of the alternatives was assigned a colour rating: green for “most preferred”, yellow for “less preferred” and orange for “least preferred”, for each of the evaluation criterion. The colour rating reflected how the alternative performs with respect to that criterion. The four evaluation categories were assigned equal weighting as they were considered to have equal importance in this evaluation.
- **Step 3: Document Potential Impacts** - The individual impacts associated with each alternative were determined and documented. These impacts were categorized under one of the four evaluation categories described above, based on whether they impact the natural environment, social & cultural environment, financial and economic environment, or technical and operational merit. A sewer matrix and a feedermain matrix were created to document the impacts, weigh the alternatives qualitatively, and ultimately determine the preferred solution. The matrices have the alternatives listed along columns and the evaluation criteria along rows.
- **Step 4: Evaluate the Alternatives** - Each of the alternatives was assigned a colour rating for each of the evaluation categories using the methodology established in Step 2. The evaluation was based on a qualitative assessment of the individual impacts documented in the table created during Step 3. The colour green rating indicates that the alternative had a low impact (most preferred) with respect to that particular criterion. An orange colour indicates that the alternative had a high impact (least preferred) with respect to that particular criterion. A yellow colour will indicate moderate impact (less preferred).
- **Step 5: Determine the Preferred Alternative** - The servicing alternative with the least overall impact was recommended for implementation.

6.2 EVALUATION CRITERIA

As indicated above, the evaluation approach involves the assessment of the impacts associated with the sewer servicing alternatives on four main evaluation criteria categories. Evaluation criteria for this project included impact on the natural environment, impact on the social and cultural environments, economic impact, and technical and operational merit. A more detailed breakdown of the impacts in their respective criterion category is below:

Natural and Physical Environment:

- Natural Features / ANSIs / ESAs

- Wood Lots and Trees
- Wildlife / SAR
- Floodplains
- Aquatic and Terrestrial Resources
- Impacts to Groundwater

Social and Cultural Environment:

- Proximity to Built-Up Areas
- Traffic Impacts
- Archaeological Features
- Cultural Heritage Features
- Private Properties Affected
- Compatibility with Current and Proposed Land Uses
- Proximity to City Parks

Technical

- Soil & Ground Water Conditions
- Impacts to Utilities
- Reliability
- Ability to Phase with Other Infrastructure Upgrades
- Constructability
- Road and Railway Crossings
- Operation and Maintenance

Economic Impact:

- Estimated capital costs
- Operating and Maintenance / Life Cycle Costs
- Land Acquisition Costs

Screening criteria were developed as a filtering mechanism to ensure that the alternative routes selected are feasible, given the preliminary understanding of the Study Area. The screening criteria used include the following:

- Utilize existing road allowances, open space and utility corridors as much as possible.
- Minimize Impact on Natural Environment, such as watercourses, green spaces, and other known features.
- Minimize Impact on Social and Cultural Environments.

Preliminary screening criteria guided the identification of alternatives in conjunction with the key considerations described below. Alternatives were selected to avoid impacts entirely or to reduce them to the extent possible. It is important to note that although alternatives were selected to minimize impacts, it is typically not feasible to mitigate all impacts for all alternatives. Each of the alternatives had different advantages as well as some negative impacts associated with it. A comprehensive assessment of the impacts was conducted during Class EA Study to select the solution with the best balance. Upon study conclusion, the alternative deemed to have the least impact will be recommended for implementation.

6.3 EVALUATION METHODOLOGY

In order to qualitatively evaluate the proposed alternatives, each of the criteria presented in Section 6.2 were assessed in a descriptive manner rather than a quantitative manner. Rather than having a numerical or weighted ranking system, the evaluation focuses instead on the strengths and weaknesses of each alignment alternative to identify the preferred alternative. For each evaluation criterion and for each sewer and feedermain alignment alternative, the potential effects on the environment were identified and evaluated relative to the other alternatives as being most preferred, less preferred, and least preferred. The evaluation is based on the relative advantages and disadvantages of the potential environmental effects for each alignment and the availability and effectiveness of mitigation measures.

In assessing alternative alignments, the alternatives were compared on the basis of each evaluation criterion. In addition, the intent of comparing alternatives based on a variety of criteria was to identify and assess the potential impacts. The alternatives were rated by color; green for “most preferred”, yellow for “moderate” and orange for “least preferred” for each of the screening criterion.

6.4 COMPARATIVE EVALUATION OF SEWER ALTERNATIVES

Tables 6-1 to 6-4 present the detailed assessment of the viable York Trunk Sewer Alternatives based on each of the criteria listed in Section 6.2. The assessment is based on the set of developed evaluation criteria. A summary of the key considerations for each evaluation criteria category are presented in sections 6-5 to 6-7.

6.5 Natural Environment Evaluation

The Natural and Physical Environment aspects of the York Trunk Sewer alternatives were evaluated with respect to impacts to natural features and areas, impacts to floodplains as well as watercourse crossings and fisheries, groundwater, and the potential sources of contamination within the Study Area, as per the evaluation criteria presented in Section 6.2. Details of the Natural and Physical Environmental impacts and evaluation for each alternative are presented below.

6.5.1 Section 2 – From Industrial Avenue to Waterworks Place

6.5.1.1 Alternative Alignment No. 1

Alternative Alignment No. 1 is located within an existing utility easement in the developed park area west of Victoria Road. It generally follows the alignment of the existing York Trunk Sanitary Sewer.

This section of Alignment 1 does not require any watercourse crossings. However, the alignment is located primarily within the regulated floodplain limits and therefore there is some potential for flooding or erosion. Additionally, dewatering may be required. Eramosa River Park is the site of an historical landfill area. Therefore, any withdrawn water may be impaired and will require treatment or alternative disposal techniques. However, it is expected that the impacts to City wells or regional groundwater flow will not be significant. Overall, it is expected that there will be minimal impacts to the floodplain associated with installation of the twinned sewer.

The banks of the Eramosa River found within the parkland have been identified as significant valleylands as part of the City’s Natural Heritage System. These valleylands are located in the undeveloped portions of the regulated flood plain. It expected that there will be significant disturbances to the trees and vegetation in Eramosa River Park, requiring some tree removal. Additionally, the following species-at-risk may be found within the vicinity: Blanding’s Turtle, Snapping Turtles, Northern Map Turtle, Milk Snake, Eastern Ribbon Snake, and Tuberous Indian-plantain.

6.5.1.2 Alternative Alignment No. 2

This alignment is located within the existing York Road corridor in Section 2, traveling westward from Industrial Road to Waterworks Place. Because this alignment is located primarily within this road allowance in an existing developed area, it is expected that there will be limited impact to natural features and vegetation.

This section of the alignment does not require any watercourse crossings and is not located within the regulated floodplain limits. Flooding or erosion, therefore, is not expected during construction. Dewatering may be required for the installation of the feedermain, however it is expected that there will not be significant impacts to City wells or regional groundwater flow. Additionally, there are limited sources of potential contamination present within the area and, therefore, any withdrawn water would not likely require treatment or alternative disposal techniques.

There are no significant natural areas along this alignment. However, the following species-at-risk may be found within the vicinity: Blanding's Turtle, Northern Map Turtle, Milk Snake, Eastern Ribbon Snake, Snapping Turtle, and Tuberous Indian-plantain. Given however, that the alignment is generally with an existing road allowance, any impacts should be minimized.

This is the preferred alternative with respect to Natural Environmental concerns with the Study Area due to its limited impact on parkland and the shoreline of the Eramosa River.

6.5.2 Section 3 – From Waterworks Place to Gordon Street

6.5.2.1 Alternative Alignment No. 1

This alignment alternative continues from the F.M. Woods Reservoir and Pumping Station in Section 2 through Eramosa River Park, enters York Road Park, and crosses the Speed River to Gordon Street. The alignment is located primarily within an existing utility corridor.

This alignment requires one (1) watercourse crossing under the Speed River from York Road Park to Gordon Street. The banks of the Speed River within the undeveloped portions of the regulated floodplain have been identified as a significant natural area as part of the City's Natural Heritage System. The river banks are considered to be significant valley lands and may be disturbed by the river crossing. Additionally, the Speed River is a cool water fish habitat and this stretch of the Speed River and waters to the west have been identified by the MNR as a waterfowl overwintering area. Further consultation with the MNR will be required at the detailed design phase to ensure that construction is performed during timing windows that will also reduce impacts to overwintering waterfowl and their habitat. As tree and vegetation removal is required on both sides of the Speed River, revegetation of the riparian zone should be carried out in a timely manner.

In addition, it is expected that there will be significant disturbances to the trees and vegetation in both Eramosa River Park and York Road Park, including some tree removal. Additionally, the following species-at-risk may be found within the vicinity: Blanding's Turtle, Northern Map Turtle, Milk Snake, Snapping Turtle, Eastern Ribbon Snake, and Tuberous Indian-plantain.

The total alignment, including the river crossing, is located within the regulated floodplain limits and therefore there is some potential for flooding or erosion. Dewatering may be required. The parkland areas are the site of a historical landfill area, therefore, any withdrawn water may be impaired and require treatment or alternative disposal techniques. However, it is expected that the impacts to City wells or regional groundwater flow will not be significant. Overall, it is expected that there will be minimal impacts to the floodplain associated with installation of a new trunk sewer within the parkland.

The crossing of the Speed River can be performed either by trenchless technology, likely boring, or by open cut. Section 6.14, below, provides a detailed analysis of these two options to determine the preferred alternative for the river crossing with respect to natural environmental considerations.

6.5.2.2 Alternative Alignment No. 2

Alternative Alignment No. 2 continues from Section 2 along York Road from Waterworks Place, entering York Road Park prior to crossing the Speed River to Gordon Street. The alignment is located primarily within a road allowance in the existing developed area. As such, it is expected that there will be limited impact to natural features and vegetation, except for a small portion of York Road Park, currently used as sports fields.

This alignment requires one (1) watercourse crossing under the Speed River from York Road Park to Gordon Street. Details related to this crossing are presented in Section 6.5.2.1 above as the alternative alignments in this area are the same.

This is the preferred alternative with respect to Natural Environmental concerns with the Study Area due to its limited impact on parkland and the shoreline of the Eramosa River.

6.5.3 Section 4 – From Gordon Street to Silvercreek Parkway South

6.5.3.1 Alternative Alignment No. 1 and Alternative Alignment No. 1A

Alternative Alignment No. 1 continues from Gordon Street, entering Royal City Park, crossing Edinburgh Road, and tying back in with the existing York TSS at Manhole 298, in Silvercreek Park. The alignment is located primarily within an existing utility corridor and lands developed as parkland.

This section requires one (1) crossing of a municipal drain and it is located within the regulated floodplain. Therefore there is some potential for flooding or erosion, and dewatering may be required. Additionally, the portion of Silvercreek Park through which it is aligned is the site of a historical landfill area. Therefore, any withdrawn water may be impaired and will require treatment or alternative disposal techniques. However, it is expected that the impacts to City wells or regional groundwater flow will not be significant. Overall, it is expected that there will be minimal impacts to the floodplain associated with installation of new trunk sewer. Additionally, exfiltration and surcharging of the sewers will be mitigated through the use of new construction materials.

The banks of the Speed River found within the parkland have been identified as significant valleylands as part of the City's Natural Heritage System. These valleylands are located in the undeveloped portions of the regulated flood plain. It expected that there will be disturbances to the trees and vegetation in Silvercreek Park, requiring some tree removal. This may be mitigated through replanting and renaturalization of disturbed trees and vegetation.

A protected Butternut tree is located in this park which will require compensatory replanting, in accordance with MNR requirements, if it is required to be removed. Alternative Alignment 1A is proposed if it is preferred to avoid the Butternut tree. This aligns the sewer southward, requiring the temporary relocation of a gazebo and a children's play area before aligning the pipe under the paved boulevard for approximately 200 metres before rejoining the primary alignment. The boulevard is lined with ash trees which are slated for removal by the City to address potential infestation by the Emerald Ash Borer beetle.

Both of these alignment alternatives are presented as viable options to be assessed during detailed design.

The following species-at-risk may be found within the vicinity: Blanding's Turtle, Northern Map Turtle, Snapping Turtle, Milk Snake, Eastern Ribbon Snake, and Tuberous Indian-plantain. Sections of Silver Creek Park which may be affected by this alignment have also been identified as restoration areas.

There is an opportunity to install the twinned sewer in conjunction with the Paisley-Clythe Feedermain, including at the Speed River Crossing. This should be exploited, if possible, to minimize environmental impacts to the river and parklands.

6.5.3.2 Alternative Alignment No. 2

Alternative Alignment No. 2 continues from Gordon Street, entering Royal City Park along the south boundary of the 40 Wellington Street West property, before turning north to Wellington Street West where it continues along the north side of the road to the west side of Edinburgh Road, where it crosses Wellington Road West to tie-in to existing manhole 298 in Silvercreek Park. The alignment is located primarily within an existing road allowance and as such it is likely to have limited impact on natural features outside of the park area.

This section requires one (1) crossings of a municipal drain and it is located within the regulated floodplain. Therefore there is some potential for flooding or erosion, and dewatering may be required. Additionally, a portion of area through which it is aligned is the site of historical landfilling activities

area. Therefore, any withdrawn water may be impaired and require treatment or alternative disposal techniques. However, it is expected that the impacts to City wells or regional groundwater flow will not be significant. Overall, it is expected that there will be minimal impacts to the floodplain associated with installation of new trunk sewer.

The banks of the Speed River found within the parkland have been identified as significant valleylands, located in the undeveloped portions of the regulated flood plain. It is expected that there will be disturbances to the trees and vegetation in Royal City Park, including some tree removal. The Butternut tree would require to be removed and compensatory planting provided as per MNR requirements. Additionally, the following other species-at-risk may be found within the vicinity: Blanding's Turtle, Northern Map Turtle, Milk Snake, Snapping Turtle Eastern Ribbon Snake, and Tuberous Indian-plantain.

Alternative Alignment No. 2 is the preferred York TSS alignment in this Section with respect to the Natural Environment due to its limited impact on trees and vegetation with the in the City Parkland.

6.6 Social and Cultural Environment Evaluation

Key Social and Cultural Environmental criteria included the proximity to built-up areas, traffic impacts, heritage features, effects on private properties, etc. as per Section 6.2. Key points of the evaluation are presented below.

6.6.1 Section 2 – From Industrial Avenue to Waterworks Place

6.6.1.1 Alternative Alignment No. 1

Eramosa River Park has been identified as an area potentially impacted by historical landfilling activities. Additionally, it is considered an area of high or uncertain archaeological potential. As a result, a Stage 2 Archaeological Assessment would be required prior to construction. In addition, an environmental assessment of the subsurface soil and groundwater conditions would be necessary to assess the potential impacts resulting from former landfilling activities.

Unlike Alternative Alignment No. 2, in this Section, disturbance to residences and business is limited. Disruption to services will not likely be required and long-term disruption of roads and the provision of services (mail, garbage collection) will not be required.

The alignment, in Eramosa River Park, will, however, have a significant impact on park use. While this is an existing utility corridor, there will be significant disturbance of trails and recreational use in the park. This may be mitigated by scheduling the work at times of low use (late fall, winter, early spring). Performing this work in conjunction with upgrades to the Clythe Feedermain, also located within this corridor, would further mitigate construction impacts of both of these projects through limiting construction areas to one location.

6.6.1.2 Alternative Alignment No. 2

This Section includes a mix a residential and commercial/industrial land uses. East of Victoria Road, the area is primarily commercial/industrial use, whereas west of Victoria Road, land use is primarily a matured residential neighbourhood with some commercial properties present. York Road is a main artery in this area for the residential neighbourhood located on both the north and south sides of York Road.

With the exception of a railroad undercrossing east of Victoria Road, which would be performed by horizontal direction drilling or boring, the installation of the sewer would be performed by open cut. The intersection of York road and Victoria Road was recently upgraded, along with a section of York Road east of this intersection. This is a very busy intersection and it is generally not preferred to redo recently completed construction as well as repeat the disruption it generated to local businesses and residents of that area.

This will cause significant disruption to access to businesses and residences in the area as, west of Victoria Road, York Road is a two-lane road and one lane will require closure for the work. The

surrounding neighbourhoods are all centered around York Road as the main thoroughfare and detours would not be easily implemented locally without causing additional disruption to local side streets. Additional temporary disruption to services (gas, phone, etc) will also likely occur.

As a main thoroughfare, the provision of other services will also be impacted, in particular, garbage collection, mail delivery, and public transportation. Potential impacts to these services would need to be reviewed with the providers and alternatives developed to mitigate the impacts at the detailed design stage.

There are no areas of archaeological potential located along this alignment and no cultural heritage features. Additionally, there will be limited disruption to local parks, however, access to Lyon Park, which contains a public swimming pool, may be limited during construction on Waterworks Place. Alternative access is available, however, on Boult Avenue, located one block east of Waterworks Place.

This alternative alignment is located completely within an existing built-up area and social and cultural impacts will be limited to the construction period, which may be further mitigated by performing the construction in conjunction with other proposed projects. As such, this is an acceptable alternative with respect to the cultural and social environment with easily mitigated impacts, however, additional archaeological assessment will be required.

Compared to the other alternative, this alignment is more desirable in that it is not located within areas of Archaeological potential and that there will be a minimal impact on use of Eramosa River Park, however; Alternative Alignment No. 1 is ultimately the preferred alternative, from a social and cultural consideration, due to the limited impacts to businesses and residents and that disturbance of roads and other services is limited.

6.6.2 Section 3 – From Waterworks Place to Gordon Street

6.6.2.1 Alternative Alignment No. 1

This alignment limits impacts to business and residents in the area beyond the imposition of construction traffic. Disturbances to the provision of services will be minimal.

Construction of the twinned sewer would be performed by open-cut. Impacts to park use, during this construction, will be significant as York Road Park is used extensively for recreation, with baseball diamonds and soccer pitches present. There is also extensive pedestrian and cyclist use of the trails within this section of the park. Impacts to park use may be mitigated, somewhat, though scheduling of the work around times of high use in the park (late spring to early fall).

York Road Park has been identified as an area potentially impacted by historical landfilling activities. Additionally, it is considered an area of high or uncertain archaeological potential, A Stage 2 Archaeological Assessment would be required prior to construction. In addition, an environmental assessment of the subsurface soil and groundwater conditions would be necessary to assess the potential impacts resulting from former landfilling activities.

Public use of the section of the Speed River where the crossing is proposed is generally limited and long-term social or cultural impacts will not result from the proposed works. As a cool water fishery, work within the Speed River is limited from March 15 to June 30. This scheduling limitation would coordinate with scheduling the work to mitigate potentially negative impacts to activities on the west side of the Speed River, such as the Boathouse Tea Room and the Guelph Lawn Bowling Club, and within York Road Park, as these areas are used less, or not in operation, in the late fall to early spring.

The river crossing is to terminate in the municipally owned parking area located between the Guelph Animal Hospital and the Guelph Lawn Bowling Club. Impacts that are anticipated with this include the temporary loss of public parking as well as disturbance to patrons of the Lawn Bowling Club, in addition to patrons of the Boathouse Tea Room, located immediately south of the area of work.

The crossing of the Speed River can be performed either by trenchless technology, likely boring, or by open cut. Section 6.14, below, provides a detailed analysis of these two options to determine the preferred alternative for the river crossing with respect to social and cultural considerations..

Again, scheduling the work around times of peak use in the park, and when the lawn bowling club is not operating, such as in the late fall to early spring, may mitigate these impacts. This would also coordinate with the restrictions on in-water work association with the cool water fishery in the Speed River.

6.6.2.2 Alternative Alignment No. 2

This alignment alternative would extend westward along York Road, veering into York Road Park near the intersection with Wyndham Street South, for the crossing of the Speed River.

The new sewer would be installed by open-cut construction which would result in significant disturbance to residents and businesses on, or around, York Road, as York Road is a two-lane road and one lane will require closure for the work. The surrounding neighbourhoods are all centered around York Road as the main thoroughfare and detours would not be easily implemented locally without causing additional disruption to local side streets. Additional temporary disruption to services (gas, phone, etc) in the area of work will also likely occur.

As a main thoroughfare, the provision of other services will also be impacted, in particular, garbage collection, mail delivery, and public transportation. Potential impacts to these services would need to be reviewed with the providers and alternatives developed to mitigate the impacts at the detailed design stage.

The section of York Road Park that would be impacted is significantly smaller with this alternative, however, areas designated as areas of uncertain archaeological potential are still present, as is an area identified as being potentially impaired due to historical landfilling activities. A Stage 2 Archaeological Assessment would be required prior to construction. In addition, an environmental assessment of the subsurface soil and groundwater conditions would be necessary to assess the potential impacts resulting from former landfilling activities.

Public use of the section of the Speed River where the crossing is proposed is generally limited and long-term social or cultural impacts will not result from the proposed works. As a cool water fishery, work within the Speed River is limited from March 15 to June 30. This scheduling limitation would coordinate with scheduling the work to mitigate potentially negative impacts to activities on the west side of the Speed River, such as the Boathouse Tea Room and the Guelph Lawn Bowling Club, and within York Road Park, as these areas are used less, or not in operation, in the late fall to early spring.

Of the two alternatives available in Section 3, this is the least preferable in a social and cultural context due to the significant disruption that will be caused to residents and business on York Road and the surrounding area.

6.6.3 Section 4 – From Gordon Street to the Hanlon Parkway

6.6.3.1 Alternative Alignment No. 1 and Alternative Alignment No. 1A

This alignment, as well as Alternative Alignment No. 1A, in Royal City Park, is located primarily within municipally owned land. This area consists of existing parkland on the south side of Wellington Street West. There is expected to be limited impact on private properties and the alignment will not impact the land upon completion of installation, however, public use of the parkland will be disrupted, including the possible temporary removal of a playground, along with disruption to use of the various sports facilities in the park.

Minimal impacts to the traffic on Wellington Street West are expected; the only areas of concern are along Wellington Street West at the crossings of Gordon Street and Edinburgh Road. These road crossing will cause temporary disruption to business and residents in the area, however, it is anticipated that this work would be completed within a matter of days and that it would be performed in phases so that vehicle flow is maintained through traffic control and marshalling.

There are no cultural heritage features of concern along this alignment.

This alignment passes through both Royal City and Silvercreek Park. There is potential for loss of trees from this park. There may also be some disruption to the park facilities including the play area, baseball diamond, volleyball courts, and walking paths located within the park. Again, this may be mitigated by scheduling work around times of peak use in the park, such as in the late fall to early spring, and the alignment will not impact the park area once installation is complete. The opportunity exists in this area to coordinate reinstatement of the works with proposed upgrades to facilities in Silvercreek Park, west of Edinburgh Road, including the relocation of the existing volleyball courts and the provision of a new skatepark.

Areas of Silvercreek Park have been identified as having the potential to be impacted by historical landfilling activities. Additionally, the alignment is located primarily within an area of uncertain archaeological potential and as such a Stage 2 Archaeological Assessment would be required prior to construction.

6.6.3.2 Alternative Alignment No. 2

This alignment is located primarily within municipally owned land. This area consists of existing built-up land along Wellington Street West. There is expected to be limited impact on private properties and the alignment will not impact the land upon completion of installation.

Additionally, impacts to the traffic on Wellington Street West are expected, due to two required road crossings, as well as crossings of Gordon Street and Edinburgh Road. These road crossings will cause temporary disruption to business and residents in the area, however, it is anticipated that this work would be completed within a matter of days and that it would be performed in phases so that vehicle flow is maintained through traffic control and marshalling.

There are no cultural heritage features of concern and it is expected that there will be limited impact to City wells.

This alignment passes through Royal City Park and there may be some disruption to the park facilities including the play area, baseball diamond, and walking paths located within the park. This may be mitigated by scheduling work around times of peak use in the park, such as in the late fall to early spring, and the alignment will not impact the park area once installation is complete.

Areas along this alignment have been identified as having potential to be impacted by historical landfilling activities. Additionally, the alignment is located primarily within an area of uncertain archaeological potential and as such a Stage 2 Archaeological Assessment would be required prior to construction.

Due to the disruption to local businesses and residents, Alternative Alignment No. 1 is the preferred alignment in the Section although the impacts to park use are anticipated to be greater with that alternative.

6.7 Technical and Operational Evaluation

The Technical and Operational aspects of the York Trunk Sanitary Sewer alternatives were evaluated with respect to soil and ground conditions, impacts to utilities, reliability, and constructability, the ability to phase with other infrastructure upgrades, and the river crossing, as per the evaluation criteria presented in Section 6.2. Details of the Technical and Operational impacts and evaluation for each alternative are presented below.

6.7.1 Section 2 – From Industrial Avenue to Waterworks Place

6.7.1.1 Alternative Alignment No. 1

This alignment would primarily be open cut construction in soils suitable for that type of construction. Some dewatering may be required depending on the local groundwater levels, but impacts resulting from this would be minimal.

In Eramosa River Park, adequate space is present in the existing utility corridor to accommodate the additional twinned sewer. One concern in this area is the presence of a historical landfill which may present unexpected soil conditions, including the presence of deleterious materials that will require to be managed and/or disposed of. If any potentially hazardous environmental conditions are encountered, additional measures may be required during construction for worker safety. If the groundwater is found to be impaired, treatment and disposal of dewatering may be necessary. Assessment of the environmental conditions should be performed prior to construction to identify any areas of potential environmental concern.

This is a feasible alternative from a Technical and Operation evaluation. Additionally, there is an opportunity to install the twinned sewer in conjunction with the Clythe Feedermain for addition cost savings. This should be exploited, if possible.

6.7.1.2 Alternative Alignment No. 2

The installation of a twinned sewer in this alignment would be performed by open cut construction, with the exception of a CN railroad crossing just east of Victoria Road which would be performed by installing the feedermain in a steel casing under the railroad right-or-way. This would be performed by horizontal directional drilling or boring. Soil conditions in the area of study are generally sands and gravels associated with glacial deposits or alluvial activity and are appropriate for both open-cut and horizontal direction drilling.

Groundwater levels generally vary between 1.5 metres and 4 metres below grade. Depending on the localized conditions, dewatering may be required for installation of the feedermain. Some reductions in groundwater baseflow are possible, however, no impacts to regional groundwater flow or existing wells are expected.

Due to the future expansion of York Road from two to four lanes, the area available for the installation of the new sewer is adequate to provide the required horizontal separation from other existing services and limited conflict with existing utilities is expected. West of Victoria Road, however, York Road is currently to remain two lanes and, given that this is a matured neighbourhood, limited space for existing utilities is expected.

The crossing of Victoria Road would be performed by open-cut construction, however this would be performed in two stages to allow for continued traffic movement in the area.

Work carried out on York Road, west of Victoria Road, does not provide any synergy to be phased with other projects, though the construction methodology is generally straightforward and technically feasible.

As with Alternative Alignment No. 1, the construction of this alternative is technically feasible, Based primarily on the conflict with existing utilities and the roadwork and reconstruction required, this alignment is not preferred over Alternative Alignment No. 1 for this section of the York Trunk Sanitary Sewer.

6.7.2 Section 3 – From Waterworks Place to Gordon Street

6.7.2.1 Alternative Alignment No. 1

This Alternative Alignment is essentially an extension of Alternative Alignment No. 1 from Section 2 with similar technical considerations for the installation of the sewer through Eramosa River Park and York Road Park. The construction would be by open-cut up to the Speed River crossing.

For the entire length of the alignment through the parkland, adequate space is present in the existing utility corridor to accommodate the additional sanitary sewer service.

Again, the presence of a historical landfill may present unexpected soil conditions, including the presence of deleterious materials that will require to be managed and/or disposed of. If any potentially hazardous environmental conditions are encountered, additional measures may be required during construction for worker safety. If the groundwater is found to be impaired, treatment and disposal of

the withdrawn water may be necessary. Assessment of the environmental conditions should be performed prior to construction to identify any areas of potential environmental concern.

The crossing of the Speed River can be performed either by trenchless technology, likely boring, or by open cut. Section 6.14, below, provides a detailed analysis of these two options to determine the preferred alternative for the river crossing with respect to operational and technical considerations..

The timing of this operation will need to be coordinated with the cool water fishery, which limits work in the waterway from April to July. Additionally, it is preferable to perform this type of river crossing when water levels are low, so it may be preferable to perform this work during the winter.

6.7.2.2 Alternative Alignment No. 2

This alignment continues the installation of the twinned sanitary sewer west along York Road. As with that alignment, in Section 2, construction on a busy street in a matured neighbourhood presents conflicts with existing utilities, which should be avoided. In order to limit the extent of excavation to enable one lane of York Road to remain in operation, trench boxes may be considered.

This is not a technically difficult alternative, however, it is logistically less desirable than Alternative Alignment No. 1, which routes the new feedermain through the parkland south of York Road.

No opportunity for phasing this work with other projects is available except for combined trenching with the York Trunk Sanitary Sewer at the undercrossing of the Speed River, which is detailed in Section 6.14.

From a technical standpoint, Alternative Alignment No. 1 is preferred over Alternative Alignment No. 2 for this section of the sewer due to the anticipated difficulties in locating the sewer in a limited road allowance with myriad existing utilities, as well as the difficulties associated with road construction on a busy street.

6.7.3 Section 4 – From Gordon Street to Silvercreek Parkway South

6.7.3.1 Alternative Alignment No. 1 and Alternative Alignment No. 1A

The installation of the twinned York Trunk Sanitary Sewer would be performed primarily using open-cut construction. This alignment includes three (3) road crossings at Edinburgh Road, Gordon Street, and McCrae Boulevard.

Soil conditions in the area Alternative Alignment No. 1 of this Alignment in Section 4 are mainly sands and gravels associated with outwash deposits or alluvial activity and are appropriate for open-cut construction. However, sections of Silvercreek Park through which the alignment travels have been identified as historical landfilling areas. The soil in these areas may be contaminated and therefore efforts must be made to handle and dispose of these soils in an appropriate manner. Additionally, should dewatering be required in these areas the withdrawn water may be contaminated and require treatment and alternative disposal procedures.

This alignment will be partially located within an existing utility corridor. Therefore, it is expected that there will be limited conflicts with existing utilities. There are some concerns, however, related to the existing watermain within the park area. The existing watermain may be realigned or an undercrossing of the new alignment below the existing watermain may be performed at this location.

A connection to the siphon which conveys sewage from south of the Speed River to the Speed River Trunk Sewer on the north side of the river can be provided. This will reduce the flow to the Speed River Trunk and allow for additional servicing in that system.

This is a feasible alternative from a technical and operation standpoint with some minor technical challenges, such as the connection to the siphon. Additionally, the installation of the section of the sewer that are located within Silvercreek Park may be performed in conjunction with the upgrades occurring to the Paisley Feedermain. Again, this should be exploited, if possible.

6.7.3.2 Alternative Alignment No. 2

The installation of the Paisley-Clythe feedermain in this Alternative Alignment would be performed primarily using open-cut construction. This alignment includes four (4) road crossings at Wellington Street West, Edinburgh Road, Gordon Street, and Wellington Street West, again, to return to Silvercreek Park.

Soil conditions in the area of this alignment in Section 4 are mainly sands and gravels associated with outwash deposits or alluvial activity and are appropriate for open-cut construction. However, sections of Silvercreek Park through which the alignment travels have been identified as historical landfilling areas. The soil in these areas may be contaminated and therefore efforts must be made to handle and dispose of these soils in an appropriate manner. Additionally, should dewatering be required in these areas the withdrawn water may be contaminated and require treatment and alternative disposal procedures.

It is expected that this Alternative will have limited conflicts with existing utilities along Wellington Street West as the road is wide enough to allow for the required distances between utilities. There are some concerns, however, related to the alignment of the existing watermain in Silvercreek Park as the new trunk sewer will be required to cross an existing watermain within the park area. The existing watermain may be realigned or an undercrossing of the new alignment below the existing watermain may be performed at this location.

A connection to the siphon which conveys sewage from south of the Speed River to the Speed River Trunk Sewer on the north side of the river, to reduce the flow to the Speed River Trunk and allow for additional servicing in that system, could also be provided with this alignment; however, once significant concern is that this alignment is longer than Alternative No. 1 and requires additional bends. The available slope to tie-in to the existing manhole 298 is limited and this alternative would have less desirable hydraulics when compared to Alternative Alignment No. 1.

This is a feasible alternative from a technical and operation standpoint with only minor technical challenges, however, it is less desirable, hydraulically, than Alternative Alignment No. 1. Additionally, the installation of the section of the feedermain that is located within Silvercreek Park may be performed in conjunction with the upgrades occurring to the York Trunk Sewer. This should be exploited, if possible.

Table 6.1 Sewer Evaluation Matrix – Natural and Physical Environment Considerations

Evaluation Criteria	Section 2 - from Industrial Road to Waterworks Pl		Section 3 - from Waterworks Pl to Gordon St		Section 4 - from Gordon Street to the Hanlon Parkway		Section 4 - Royal City Park Alternative	
	Alternative Alignment No. 1	Alternative Alignment No. 2	Alternative Alignment No. 1	Alternative Alignment No. 2	Alternative Alignment No. 1	Alternative Alignment No. 2	Alternative Alignment No. 1 and No. 2	Alternative Alignment No. 1A
Natural and Physical Environment Considerations								
Natural Features/ANSIs/ ESAs	• Located within an existing utility easement • Passes through significant Natural Areas designated in the City's Natural Heritage Strategy	• Located within road allowance in an existing developed area • Limited impact to natural features	• Located within an existing utility corridor in Park • Cofferdams required to divert river around excavation • Speed River is regulated Natural Heritage feature • Passes through significant Natural areas designated in the City's Natural Heritage Strategy	• Located within road allowance in an existing developed area • Limited impact to natural features • Cofferdams required to divert river around excavation • Speed River is regulated Natural Heritage Feature	• Located primarily in existing utility corridor and lands developed as parkland • Located within area as noted as significant natural area in City's Natural Heritage Strategy	• Located primarily in existing road allowance or developed area • Located partially within area as noted as significant natural area in City's Natural Heritage Strategy • Limited impact to natural features	• Located in parkland	• Located in parkland
Wood Lots and Trees	• Some tree removal / disturbance may be required in Eramosa Road Park	• Limited impact to wood lots and trees	• Some tree removal / disturbance may be required in York Road Park • Tree / vegetation removal required on both sides of the Speed River	• Tree / vegetation removal required on both sides of the Speed River	• Alignment required to cross through Royal City Park and Silver Creek Park – some tree loss is anticipated	• Alignment required to cross partially through Royal City Park and Silver Creek Park – some tree loss is anticipated	• Significant tree removal / disturbance may be required in Royal City Park • Removal of Butternut Tree would be required	• Significant tree removal / disturbance may be required in Royal City Park • May be performed in coordination with tree removal for Emerald Ash Borer
Wildlife and Species at Risk (MNR or COSEWIC Status)	• Species At Risk identified in the vicinity: • Blanding's Turtle • Northern Map Turtle • Snapping Turtle • Milk Snake • Eastern Ribbon Snake • Tuberous Indian-plantain	• Species At Risk identified in the vicinity: • Blanding's Turtle • Northern Map Turtle • Snapping Turtle • Milk Snake • Eastern Ribbon Snake • Tuberous Indian-plantain	• Open cut of river bottom will disturb wildlife habitat • Species At Risk identified in the vicinity: • Blanding's Turtle • Northern Map Turtle • Snapping Turtle • Milk Snake • Eastern Ribbon Snake • Tuberous Indian-plantain	• Open cut of river bottom will disturb wildlife habitat • Species At Risk identified in the vicinity: • Blanding's Turtle • Northern Map Turtle • Snapping Turtle • Milk Snake • Eastern Ribbon Snake • Tuberous Indian-plantain	• Species At Risk identified in the vicinity: • Blanding's Turtle • Northern Map Turtle • Snapping Turtle • Milk Snake • Eastern Ribbon Snake • Tuberous Indian-plantain • Butternut Tree	• Species At Risk identified in the vicinity: • Blanding's Turtle • Northern Map Turtle • Snapping Turtle • Milk Snake • Eastern Ribbon Snake • Tuberous Indian-plantain • Butternut Tree	• Species At Risk identified in the vicinity: • Blanding's Turtle • Northern Map Turtle • Snapping Turtle • Milk Snake • Eastern Ribbon Snake • Tuberous Indian-plantain • Butternut Tree	• Species At Risk identified in the vicinity: • Blanding's Turtle • Northern Map Turtle • Snapping Turtle • Milk Snake • Eastern Ribbon Snake • Tuberous Indian-plantain • Butternut Tree
Floodplains	• Generally located within Regulated Floodplain • Minimal impact to floodplain associated with installation	• Not located within floodplain	• Located within Regulated Floodplain • Minimal impact to floodplain associated with installation	• Primarily located outside of floodplain • Minimal impact to floodplain association with	• Located within regulated floodplain • Minimal impact to floodplain associated with installation	• Located within regulated floodplain • Minimal impact to floodplain associated with installation	• Located within regulated floodplain • Minimal impact to floodplain associated with installation	• Located within regulated floodplain • Minimal impact to floodplain associated with
Aquatic and Terrestrial Resources	• Limited impact to aquatic and terrestrial resources	• Limited impact to aquatic and terrestrial resources	• Open cut of river bottom will disturb wildlife habitat (may be mitigated by scheduling work outside of spawning season) • Limited impact to terrestrial resources	• Open cut of river bottom will disturb wildlife habitat (may be mitigated by scheduling work outside of spawning season) • Limited impact to terrestrial resources	• Limited impact to aquatic and terrestrial resources	• Limited impact to aquatic and terrestrial resources	• Limited impact to aquatic and terrestrial resources	• Limited impact to aquatic and terrestrial resources
Watercourse Crossings and Fisheries	• No watercourse crossings	• No watercourse crossings	• One watercourse crossing • Speed River is a cool water fish habitat • Open cut of river bottom may impact aquatic habitat	• One watercourse crossing • Speed River is a cool water fish habitat • Open cut of river bottom may impact aquatic habitat	• One crossing of municipal drains required	• One crossins of municipal drains required	• No watercourse crossings	• No watercourse crossings
Impacts to Groundwater	• Dewatering may be required • Impacts to wells or regional groundwater flow not expected to be significant	• Dewatering may be required • Impacts to wells or regional groundwater flow not expected to be significant	• Dewatering may be required • Impacts to wells or regional groundwater flow not expected to be significant	• Dewatering may be required • Impacts to wells or regional groundwater flow not expected to be significant	• Dewatering may be required • Impacts to wells or regional groundwater flow not expected to be significant	• Dewatering may be required • Impacts to wells or regional groundwater flow not expected to be significant	• Dewatering may be required • Impacts to wells or regional groundwater flow not expected to be significant	• Dewatering may be required • Impacts to wells or regional groundwater flow not expected to be significant
Potential Contaminant Sources	• Historical / abandoned landfills may be present • Manufacturing/chemical plant located in proximity to alignment	• No historical / abandoned landfills present • Auto service/gas stations present in proximity to alignment	• York Road Park is the site of an abandoned landfill • Coal/oil/salt storage sites present in proximity to alignment • Some deleterious environmental conditions may be encountered during the work	• York Road Park is the site of an abandoned landfill • Some deleterious environmental conditions may be encountered during the work.	• Located partially within historic landfill • Some deleterious environmental conditions may be encountered during the work	• Located partially within historic landfill • Some deleterious environmental conditions may be encountered during the work	• Located partially within historic landfill • Some deleterious environmental conditions may be encountered during the work	• Located within historic landfill • Some deleterious environmental conditions may be encountered during the work
Natural Environment Overall Rating								

LEGEND

Most Preferred

Less Preferred

Least Preferred

Table 6.2 Sewer Evaluation Matrix – Social and Cultural Environment Considerations

Evaluation Criteria	Section 2 - from Industrial Road to Waterworks Pl		Section 3 - from Waterworks Pl to Gordon St		Section 4 - from Gordon Street to the Hanlon Parkway		Section 4 - Royal City Park Alternative	
	Alternative Alignment No. 1	Alternative Alignment No. 2	Alternative Alignment No. 1	Alternative Alignment No. 2	Alternative Alignment No. 1	Alternative Alignment No. 2	Alternative Alignment No. 1 and No. 2	Alternative Alignment No. 1A
Social & Cultural Environment Consideration								
Proximity to Built-Up Areas	• Located within existing utility corridor and developed area • Alignment runs through Eramosa River Park	• Located within existing developed area	• Alignment runs through York Road Park • River crossing starts in York Road Park and terminates in City owned lot adjacent to Gordon Street	• Located within existing developed area • Alignment runs through a portion of York Road Park • River crossing starts in York Road Park and terminates in City owned lot adjacent to Gordon Street	• Located within existing parkland	• Located within existing developed/built-up area	• Located within existing densely developed / park area	• Located within existing densely developed / park area
Traffic Impacts	• Limited • One road crossing at Victoria Road	• Alignment located on a busy street • Crossing of Victoria Road is required	• Limited traffic impact	• Alignment is located on a busy street	• Alignment is on south side of Wellington Road • Traffic impacts anticipated to be minimal except for crossings of Gordon Street, Edinburgh Road, and McCrea Blvd	• Alignment is on north side of Wellington Road • Traffic impacts anticipated to be minimal except for crossings of Gordon Street, Edinburgh Road, and Wellington Street West (twice)	• Minimal impact on traffic anticipated	• Minimal impact on traffic anticipated
Archaeological Features	• Alignment passes though an area of high archaeological potential	• None	• Alignment passes though an area of high archaeological potential	• Alignment passes though an area of high archaeological potential in limited area	• Located primarily within area of uncertain archaeological potential	• Located primarily within area of uncertain archaeological potential	• Located primarily within area of uncertain archaeological potential	• Located primarily within area of uncertain archaeological potential
Cultural Heritage Features	• None	• None	• None	• None	• None	• None	• None	• None
Private Properties Affected	• Limited disruption to residents and businesses during installation	• Disruption to residents and businesses during installation	• Minimal disruption to private properties	• Disruption to residents and businesses during installation	• Principally within municipally owned land • Limited impact on private properties	• Principally within municipally owned land • Limited impact on private properties	• Principally within municipally owned land • Limited impact on private properties	• Principally within municipally owned land • Limited impact on private properties
City Wells Affected	• Limited impact to City wells and 2-year sourcewater protection zone	• Limited impact to City wells and 2-year sourcewater protection zone	• Limited impact to City wells and 2-year sourcewater protection zone	• Limited impact to City wells and 2-year sourcewater protection zone	• Limited impact to City wells	• Limited impact to City wells	• Limited impact to City wells	• Limited impact to City wells
Compatibility with Proposed Land Uses	• Located within existing utility corridor • Will not impact area once installation is complete	• Located within existing road allowance • Will not impact area once installation is complete	• Located within existing utility corridor • Will not impact area once installation is complete • No significant impact on river once installation is complete	• Located within existing road allowance • Will not impact area once installation is complete • No significant impact on river once installation is complete	• Located within parkland or existing municipal land • Will not impact area once installation is completed • Opportunity to perform work with future park upgrades	• Located within parkland or existing municipal land • Will not impact area once installation is completed	• Located within parkland or existing municipal land • Will not impact area once installation is completed	• Located within parkland or existing municipal land • Will not impact area once installation is completed
Proximity to City Parks	• Alignment passes through Eramosa River Park	• Limited disruption to parks	• Alignment passes through York Road Park • Work associated with open cut limited to western side of York Road Park	• Park impact limited to where alignment enters western end of York Road Park • Work associated with open cut limited to western side of York Road Park	• Alignment passes through Royal City Park and Silvercreek Park • Potential loss of trees in park • Potential disruption to use of some facilities (may be mitigated by scheduling work off-season)	• Alignment partially located within Royal City Park and Silvercreek Park • Anticipated loss of some trees in park • Limited disruption to use of facilities (may be mitigated by scheduling work off-season)	• Alignment located within Royal City Park • Anticipated loss of some trees, including the protected Butternut Tree, in park • Potential disruption to use of facilities (may be mitigated by scheduling work off-season)	• Alignment located within Royal City Park • Anticipated loss of some trees in park • Significant disruption to use of facilities, including play area (may be mitigated by scheduling work off-season)
Social and Cultural Overall Rating								

LEGEND

Most Preferred | Less Preferred | Least Preferred

Table 6.3 Sewer Evaluation Matrix – Technical Considerations

Evaluation	Section 2 - from Industrial Road to Waterworks Pl		Section 3 - from Waterworks Pl to Gordon St		Section 4 - from Gordon Street to the Hanlon Parkway		Section 4 - Royal City Park Alternative	
	Alternative Alignment No. 1	Alternative Alignment No. 2	Alternative Alignment No. 1	Alternative Alignment No. 2	Alternative Alignment No. 1	Alternative Alignment No. 2	Alternative Alignment No. 1 and No. 2	Alternative Alignment No. 1A
Technical Considerations								
Soil and Ground Water Conditions	• Located mainly within sands and gravels associated with outwash deposits or alluvial activity • Will be located in existing utility corridor • Subsurface conditions may vary in areas of historical landfilling and some deleterious substances may be encountered	• Located mainly within sands and gravels associated with outwash deposits or alluvial activity • Will be located in existing road right of way and utility corridor	• Located mainly within sands and gravels associated with outwash deposits or alluvial activity • Will be generally located in existing utility corridor • Located in bedrock under Speed River • Top strata of bedrock is expected to be fractured	• Located mainly within sands and gravels associated with outwash deposits or alluvial activity • Will be mainly located in existing road right of way and utility corridor • Located in bedrock under Speed River • Top strata of bedrock is expected to be fractured	• Located mainly within sands and gravels associated with outwash deposits or alluvial activity • Will be located in existing utility corridor	• Located mainly within sands and gravels associated with outwash deposits or alluvial activity • Will be located in existing utility corridor	• Located mainly within sands and gravels associated with outwash deposits or alluvial activity	• Located mainly within sands and gravels associated with outwash deposits or alluvial activity
Impacts to Utilities	• Limited conflict with existing utilities in Eramosa River Park	• May be conflicts with existing utilities in developed area of York Road west of Victoria Road	• Limited conflict with existing utilities	• May be conflicts with existing utilities in developed area of York Road west of Victoria Road	• Limited conflicts with existing utilities • Some concerns related to alignment of existing watermain in Silvercreek Park	• Limited conflicts with existing utilities • Some concerns related to alignment of existing watermain in Silvercreek Park	• Limited conflicts with existing utilities • Some concerns related to alignment of existing watermain in Royal City Park	• Limited conflicts with existing utilities • Some concerns related to alignment of existing watermain in Royal City Park
Reliability	• Twinned gravity sewer is a reliable technology • Reduced flow in existing will allow for inspection/rehabilitation	• Twinned gravity sewer is a reliable technology • Reduced flow in existing will allow for inspection/rehabilitation	• Twinned gravity sewer is a reliable technology • Reduced flow in existing will allow for inspection/rehabilitation	• Twinned gravity sewer is a reliable technology • Reduced flow in existing will allow for inspection/rehabilitation	• Twinned gravity sewer is a reliable technology • Reduced flow in existing will allow for inspection/rehabilitation • Better hydraulics than Alternative Alignment No. 2	• Twinned gravity sewer is a reliable technology • Reduced flow in existing will allow for inspection/rehabilitation • Longer with more alignment changes than Alternative Alignment No. 1	• Twinned gravity sewer is a reliable technology • Reduced flow in existing will allow for inspection/rehabilitation	• Twinned gravity sewer is a reliable technology • Reduced flow in existing will allow for inspection/rehabilitation
Ability to Phase with Other Infrastructure Upgrades	• Installation in Eramosa River Park may be performed in conjunction with Feedermain Installation	• Trunk Sewer would be installed independently of any other proposed works	• Installation in Eramosa River Park may be performed in conjunction with Feedermain Installation	• Trunk Sewer would be installed independently of any other proposed works on York Road • Trunk Sewer installation may be performed in conjunction with upgrades to the Paisley-Clythe Feedermain	• Installation located in Silvercreek Parks may be performed in conjunction with upgrades to Feedermain • Opportunity to coordinate with future park upgrades	• Limited synergy with other upgrades	• Installation in Eramosa River Park may be performed in conjunction with Feedermain Installation	• Installation in Eramosa River Park may be performed in conjunction with Feedermain Installation
Constructability	• Primarily open-cut construction • Boring / casing installation will be required for railroad undercrossings	• Primarily open-cut construction • Boring / casing installation will be required for railroad undercrossings	• Primarily open-cut construction in park land • Open cut construction in river will require cofferdams and dewatering	• Primarily open-cut construction in a developed roadway • Open cut construction in river will require cofferdams and dewatering	• Primarily open-cut construction	• Primarily open-cut construction	• Primarily open-cut construction	• Primarily open-cut construction
Road and Railway Crossings	• 1 road crossing at Victoria Road • 1 railroad undercrossing	• 1 road crossing at Victoria Road • 1 railroad undercrossing	• None	• None	• 3 road crossings (Edinburgh Road, Gordon Street, McCrea Blvd)	• 4 road crossings (Wellington Street, Edinburgh Road, Gordon Street, Wellington Road)	• None	• None
Technical Overall Rating								

LEGEND

Most Preferred

Less Preferred

Least Preferred

6.8 Financial and Economic Evaluation

The Financial and Economic aspects of the York TSS alternatives were evaluated with respect to estimated capital costs, operating and maintenance costs, and land acquisition costs, as per the evaluation criteria presented in Section 6.2. Details of the Financial and Economic impacts and evaluation for each alternative are presented below.

Note that with both of these alternatives, there is the potential requirement for dewatering of impaired groundwater and disposal of contaminated soils related to work in areas of historical landfilling activities. An additional allowance of $2.6 million should be included in the total project cost as a contingency to address these issues.

An additional discussion of the options of replacing pipe section of the existing York TSS versus in-situ remediation is also presented in this section.

6.8.1 Section 2 – From Industrial Avenue to Waterworks Place

6.8.1.1 Alternative Alignment No. 1

This alignment is located within a municipal right of way and no additional easements or land acquisition is expected to be necessary.

There are no additional operations and maintenance costs associated with the alternative above regular City maintenance.

The estimated capital cost for this alternative, including contingencies and design, and construction is $3.6 million.

6.8.1.2 Alternative Alignment No. 2

This alignment is located within a municipal right of way and no additional easements or land acquisition is expected to be necessary, however, permitting will be required for the undercrossing of a CN rail spur.

There are no additional operations and maintenance costs associated with the alternative above regular City maintenance.

The estimated capital cost for this alternative, including contingencies and design, and construction is $5.0 million.

6.8.2 Section 3 – From Waterworks Place to Gordon Street

6.8.2.1 Alternative Alignment No. 1

This alignment is located within a municipal right of way and no additional easements or land acquisition is expected to be necessary.

There are no additional operations and maintenance costs associated with the alternative above regular City maintenance.

The estimated capital cost for this alternative, including contingencies and design, and construction is $1.6 million. This does not include the costs associated with the river crossing, which are estimated at approximately $2.1 million, as detailed in Section 6.14.

6.8.2.2 Alternative Alignment No. 2

This alignment is located within a municipal right of way and no additional easements or land acquisition is expected to be necessary.

There are no additional operations and maintenance costs associated with the alternative above regular City maintenance.

The estimated capital cost for this alternative, including contingencies and design, and construction is $2.0 million. This does not include the costs associated with the river crossing, which are estimated at approximately $2.1 million, as detailed in Section 6.14.

6.8.3 Section 4 – From Gordon Street to Silvercreek Parkway South

6.8.3.1 Alternative Alignment No. 1 and Alternative Alignment No. 1A

This alignment is located within a municipal right of way and no additional easements or land acquisition is expected to be necessary.

There are no additional operations and maintenance costs associated with the alternative above regular City maintenance.

The estimated capital cost, including contingencies and design, and construction is $5.1 million for Alternative Alignment No. 1, and $5.5 million for Alternative Alignment No. 1A.

6.8.3.2 Alternative Alignment No. 2

This alignment is located within municipally owned property through Royal City Park and then on the north side of Wellington Street West before crossing back into Silvercreek Park.

No additional operations and maintenance costs are anticipated to be associated with this alternative.

The estimated capital cost for this alternative, including contingencies and design, and construction is $5.6 million.

6.8.3.3 Twinning of Existing Sewer and Rehabilitation of Existing Sewer

Twinning and rehabilitation of the existing York Trunk Sanitary Sewer would improve operations and maintenance capability by improving access to the pipes, via the twinned section, and by reducing the flow in the existing system to the point that rehabilitation of the existing pipes can be assessed and performed. Given the access issues, it is unknown what the actual extent of upgrades will be required to the existing system, however, an estimate has been formed based on an assumption of 20% of the sewer requiring rehabilitation.

The estimated capital cost for this alternative, including the river crossing, contingencies and design, and construction is $20.9 million.

6.8.3.4 Partial Replacement of Existing Sewer and Twinning

As with twinning and rehabilitation, twinning and partial replacement of the existing York Trunk Sanitary Sewer would improve operations and maintenance capability by improving access to the pipes. This alternative would also allow for future expansion of the F.M. Woods Pumping Station and Reservoir; the removal of this potential conflict is a benefit to that future project.

The estimated capital cost for this alternative, including the river crossing, contingencies and design, and construction is $15.5 million.

Based on project cost, this is the preferred alternative with respect to remedial works required to the existing York TSS infrastructure.

Table 6.4 Sewer Evaluation Matrix – Economic

Evaluation Criteria	Section 2 - from Industrial Road to Waterworks Pl		Section 3 - from Waterworks Pl to Gordon St		Section 4 - from Gordon Street to the Hanlon Parkway		Section 4 - Royal City Park Alternative	
	Alternative Alignment No. 1	Alternative Alignment No. 2	Alternative Alignment No. 1	Alternative Alignment No. 2	Alternative Alignment No. 1	Alternative Alignment No. 2	Alternative Alignment No. 1 and No. 2	Alternative Alignment No. 1A
Economic Considerations								
Estimated Capital Costs	• $3.6 Million	• $5.0 Million	• $1.6 Million	• $2.0 Million	• $5.1 Million	• $5.6 Million	• Included in Section 4 Costing	• +$400,000
Operating and Maintenance/Life Cycle Costs	• No additional requirements above regular maintenance currently performed by the City	• No additional requirements above regular maintenance currently performed by the City	• No additional requirements above regular maintenance currently performed by the City	• No additional requirements above regular maintenance currently performed by the City	• No additional requirements above regular maintenance currently performed by the City	• No additional requirements above regular maintenance currently performed by the City	• Included in Section 4 Costing	• No additional requirements above regular maintenance currently performed by the City
Land Acquisition Requirements	• No additional land acquisition required	• No additional land acquisition required	• No additional land acquisition required	• No additional land acquisition required	• No additional land acquisition required	• No additional land acquisition required	• No additional land acquisition required	• No additional land acquisition required
Economic Overall Rating								

LEGEND

Most Preferred

Less Preferred

Least Preferred

6.9 COMPARATIVE EVALUATION OF FEEDERMAIN ALTERNATIVES

Tables 6-5 to 6-8 present the detailed assessment of the various feedermain alternative alignments for each of the criteria listed in Section 6.2. The assessment is based on a set of developed evaluation criteria. A summary of the key considerations for each evaluation criteria category are presented in Sections 6.10 - 6.13.

6.10 Natural and Physical Environment Evaluation

The Natural and Physical Environment aspects of the feedermain alignment alternatives were evaluated with respect to impacts to natural features and areas, impacts to floodplains as well as watercourse crossings and fisheries, groundwater, and the potential impacts of historical landfill sites, as per the evaluation criteria presented in Section 6.2. Details of the Natural and Physical environmental impacts and evaluation for each alternative alignment within each of the five sections of the Study Area are presented below.

6.10.1 Section 1 - from the City Limit down York Road to Industrial Avenue (Clythe Feedermain)

6.10.1.1 Alternative Alignment No. 1 (Master Plan Alternative) and Alternative Alignment No. 2

This is the only feasible alignment for the Clythe Feedermain along this portion of the route designated as Section 1. To accommodate the developed and environmental conditions in the area the alignment is generally located within the existing York Road corridor, which includes York Road, and various utilities, including the York Trunk Sewer. Because this alignment is located primarily within this road allowance in an existing developed area, it is expected that there will be limited impact to natural features and vegetation.

This section of the Alignment does not require any watercourse crossings. However, the alignment is located primarily within the regulated floodplain limits and therefore there is some potential for flooding or erosion, and dewatering may be required. However, it is expected that impacts to City wells or regional groundwater flow will not be significant and the fact that there are no historical or abandoned landfills present means that the withdrawn water will not likely require treatment or alternative disposal techniques. Overall, it is expected that there will be minimal impacts to the floodplain associated with installation of new feedermain in this area.

The City of Guelph's Natural Heritage System has identified a number of areas of significance along this alignment; a provincially significant wetland (PSW) is located near the Clythe Pumping Station and Reservoir, a significant valleyland is located in the undeveloped portions of the regulated flood plain near the Clythe Pumping Station and a locally significant wetland is located in the area surrounding the Eramosa River to the east of Industrial Avenue and south of York Road. Work in this area will be restricted to existing developed areas.

The forested area on the north side of York Road from Water Road North to the west of Watson Parkway has been identified as a significant woodland under the City's Natural Heritage System due to its potential as habitat for provincially significant species. Similarly, the area to the north of York Road from Watson Parkway North to Cityview Drive South has been identified as a cultural woodland area. Some street tree trimming may be required along this alignment. Significant tree or vegetation removal is not anticipated.

Finally, there is a wildlife crossing opportunity located on York Road, to the west of Watson Parkway North. The following species-at-risk which may be found within the vicinity Blanding's Turtle, Snapping Turtle, Northern Map Turtle, Milk Snake, and the Eastern Ribbon Snake.

6.10.2 Section 2 – from Industrial Avenue to Waterworks Place (Clythe Feedermain)

6.10.2.1 Alternative Alignment No. 1 (Master Plan Alternative)

The Master Plan Alternative is located primarily within the existing York Road corridor in Section 2. It travels down York Road, turning south at Waterworks Place and enters Eramosa River Park. Because this alignment is located primarily within this road allowance in an existing developed area, it is expected that there will be limited impact to natural features and vegetation.

This section of the Master Plan Alignment does not require any watercourse crossings and is not located within the regulated floodplain limits. Therefore, flooding or erosion is not expected during construction. Dewatering may be required for the installation of the feedermain, however it is expected that there will not be significant impacts to City wells or regional groundwater flow. Additionally, there are no historical or abandoned landfills present within the area and therefore the withdrawn water would not likely require treatment or alternative disposal techniques.

There are no significant natural areas along this alignment. However, the following species-at-risk may be found within the vicinity: Blanding's Turtle, Northern Map Turtle, Milk Snake, Eastern Ribbon Snake, Snapping Turtle, and Tuberous Indian-plantain.

6.10.2.2 Alternative Alignment No. 2

Alternative Alignment No. 2 is located within an existing utility easement in the developed area after crossing to the west of Royal City Jaycees Park. It enters Eramosa River Park after crossing Victoria Road. The alignment is located primarily within an existing utility corridor.

This section of Alternative Alignment No.2 does not require any watercourse crossings. However, the alignment is located primarily within the regulated floodplain limits and therefore there is some potential for flooding or erosion. Additionally, dewatering may be required. Eramosa River Park is the site of an historical landfill area. Therefore, any withdrawn water may be impaired and will require treatment or alternative disposal techniques. However, it is expected that the impacts to City wells or regional groundwater flow will not be significant. Overall, it is expected that there will be minimal impacts to the floodplain associated with installation of new feedermain.

The banks of the Eramosa River found within the parkland have been identified as significant valleylands as part of the City's Natural Heritage System. These valleylands are located in the undeveloped portions of the regulated flood plain. It expected that there will be significant disturbances to the trees and vegetation in Eramosa River Park, requiring some tree removal. Additionally, the following species-at-risk may be found within the vicinity: Blanding's Turtle, Snapping Turtles, Northern Map Turtle, Milk Snake, Eastern Ribbon Snake, and Tuberous Indian-plantain.

Based on this assessment, Alternative Alignment No. 1 is preferred in this Section with respect Natural and Physical Environmental Considerations.

6.10.3 Section 3 – from Waterworks Place to Gordon Street (Paisley Feedermain)

6.10.3.1 Alternative Alignment No. 1

Alignment 2 continues from Section 2 from the Master Plan Alternative before it turns south at Waterworks Place, continuing down York Road and entering York Road Park prior to crossing the Speed River to Gordon Street. The alignment is located primarily within a road allowance in the existing developed area. As such, it is expected that there will be limited impact to natural features and vegetation.

This alignment requires one (1) watercourse crossing under the Speed River from York Road Park to Gordon Street. The banks of the Speed River within the undeveloped portions of the regulated floodplain have been identified as a significant natural area as part of the City's Natural Heritage System. They are considered to be significant valley lands and may be disturbed by the river crossing.

Additionally, the Speed River is a cool water fish habitat and this stretch of the Speed River and waters to the west have been identified by the MNR as a waterfowl overwintering area. Impacts to fish and fish habitat may be mitigated by scheduling work outside of the spawning season and renaturalization of the river bottom and habitat, where disturbed. Further consultation with the MNR will be required at the detailed design phase to ensure that construction is performed during timing windows that will also reduce impacts to overwintering waterfowl and their habitat. As tree and vegetation removal is required on both sides of the Speed River revegetation of the riparian zone should be carried out in a timely manner. Additionally, cofferdams would be required to divert the flow of water around the excavation.

It is expected that there will be significant disturbances to the trees and vegetation in the York Road Park, requiring some tree removal. This may be mitigated through replanting and renaturalization of the area. Additionally, the following species-at-risk may be found within the vicinity: Blanding's Turtle, Northern Map Turtle, Snapping Turtle, Milk Snake, Eastern Ribbon Snake, and Tuberous Indian-plantain.

The entire alignment within this Section, including the river crossing, is located within the regulated floodplain limits and therefore there is some potential for flooding or erosion, and dewatering may be required. The parkland area through which the feedermain is aligned in York Road Park is the site of an historical landfill area, therefore, any withdrawn water may be impaired and require treatment or alternative disposal techniques. However, it is expected that the impacts to City wells or regional groundwater flow will not be significant. Overall, it is expected that there will be minimal impacts to the floodplain associated with installation of new feedermain within the parkland.

6.10.3.2 Alternative Alignment No. 2 (Master Plan Alternative)

The Master Plan Alternative continues from Section 2 through Eramosa River Park, enters York Road Park, and crosses the Speed River via open-cut excavation to Gordon Street. The alignment is located primarily within an existing utility corridor.

This alignment requires one (1) watercourse crossing under the Speed River from York Road Park to Gordon Street. The banks of the Speed River within the undeveloped portions of the regulated floodplain have been identified as a significant natural area as part of the City's Natural Heritage System. The river banks are considered to be significant valley lands and may be disturbed by the river crossing. Additionally, the Speed River is a cool water fish habitat and this stretch of the Speed River and waters to the west have been identified by the MNR as a waterfowl overwintering area. Impacts to fish and fish habitat may be mitigated by scheduling work outside of the spawning season and renaturalization of the river bottom and aquatic habitats, where distrubed. Further consultation with the MNR will be required at the detailed design phase to ensure that construction is performed during timing windows that will also reduce impacts to overwintering waterfowl and their habitat. As tree and vegetation removal is required on both sides of the Speed River, revegetation of the riparian zone should be carried out in a timely manner.

In addition, it is expected that there will be significant disturbances to the trees and vegetation in both Eramosa River Park and York Road Park, including some tree removal. Additionally, the following species-at-risk may be found within the vicinity: Blanding's Turtle, Northern Map Turtle, Milk Snake, Snapping Turtle, Eastern Ribbon Snake, and Tuberous Indian-plantain.

The total alignment, including the river crossing, is located within the regulated floodplain limits and therefore there is some potential for flooding or erosion. Dewatering may be required. The parkland areas are the site of a historical landfill area, therefore, any withdrawn water may be impaired and require treatment or alternative disposal techniques. However, it is expected that the impacts to City wells or regional groundwater flow will not be significant. Overall, it is expected that there will be minimal impacts to the floodplain associated with installation of a new feedermain within the parkland.

Based on this assessment, Alternative Alignment No. 1 is preferred in this Section with respect Natural and Physical Environmental Considerations.

6.10.4 Section 4 – from Gordon Street to the Hanlon Parkway (Paisley Feedermain)

6.10.4.1 Alternative Alignment No. 1 (Master Plan Alternative) and 1A

The Master Plan alternative alignment continues from Gordon Street, entering Royal City Park to Wellington Street West where it continues along the north side of the road to the Hanlon Parkway. The alignment is located primarily within an existing road allowance and as such it is likely to have limited impact on natural features outside of the park area.

This section requires two (2) crossings of municipal drains and it is located within the regulated floodplain. Therefore there is some potential for flooding or erosion, and dewatering may be required. Additionally, the portion of area through which it is aligned is the site of historical landfilling activities area. Therefore, any withdrawn water may be impaired and require treatment or alternative disposal techniques. However, it is expected that the impacts to City wells or regional groundwater flow will not be significant. Overall, it is expected that there will be minimal impacts to the floodplain associated with installation of new feedermain.

The banks of the Speed River found within the parkland have been identified as significant valleylands, located in the undeveloped portions of the regulated flood plain. It is expected that there will be disturbances to the trees and vegetation in Royal City Park, including some tree removal.

In this alignment, the Butternut tree would likely be removed and compensatory planting provided as per MNR requirements. Alternatively, Alignment 1A aligns the feedermain southward in this area to avoid the tree, however, this would require the temporary relocation of a gazebo and a children's play area before aligning the pipe under the paved boulevard for approximately 200 metres before rejoining the primary alignment. The boulevard is lined with ash trees which are slated for removal by the City to address potential infestation by the Emerald Ash Borer beetle.

Both of these alignment alternatives are presented as viable options to be assessed during detailed design.

Additionally, the following other species-at-risk may be found within the vicinity: Blanding's Turtle, Northern Map Turtle, Milk Snake, Snapping Turtle Eastern Ribbon Snake, and Tuberous Indian-plantain.

6.10.4.2 Alternative Alignment No. 1B

This Alternative Alignment follows the Master Plan Alternative through Section 3 to Edinburgh Road, where it turns north to Paisley Road and continues west to the Hanlon Parkway. It is located primarily in an existing road allowance and developed areas and as such it is expected that there will be limited impact on natural features.

The alignment does not require any watercourse crossings, and it is generally not located in the floodplain except for a small section of Edinburgh Road close to the Wellington Street West intersection. Some dewatering may be required, however it is expected that the impacts to City wells or regional groundwater flow will not be significant. Additionally, there are no areas of historical or abandoned landfills along this alignment and therefore it is not expected that the withdrawn water would require any treatment or alternative disposal techniques.

There are no significant natural areas located along the alignment. The following species-at-risk may be found within the vicinity: Blanding's Turtle, Northern Map Turtle, Snapping Turtle, Milk Snake, Eastern Ribbon Snake, and Tuberous Indian-plantain.

6.10.4.3 Alternative Alignment No. 2 and Alternative Alignment No. 2A

Alternative Alignment No. 2 and No. 2A continues from Gordon Street, entering Royal City Park to Wellington Street West where it continues along the south side of the road through Silvercreek Park to the Hanlon Parkway. The alignment is located primarily within an existing utility corridor and lands developed as parkland.

This section requires two (2) crossings of municipal drains and it is located within the regulated floodplain. Therefore there is some potential for flooding or erosion, and dewatering may be required. Additionally, the portion of Silver Creek Park through which it is aligned is the site of a historical landfill area. Therefore, any withdrawn water may be impaired and require treatment or alternative disposal techniques. However, it is expected that the impacts to City wells or regional groundwater flow will not be significant. Overall, it is expected that there will be minimal impacts to the floodplain associated with installation of new feedermain.

The banks of the Speed River found within the parkland have been identified as significant valleylands as part of the City's Natural Heritage System. These valleylands are located in the undeveloped portions of the regulated flood plain. It expected that there will be disturbances to the trees and vegetation in Silver Creek Park, requiring some tree removal. This may be mitigated through replanting and renaturalization of disturbed trees and vegetation. The Butternut tree could be removed and compensatory planting provided as per MNR requirements. This would allow the alignment to continue through the park with limited disturbance to the gazebo and playground and would not require the removal and reinstatement of the roadway. Both of these alignment alternatives are presented as viable options to be assessed during detailed design. Additionally, the following species-at-risk may be found within the vicinity: Blanding's Turtle, Northern Map Turtle, Snapping Turtle, Milk Snake, Eastern Ribbon Snake, and Tuberous Indian-plantain. Sections of Silver Creek Park which may be affected by this alignment have also been identified as restoration areas.

Due to limited impact on natural features, Alternative Alignment No. 1B is the preferred alignment in this section with regards to Natural Physical Environmental considerations.

6.10.5 Section 5 – from the Hanlon Parkway to the Paisley Road Booster Station (Paisley Feedermain)

6.10.5.1 Alternative Alignment No. 1 (Master Plan Alternative)

The Master Plan Alternative crosses the Hanlon Parkway and travels through a subdivision to the Paisley Reservoir and Booster Station. This alignment is located primarily in an existing road allowance or developed area and as such it is expected to have limited impact on natural features.

The alignment does not require any watercourse crossings; however, it does cross one municipal drain to the west of the Hanlon Parkway. Generally, it is not located in the floodplain. Some dewatering may be required, however it is expected that the impacts to City wells or regional groundwater flow will not be significant. Additionally, there are no areas of historical or abandoned landfills along this alignment and therefore it is not expected that the effluent from construction dewatering would require any treatment or alternative disposal techniques.

The alignment passes through one significant natural area in the municipal drain to the west of the Hanlon Parkway, which has been identified as a cool water fish habitat as part of the City of Guelph's Natural Heritage System. The following species-at-risk may be found within the vicinity: Blanding's Turtle, Northern Map Turtle, Snapping Turtle, Milk Snake, Eastern Ribbon Snake, and Tuberous Indian-plantain.

6.10.5.2 Alternative Alignment No 1A (Master Plan Alternative 2)

The Master Plan Alternative 2 travels north along Silver Creek Parkway South to Paisley Road, where it crosses the Hanlon Parkway and continues to the Paisley Road Booster Station. This alignment is located primarily in an existing road allowance or developed area and as such it is expected to have limited impact on natural features.

The alignment does not require any watercourse crossings; however, it does cross one municipal drain to the west of the Hanlon Parkway. Generally, it is not located in the floodplain. Some dewatering may be required, however it is expected that the impacts to City wells or regional groundwater flow will not be significant. Additionally, there are no areas of historical or abandoned landfills along this alignment and therefore it is not expected that the withdrawn water would require any treatment or alternative disposal techniques.

The alignment passes through a cool water fish habitat as it crosses the municipal drain to the west of the Hanlon Parkway. This area is included in the City of Guelph's Natural Heritage System. Additionally, the alignment crosses potential habitat for locally significant species located to the south of the Lafarge lands. The following species-at-risk may be found within the vicinity: Blanding's Turtle, Northern Map Turtle, Snapping Turtle, Milk Snake, Eastern Ribbon Snake, and Tuberous Indian-plantain.

6.10.5.3 Alternative Alignment No. 2

Alignment 2 travels north along Silver Creek Parkway to halfway between Wellington Street West and Paisley Road, where it crosses the Hanlon Parkway and follows along the municipal drain which is located to the west of the Hanlon Parkway to the Paisley Road Booster Station. This alignment is located primarily in lands proposed to be developed or within a municipal easement. The feedermain is proposed to be installed adjacent to the municipal drain, which is regulated by the Grand River Conservation Authority.

The alignment does not require any watercourse crossings; however, it does cross the municipal drain directly after crossing the Hanlon Parkway. The alignment is primarily located within the regulated floodplain. Some dewatering may be required, however it is expected that the impacts to City wells or regional groundwater flow will not be significant. Additionally, there are no areas of historical or abandoned landfills along this alignment and therefore it is not expected that the withdrawn water would require any treatment or alternative disposal techniques.

The alignment passes through a cool water fish habitat as it crosses the municipal drain to the west of the Hanlon Parkway. This area is included in the City of Guelph's Natural Heritage System. Additionally, the alignment crosses a potential habitat for locally significant species located to the south of the Lafarge lands. The following species-at-risk may be found within the vicinity: Blanding's Turtle, Northern Map Turtle, Snapping Turtle, Milk Snake, Eastern Ribbon Snake, and Tuberous Indian-plantain.

Both Alternative Alignment No. 1 and Alternative Alignment No. 1A have been assessed as having a similar impact with respect to the Natural and Physical Environment. Alternative Alignment No. 2 is potentially located within a floodplain and is adjacent to a regulated waterway. In light of this, Alternative Alignment No. 2 is the least preferred alignment in this Section.

Table 6.5 Feedermain Evaluation Matrix – Natural and Physical Environment Considerations

Evaluation Criteria	Section 1	Section 2 - from Industrial Road to Waterworks Place		Section 3 - from Waterworks Place to Gordon Street	
	Alternative Alignment No. 1 and No. 2	Alternative Alignment No. 1	Alternative Alignment No. 2	Alternative Alignment No. 1	Alternative Alignment No. 2
Natural and Physical Environment Considerations					
Natural Features/ANSIs /ESAs	• Located within road allowance in an existing developed area • Limited impact to natural features	• Located within road allowance in an existing developed area • Limited impact to natural features	• Located within an existing utility easement • Passes through significant Natural Areas designated in the City's Natural Heritage Strategy	• Located within road allowance in an existing developed area • Limited impact to natural features • Cofferdams required to divert river around excavation • Speed River is regulated Natural Heritage Feature	• Located within an existing utility corridor in Park • Cofferdams required to divert river around excavation • Speed River is regulated Natural Heritage feature • Passes through significant Natural Areas designated in the City's Natural Heritage Strategy
Wood Lots and Trees	• Limited impact to wood lots and trees	• Limited impact to wood lots and trees	• Some tree removal / disturbance may be required in Eramosa Road Park	• Tree / vegetation removal required on both sides of the Speed River	• Some tree removal / disturbance may be required in York Road Park • Tree / vegetation removal required on both sides of the Speed River
Wildlife and Species at Risk (MNR or COSEWIC Status)	• Species At Risk identified in the vicinity: • Blanding's Turtle • Northern Map Turtle • Snapping Turtle • Milk Snake • Eastern Ribbon Snake • Tuberous Indian-plantain	• Species At Risk identified in the vicinity: • Blanding's Turtle • Northern Map Turtle • Snapping Turtle • Milk Snake • Eastern Ribbon Snake • Tuberous Indian-plantain	• Species At Risk identified in the vicinity: • Blanding's Turtle • Northern Map Turtle • Snapping Turtle • Milk Snake • Eastern Ribbon Snake • Tuberous Indian-plantain	• Open cut of river bottom will disturb wildlife habitat • Species At Risk identified in the vicinity: • Blanding's Turtle • Northern Map Turtle • Snapping Turtle • Milk Snake • Eastern Ribbon Snake • Tuberous Indian-plantain	• Open cut of river bottom will disturb wildlife habitat • Species At Risk identified in the vicinity: • Blanding's Turtle • Northern Map Turtle • Snapping Turtle • Milk Snake • Eastern Ribbon Snake • Tuberous Indian-plantain
Floodplains	• Generally located within Regulated Floodplain • Minimal impact to floodplain associated with installation of new feedermain	• Not located within floodplain	• Generally located within Regulated Floodplain • Minimal impact to floodplain associated with installation of new feedermain	• Primarily located outside of floodplain • Minimal impact to floodplain association with installation of new feedermain	• Located within Regulated Floodplain • Minimal impact to floodplain associated with installation of new feedermain
Aquatic and Terrestrial Resources	• Limited impact to aquatic and terrestrial resources	• Limited impact to aquatic and terrestrial resources	• Limited impact to aquatic and terrestrial resources	• Open cut of river bottom will disturb wildlife habitat (may be mitigated by scheduling work outside of spawning season) • Limited impact to terrestrial resources	• Open cut of river bottom will disturb wildlife habitat (may be mitigated by scheduling work outside of spawning season) • Limited impact to terrestrial resources
Watercourse Crossings and Fisheries	• No watercourse crossings	• No watercourse crossings	• No watercourse crossings	• One watercourse crossing • Speed River is a cool water fish habitat • Open cut of river bottom may impact aquatic habitat	• One watercourse crossing • Speed River is a cool water fish habitat • Open cut of river bottom may impact aquatic habitat
Impacts to Groundwater	• Dewatering may be required • Impacts to wells or regional groundwater flow not expected to be significant	• Dewatering may be required • Impacts to wells or regional groundwater flow not expected to be significant	• Dewatering may be required • Impacts to wells or regional groundwater flow not expected to be significant	• Dewatering may be required • Impacts to wells or regional groundwater flow not expected to be significant	• Dewatering may be required • Impacts to wells or regional groundwater flow not expected to be significant
Potential Contaminant Sources	• No historical / abandoned landfills present • Auto service/gas stations present in proximity to alignment	• No historical / abandoned landfills present • Auto service/gas stations present in proximity to alignment	• Historical / abandoned landfills may be present • Manufacturing/chemical plant located in proximity to alignment	• York Road Park is the site of an abandoned landfill • Some deleterious environmental conditions may be encountered during the work.	• York Road Park is the site of an abandoned landfill • Coal/oil/salt storage sites present in proximity to alignment • Some deleterious environmental conditions may be encountered during the work • This alternative is more likely to encounter historical landfills than Alignment No. 1
Natural Environment Overall Rating					

LEGEND

Most Preferred Less Preferred Least Preferred

Table 6.5 Feedermain Evaluation Matrix – Natural and Physical Environment Considerations

Evaluation Criteria	Section 4 – from Gordon Street to Hanlon Parkway			Section 4 – Royal City Park Alternative		Section 5 – from Hanlon Parkway to Paisley Road Booster Station		
	Alternative Alignment No. 1	Alternative Alignment No. 1B	Alternative Alignment No. 2	Alternative Alignment No. 1 and No. 2	Alternative Alignment No. 1A and 2A	Alternative Alignment No. 1	Alternative Alignment No. 1A	Alternative Alignment No. 2
Natural and Physical Environmental Considerations								
Natural Features/ANSIs/ ESAs	• Located primarily in existing road allowance or developed area • Located partially within area noted as significant natural area in City's Natural Heritage Strategy • Limited impact to natural features	• Located primarily in existing road allowance or developed area • Located partially within area noted as significant natural area in City's Natural Heritage Strategy • Limited impact to natural features	• Located primarily in existing utility corridor and lands developed as parkland • Located within area noted as significant natural area in City's Natural Heritage Strategy	• Located in parkland • Located partially within area noted as significant natural area in City's Natural Heritage Strategy	• Located in parkland • Located partially within area as noted as significant natural area in City's Natural Heritage Strategy	• Located primarily in existing road allowance or developed area • Limited impact to natural features	• Located primarily in existing road allowance or developed area • Limited impact to natural features	• Located primarily in lands proposed to be developed or within municipal easement • Feedermain proposed to be installed adjacent to municipal drain • Drain is regulated by Conservation Authority
Wood Lots and Trees	• Alignment required to cross through a portion of Silver Creek Park – some tree loss is anticipated	• Limited impact to wood lots and trees	• Alignment required to cross through Silver Creek Park – some tree loss is anticipated	• Tree removal required • Butternut tree required to be removed	• Some tree removal / disturbance may be required in Royal City Park • May be coordinated with tree removal associated with Emerald Ash Borer control	• Limited impact to wood lots and trees	• Limited impact to wood lots and trees	• Limited impact to wood lots and trees
Wildlife and Species at Risk (MNR or COSEWIC Status)	• Species At Risk identified in the vicinity: • Blanding's Turtle • Northern Map Turtle • Snapping Turtle • Milk Snake • Eastern Ribbon Snake • Tuberous Indian-plantain • Butternut Tree	• Species At Risk identified in the vicinity: • Blanding's Turtle • Northern Map Turtle • Snapping Turtle • Milk Snake • Eastern Ribbon Snake • Tuberous Indian-plantain • Butternut Tree	• Species At Risk identified in the vicinity: • Blanding's Turtle • Northern Map Turtle • Snapping Turtle • Milk Snake • Eastern Ribbon Snake • Tuberous Indian-plantain • Butternut Tree	• Species At Risk identified in the vicinity: • Blanding's Turtle • Northern Map Turtle • Snapping Turtle • Milk Snake • Eastern Ribbon Snake • Tuberous Indian-plantain • Butternut Tree • Removal of Butternut Tree would be required	• Species At Risk identified in the vicinity: • Blanding's Turtle • Northern Map Turtle • Snapping Turtle • Milk Snake • Eastern Ribbon Snake • Tuberous Indian-plantain • Butternut Tree	• Species At Risk identified in the vicinity: • Blanding's Turtle • Northern Map Turtle • Snapping Turtle • Milk Snake • Eastern Ribbon Snake • Tuberous Indian-plantain	• Species At Risk identified in the vicinity: • Blanding's Turtle • Northern Map Turtle • Snapping Turtle • Milk Snake • Eastern Ribbon Snake • Tuberous Indian-plantain	• Species At Risk identified in the vicinity: • Blanding's Turtle • Northern Map Turtle • Snapping Turtle • Milk Snake • Eastern Ribbon Snake • Tuberous Indian-plantain
Floodplains	• Located within regulated floodplain • Minimal impact to floodplain associated with installation of new feedermain	• Generally not located within regulated floodplain	• Located within regulated floodplain • Minimal impact to floodplain associated with installation of new feedermain	• Located within regulated floodplain • Minimal impact to floodplain associated with installation of new feedermain	• Located within regulated floodplain • Minimal impact to floodplain associated with installation of new feedermain	• Generally not located within regulated floodplain	• Generally not located within regulated floodplain	• Located within regulated floodplain • Minimal impact to floodplain associated with installation of new feedermain
Aquatic and Terrestrial Resources	• Limited impact to aquatic and terrestrial resources	• Limited impact to aquatic and terrestrial resources	• Limited impact to aquatic and terrestrial resources	• Limited impact to aquatic and terrestrial resources	• Limited impact to aquatic and terrestrial resources	• Limited impact to aquatic and terrestrial resources	• Limited impact to aquatic and terrestrial resources	• Limited impact to aquatic and terrestrial resources
Watercourse Crossings and Fisheries	• Two crossings of municipal drains required	• One crossing of a municipal drain required	• Two crossings of municipal drains required	• No watercourse crossings	• No watercourse crossings	• No watercourse crossings	• No watercourse crossings	• No watercourse crossings • Alignment will run alongside municipal drain
Impacts to Groundwater	• Dewatering may be required • Impacts to wells or regional groundwater flow not expected to be significant	• Dewatering may be required • Impacts to wells or regional groundwater flow not expected to be significant	• Dewatering may be required • Impacts to wells or regional groundwater flow not expected to be significant	• Dewatering may be required • Impacts to wells or regional groundwater flow not expected to be significant	• Dewatering may be required • Impacts to wells or regional groundwater flow not expected to be significant	• Dewatering may be required • Impacts to wells or regional groundwater flow not expected to be significant	• Dewatering will likely be required • Impacts to wells or regional groundwater flow not expected to be significant	• Dewatering will likely be required • Impacts to wells or regional groundwater flow not expected to be significant
Proximity to Abandoned Landfills	• Located partially within historic landfill • Some deleterious environmental conditions may be encountered during the work	• No historical / abandoned landfills present	• Located partially within historic landfill • Some deleterious environmental conditions may be encountered during the work	• Located within historic landfill • Some deleterious environmental conditions may be encountered during the work	• Located within historic landfill • Some deleterious environmental conditions may be encountered during the work	• No historical / abandoned landfills present	• No historical / abandoned landfills present	• No historical / abandoned landfills present
Natural Environment Overall Rating								

LEGEND

Most Preferred | Less Preferred | Least Preferred

6.11 Social and Cultural Environment Evaluation

The Social and Cultural aspects of the feedermain alignment alternatives were evaluated with respect to land use, impacts to recreational areas, heritage features, impacts to private properties, etc, as per the evaluation criteria presented in Section 6.2. Details of the Social and Cultural impacts and evaluation for each alternative alignment within each of the five sections of the Study Area are presented below.

6.11.1 Section 1 - from the City Limit down York Road to Industrial Avenue (Clythe Feedermain)

6.11.1.1 Alternative Alignment No. 1 (Master Plan Alternative) and Alternative Alignment No. 2

This route is the only feasible alignment in this section of the Study Area due to the existing built and natural environment. The alignment is generally located within the existing York Road corridor, which includes York Road, and various utilities, including the York Trunk Sewer.

There are some residential properties located on the north side of York Road, in the eastern reach of this alignment, however, the majority of the properties are commercial and industrial use, including auto dealerships, restaurants, and construction equipment supply business.

The former Guelph Correctional Institute is located on the south side of York Road, along with the Royal Jaycees Park, which has recreational facilities, including four baseball diamonds. The Guelph Correctional Institute lands are slated for redevelopment as the Guelph Innovation District.

Installation of the feedermain in this area would be performed by open cut, except for at railroad crossings, where horizontal directional drilling would likely be implemented. The open cut installation will cause disruption to traffic and properties in the area, particularly as York Road is a major east-west thoroughfare.

Existing services, such as domestic water, gas, phone, etc, may be disrupted by the works, however, the opportunity exists to perform this work in conjunction with the proposed expansion of York Road to four lanes, up to Watson Road, by the City.

As this alignment is located within an existing road allowance and utility corridor, it is generally compatible with existing and future land uses and will not have any further impacts on the social and cultural environment once installation is completed.

This alternative alignment passes through an area identified as having high archaeological potential around the Clythe Reservoir and Booster Station, however, for the most part; the alignment is in an area of uncertain archaeological potential in the areas on the north and south sides of York Road. This will require a Stage 2 Archaeological Assessment be performed prior to construction. No significant heritage features have been identified in this area.

This Section is primarily a pre-developed area and social and cultural impacts will be limited to the construction period, which, may be further mitigated by performing the construction in conjunction with other proposed projects. As such, this is an acceptable alternative with respect to the cultural and social environment with easily mitigatable impacts; however, additional archaeological assessment will be required.

6.11.2 Section 2 – from Industrial Avenue to Waterworks Place (Clythe Feedermain)

6.11.2.1 Alternative Alignment No. 1 (Master Plan Alternative)

The Master Plan Alternative alignment continues from the Section 1 alignment by alignment the new feedermain down York Road, past Victoria Road, to Waterworks Place, where it turns south to the F.M. Woods Pumping Station and Reservoir.

This Section includes a mix a residential and commercial/industrial land uses. East of Victoria Road, the area is primarily commercial/industrial use, whereas west of Victoria Road, land use is primarily a matured residential neighbourhood with some commercial properties present. York Road is a main artery in this area for the residential neighbourhood located on both the north and south sides of York Road.

With the exception of a railroad undercrossing east of Victoria Road, which would be performed by horizontal direction drilling, the installation of the feedermain would be performed by open cut. The intersection of York road and Victoria Road was recently upgraded, along with a section of York Road east of this intersection. This is a very busy intersection and it is generally not preferred to redo recently completed construction as well as repeat the disruption it generated to local businesses and residents of that area.

This will cause significant disruption to access to businesses and residences in the area as, west of Victoria Road, York Road is a two-lane road and one lane will require closure for the work. The surrounding neighbourhoods are all centered around York Road as the main thoroughfare and detours would not be easily implemented locally without causing additional disruption to local side streets. Additional temporary disruption to services (gas, phone, etc) will also likely occur.

As a main thoroughfare, the provision of other services will also be impacted, in particular, garbage collection, mail delivery, and public transportation. Potential impacts to these services would need to be reviewed with the providers and alternatives developed to mitigate the impacts at the detailed design stage.

There are no areas of archaeological potential located along this alignment and no cultural heritage features. Additionally, there will be limited disruption to local parks, however, access to Lyon Park, which contains a public swimming pool, may be limited during construction on Waterworks Place. Alternative access is available, however, on Boult Avenue, located one block east of Waterworks Place.

This alternative alignment is located completely within an existing built-up area and social and cultural impacts will be limited to the construction period, which may be further mitigated by performing the construction in conjunction with other proposed projects. As such, this is an acceptable alternative with respect to the cultural and social environment with easily mitigatable impacts, however, additional archaeological assessment will be required.

6.11.2.2 Alternative Alignment No. 2

This alignment utilizes the existing utility corridor which extends along the west border of the Royal Jaycees Park from Industrial Avenue. It will cross existing CN railway tracks before turning west to pass between the PDI plant and a plaza, located at Victoria Road.

An undercrossing of a Guelph Junction railroad spur will be required. Additionally, there is limited area at the southern extent of this utility corridor where it turns west, and additional land acquisition may be necessary. Property in this area is administered by Infrastructure Ontario and any impacts to this property may trigger their EA process.

The alignment between the PDI plant and the plaza may also require an expansion of the existing easement to accommodate the additional water feedermain.

Limited disturbance to activities in the Royal Jaycees Park is anticipated as the work would be generally west of the main park area, where the baseball diamonds are located and the diamonds are not in use.

This area is generally a disturbed area, due to the existing utilities, however, any expansion of that corridor will be through non-disturbed areas which are considered to be areas of high archaeological potential.

The open-cut crossing of Victoria Road will cause significant disturbance to traffic and local residents and businesses in the area, however, it is anticipated that this work would be completed within a

matter of days and that it would be performed in phases so that vehicle flow on Victoria Road is maintained through traffic control and marshalling.

Past Victoria Road, the alternative alignment briefly enters Florence Lane before heading south behind a row of houses, into Eramosa River Park.

Eramosa River Park has been identified as an area potentially impacted by historical landfilling activities. Additionally, it is considered an area of high or uncertain archaeological potential. As with the section of the alignment adjacent to the Royal Jaycees Park, a Stage 2 Archaeological Assessment would be required prior to construction. In addition, an environmental assessment of the subsurface soil and groundwater conditions would be necessary to assess the potential impacts resulting from former landfilling activities.

Unlike alignment 1, in this Section, disturbance to residences and business is limited to the few houses on Victoria Road and the PDI plant and plaza. Disruption to services will not likely be required and long-term disruption of roads and the provision of services (mail, garbage collection) will not be required.

The alignment, in Eramosa River Park, will, however, have a significant impact on park use. While this is an existing utility corridor, there will be significant disturbance of trails and recreational use in the park. This may be mitigated by scheduling the work at times of low use (late fall, winter, early spring). Performing this work in conjunction with upgrades to the York Trunk Sewer, also located within this corridor, would further mitigate construction impacts of both of these projects through limiting construction areas to one location.

Compared to the other alternative, this alignment is less desirable in that it is located within areas of Archaeological potential and that there will be a significant impact on use of Eramosa River Park, however; this is ultimately the preferred alternative, from a social and cultural consideration, due to the limited impacts to businesses and residents and that disturbance of roads and other services is limited.

6.11.3 Section 3 – from Waterworks Place to Gordon Street (Paisley Feedermain)

6.11.3.1 Alternative Alignment No. 1

This alignment alternative would either connect to the Master Plan alignment at the intersection of York Road and Waterworks Place, or extend northward from the F.M. Woods Pumping Station and Reservoir up Waterworks Place to York Road, depending on the ultimate preferred alignment for Section 2.

From that point, it would extend westward along York Road, veering into York Road Park near the intersection with Wyndham Street South, for the water crossing of the Speed River, which would be located in the same location as is proposed for the Master Plan alternative.

The feedermain would be installed by open-cut construction which would result in significant disturbance to residents and businesses on, or around, York Road, as York Road is a two-lane road and one lane will require closure for the work. The surrounding neighbourhoods are all centered around York Road as the main thoroughfare and detours would not be easily implemented locally without causing additional disruption to local side streets. Additional temporary disruption to services (gas, phone, etc) in the area of work will also likely occur.

As a main thoroughfare, the provision of other services will also be impacted, in particular, garbage collection, mail delivery, and public transportation. Potential impacts to these services would need to be reviewed with the providers and alternatives developed to mitigate the impacts at the detailed design stage.

The section of York Road Park that would be impacted is significantly smaller with this alternative, however, areas designated as areas of uncertain archaeological potential are still present, as is an area identified as being potentially impaired due to historical landfilling activities. A Stage 2

Archaeological Assessment would be required prior to construction. In addition, an environmental assessment of the subsurface soil and groundwater conditions would be necessary to assess the potential impacts resulting from former landfilling activities.

Public use of the section of the Speed River where the crossing is proposed is generally limited and long-term social or cultural impacts will not result from the proposed works. As a cool water fishery, work within the Speed River is limited from March 15 to June 30. This scheduling limitation would coordinate with scheduling the work to mitigate potentially negative impacts to activities on the west side of the Speed River, such as the Boathouse Tea Room and the Guelph Lawn Bowling Club, and within York Road Park, as these areas are used less, or not in operation, in the late fall to early spring.

6.11.3.2 Alternative Alignment No. 2 (Master Plan Alternative)

The Master Plan alternative from the F.M. Woods Pumping Station and Reservoir to Gordon Street aligns the new feedermain through York Road Park.

This alignment limits impacts to business and residents in the area beyond the imposition of construction traffic. Disturbances to the provision of services will be minimal.

This alignment would be located within the same utility corridor as the York Trunk Sanitary Sewer and the recommended upgrades to that system which would provide the opportunity to perform the installation of both of these utilities simultaneously. This would also be consistent with current land uses and there would be no additional impact on the area once the construction is completed.

Construction of the feedermain would be performed by open-cut. Impacts to park use, during this construction, will be significant as York Road Park is used extensively for recreation, with baseball diamonds and soccer pitches present. There is also extensive pedestrian and cyclist use of the trails within this section of the park. Impacts to park use may be mitigated, somewhat, though scheduling of the work around times of high use in the park (late spring to early fall).

York Road Park has been identified as an area potentially impacted by historical landfilling activities. Additionally, it is considered an area of high or uncertain archaeological potential, A Stage 2 Archaeological Assessment would be required prior to construction. In addition, an environmental assessment of the subsurface soil and groundwater conditions would be necessary to assess the potential impacts resulting from former landfilling activities.

Public use of the section of the Speed River where the crossing is proposed is generally limited and long-term social or cultural impacts will not result from the proposed works. As a cool water fishery, work within the Speed River is limited from March 15 to June 30. This scheduling limitation would coordinate with scheduling the work to mitigate potentially negative impacts to activities on the west side of the Speed River, such as the Boathouse Tea Room and the Guelph Lawn Bowling Club, and within York Road Park, as these areas are used less, or not in operation, in the late fall to early spring.

The river crossing is to terminate in the municipally owned parking area located between the Guelph Animal Hospital and the Guelph Lawn Bowling Club. Impacts that are anticipated with this include the temporary loss of public parking as well as disturbance to patrons of the Lawn Bowling Club, in addition to patrons of the Boathouse Tea Room, located immediately south of the area of work.

Again, scheduling the work around times of peak use in the park, and when the lawn bowling club is not operating, such as in the late fall to early spring, may mitigate these impacts. This would also coordinate with the restrictions on in-water work association with the cool water fishery in the Speed River.

Of the two alternatives available in Section 3, Alternative Alignment No. 1 is the least preferable in a social and cultural context due to the significant disruption that will be caused to residents and business on York Road and the surrounding area. In addition, there is little synergy between this alignment and the proposed upgrades to the York Trunk Sanitary Sewer, which could be performed simultaneously with the feedermain installation with the Master Plan Alternative.

6.11.4 Section 4 – from Gordon Street to the Hanlon Parkway (Paisley Feedermain)

6.11.4.1 Alternative Alignment No. 1 and Alternative Alignment 1A (Master Plan Alternative)

The Master Plan Alternative continues from Section 3 through Silvercreek Park to Wellington Street West, crossing to the north side of the road before crossing McCrae Boulevard. This alignment continues along Wellington Street West to the Hanlon Parkway.

This alignment is located primarily within municipally owned land. This area consists of existing built-up land along Wellington Street West. There is expected to be limited impact on private properties and the alignment will not impact the land upon completion of installation.

Additionally, minimal impacts to the traffic on Wellington Street West are expected; the only areas of concern are along Wellington Street West at the crossings of Gordon Street and Edinburgh Road. These road crossing will cause temporary disruption to business and residents in the area, however, it is anticipated that this work would be completed within a matter of days and that it would be performed in phases so that vehicle flow is maintained through traffic control and marshalling.

There are no cultural heritage features of concern and it is expected that there will be limited impact to City wells.

This alignment passes through Royal City Park. There is potential for loss of trees in this park. There may also be some disruption to the park facilities including the play area, baseball diamond, and walking paths located within the park. This may be mitigated by scheduling work around times of peak use in the park, such as in the late fall to early spring, and the alignment will not impact the park area once installation is complete.

Areas of Silvercreek Park through which the Master Plan Alternative is aligned have been identified as having potential to be impacted by historical landfilling activities. Additionally, the alignment is located primarily within an area of uncertain archaeological potential and as such a Stage 2 Archaeological Assessment would be required prior to construction.

6.11.4.2 Alternative Alignment No. 1B

Alternative Alignment No. 1B follows the Master Plan Alternative to Edinburgh Road South where it turns north up Edinburgh Road to Paisley Road. It continues west along Paisley Road to the Hanlon Parkway.

This alignment travels through existing densely built-up land along both Edinburgh Road and Paisley Road. Development along these roads consists of heavy residential areas and business. While this alignment is to be located completely within a municipal road allowance on these roads, there is expected to be significant impact on traffic accessing the residential properties and business. This is expected to have a significant impact on these private properties during construction. The alignment, however, will not impact the area once the installation is complete.

There are no significant archaeological or cultural heritage features along this alignment. Additionally, it is expected that there will be limited impact to City wells as a result of Alternative Alignment No. 1B.

6.11.4.3 Alternative Alignment No. 2 and Alternative Alignment No. 2A

Alternative Alignment No. 2 and 2A, which connects to the Master Plan Alternative between the Speed River and Gordon Street, is aligned through Royal City Park and continues along the south side of Wellington Street West through Silvercreek Park to the Hanlon Expressway.

This alignment is located primarily within municipally owned land. This area consists of existing built-up land along Wellington Street West. There is expected to be limited impact on private properties and the alignment will not impact the land upon completion of installation.

Additionally, as with the Master Plan Alternative, minimal impacts to the traffic on Wellington Street West are expected; the only areas of concern are along Wellington Street West at the crossings of Gordon Street, McCrae Blvd., and Edinburgh Road. These road crossing will cause temporary disruption to business and residents in the area, however, it is anticipated that this work would be completed within a matter of days and that it would be performed in phases so that vehicle flow is maintained through traffic control and marshalling.

There are no cultural heritage features of concern and it is expected that there will be limited impact to City wells.

This alignment passes through Royal City and Silvercreek Park and there may also be some disruption to the park facilities including the play area, baseball diamond, volleyball courts, and walking paths located within the park. Again, this may be mitigated by scheduling work around times of peak use in the park, such as in the late fall to early spring, and the alignment will not impact the park area once installation is complete. With this alignment, opportunities exist to coordinate the work with future upgrades to Silvercreek Park, including the relocation of the existing volleyball courts and the construction of a new skatepark, west of Edinburgh Road.

Areas of Silvercreek Park through which Alternative Alignment No. 2 is aligned have been identified as having potential to be impacted by historical landfilling activities. Additionally, the alignment is located primarily within an area of uncertain archaeological potential and as such a Stage 2 Archaeological Assessment would be required prior to construction.

Due to the anticipated traffic impacts and disruption to local businesses and residents with Alternative Alignment No. 1 and No. 1B, this is the preferred alternative with respect to social and cultural considerations.

6.11.5 Section 5 – from the Hanlon Parkway to the Paisley Road Booster Station (Paisley Feedermain)

6.11.5.1 Alternative Alignment No. 1 (Master Plan Alternative)

The Master Plan Alternative continues from Section 4 across the Hanlon Parkway, entering the subdivision to the west of the Hanlon Expressway at Melrose Place. The alignment continues along Melrose Place, turning west at Deerpath Drive, north at Stephanie to Candlewood Drive where it turns west and continues to Paisley Road where it travels west to the Paisley Pumping Station and Reservoir.

This alignment is located entirely within an existing densely built-up area, primarily a residential subdivision. It is expected that there will be significant impacts on local residential traffic as a large portion of the alignment will need to be located within a residential road allowance within the subdivision.

The work within the residential area may cause disruption to services such as garbage collection, mail delivery, etc. Coordination with these service providers would be required during the detailed design stage to mitigate the impacts of these disturbances.

In addition, this alignment crosses privately owned land on the west side of the Hanlon Parkway prior to entering the subdivision. This may require easement or property acquisition. Therefore, it is expected that this Master Plan Alternative will have significant impact on private properties during construction. However, the alignment will not impact the area once installation is complete.

The alignment travels through a small area to the east of the Hanlon Expressway that is of uncertain archaeological potential. A Stage 2 Archaeological Assessment would be required prior to construction.

There are no cultural heritage features of concern and it is expected that there will be limited impact to City wells.

6.11.5.2 Alternative Alignment No 1A (Master Plan Alternative 2)

Master Plan Alternative B continues from Section 4 north along Silvercreek Parkway South, crossing the Hanlon Parkway at Paisley Road and continuing west along this road to the Paisley Pumping Station and Reservoir.

This alignment is located within an existing built-up area along Silvercreek Parkway South and Paisley Road and also passes through the future Lafarge Lands development.

Silvercreek Parkway South is not currently a major thoroughfare and therefore it is expected that the impacts to traffic on this road will be minimal, though this road is slated for improvements associated with the Lafarge Lands redevelopment. Paisley Road, however, is a very busy road for both residential and commercial traffic. It is expected that there will be significant impacts to traffic along this roadway. Because of this there are potential impacts to private properties during construction.

In addition, there is potential for conflict with the Ministry of Transportation in regards to the future development of Paisley Road intersection. The Ministry of Transportation has proposed that this intersection will be expanded and upgraded into an interchange. It is unclear at this time where exactly the work will take place, and therefore it is difficult to appropriately align the feedermain in this location as this time.

The alignment travels through a small to the east of the Hanlon Expressway that is of uncertain archaeological potential. A Stage 2 Archaeological Assessment would be required prior to construction.

There are no cultural heritage features of concern and it is expected that there will be limited impact to City wells.

6.11.5.3 Alternative Alignment No. 2

Alignment 2 continues from Section 4 north along Silvercreek Parkway South, through a tract of municipally owned land and up the west side of the Lafarge lands, crossing the Hanlon Parkway approximately halfway between Wellington Street West and Paisley Road, and continuing along an existing municipal drain to Paisley Road where it travels west to the Paisley Pumping Station and Reservoir.

This alignment is located principally within municipally owned land. It travels through some existing built-up area; however, it is located primarily through land designated for redevelopment. It is expected that there will be minimal impacts on traffic and private properties.

The portion of alignment 2 that follows along the municipal drain is located within Castlebury Park. The City has proposed upgrades to the Castlebury park facilities as part of the Castlebury Park Master Plan. There is opportunity to coordinate the installation of the feedermain with the work required for the park upgrades. The alignment will not impact the park area once installation is complete.

The alignment is located primarily within an area of uncertain archaeological potential and as such a Stage 2 Archaeological Assessment would be required prior to construction.

There are no cultural heritage features of concern and it is expected that there will be limited impact to City wells.

Based on the limited impacts to traffic and surrounding neighbourhoods, this is the preferred Alignment Alternative with respect to social and cultural considerations.

Table 6.6 Feedermain Evaluation Matrix – Social and Cultural Environment Considerations

Evaluation Criteria	Section 1	Section 2 - from Industrial Road to Waterworks Place		Section 3 - from Waterworks Place to Gordon Street	
	Alternative Alignment No. 1 and No. 2	Alternative Alignment No. 1	Alternative Alignment No. 2	Alternative Alignment No. 1	Alternative Alignment No. 2
Social & Cultural Environment Considerations					
Proximity to Built-Up Areas	• Located within existing developed area	• Located within existing developed area • Disruption to local residents and businesses	• Located within existing utility corridor and developed area • Alignment runs through Eramosa River Park	• Located within existing developed area • Disruption to local residents and businesses • Alignment runs through a portion of York Road Park • River crossing starts in York Road Park and terminates in City owned lot adjacent to Gordon Street	• Alignment runs through York Road Park • River crossing starts in York Road Park and terminates in City owned lot adjacent to Gordon Street
Traffic Impacts	• Alignment is located on a busy street • Impacts to traffic may be mitigated by performing work in conjunction with expansion of York Road	• Alignment located on a busy street • Crossing of Victoria Road is required	• Limited • One road crossing at Victoria Road	• Alignment is located on a busy street	• Limited traffic impact
Archaeological Features	• Alignment passes through an area of high archaeological potential and of uncertain archaeological potential	• None	• Alignment passes though an area of high archaeological potential	• Alignment passes though an area of high archaeological potential in limited area	• Alignment passes though an area of high archaeological potential
Cultural Heritage Features	• None	• None	• None	• None	• None
Private Properties Affected	• Disruption to residents and businesses during installation of feedermain	• Disruption to residents and businesses during installation of feedermain	• Limited disruption to residents and businesses during installation of feedermain	• Disruption to residents and businesses during installation of feedermain	• Minimal disruption to private properties
City Wells Affected	• Limited impact to City wells and 2-year sourcewater protection zone	• Limited impact to City wells and 2-year sourcewater protection zone	• Limited impact to City wells and 2-year sourcewater protection zone	• Limited impact to City wells and 2-year sourcewater protection zone	• Limited impact to City wells and 2-year sourcewater protection zone
Compatibility with Proposed Land Uses	• Feedermain located within existing road allowance • Will not impact area once installation is complete	• Feedermain located within existing road allowance • Will not impact area once installation is complete	• Feedermain located within existing utility corridor • Will not impact area once installation is complete	• Feedermain located within existing utility corridor • Will not impact area once installation is complete • No significant impact on river once installation is complete	• Feedermain located within existing road allowance • Will not impact area once installation is complete • No significant impact on river once installation is complete
Proximity to City Parks	• Alignment adjacent to Royal Jaycees Park • Limited disruption anticipated	• Limited disruption to parks	• Alignment passes through Eramosa River Park	• Park impact limited to where alignment enters western end of York Road Park	• Alignment passes through York Road Park
Social and Cultural Overall Rating					

LEGEND

Most Preferred

Less Preferred

Least Preferred

Table 6.6 Feedermain Evaluation Matrix – Social and Cultural Environment Considerations

Evaluation Criteria	Section 4 – from Gordon Street to Hanlon Parkway			Section 4 – Royal City Park Alternative		Section 5 – from Hanlon Parkway to Paisley Road Booster Station		
	Alternative Alignment No. 1	Alternative Alignment No. 1B	Alternative Alignment No. 2	Alternative Alignment No. 1 and No. 2	Alternative Alignment No. 1A and 2A	Alternative Alignment No. 1	Alternative Alignment No. 1A	Alternative Alignment No. 2
Social & Cultural Environment Considerations								
Proximity to Built-Up Areas	• Located within existing developed / built-up area	• Located within existing densely developed / built-up Area	• Located within existing parkland	• Located within existing parkland	• Located within existing parkland • Playground and gazebo structure will require demolition	• Located within existing developed / built-up area	• Located within existing developed / built-up area	• Located within existing developed / built-up area / area to be developed further
Traffic Impacts	• Alignment is on north side of Wellington Road • Traffic impacts anticipated to be minimal except for crossings of Gordon Street, Wellington Street West, and Edinburgh Road	• Alignment within road allowance on both Edinburgh Road and Paisley Road • Significant impact on local traffic	• Alignment is on north side of Wellington Road • Traffic impacts anticipated to be minimal except for crossings of Gordon Street and Edinburgh Road	• Minimal impact on traffic anticipated	• Disruption to access road through park	• Alignment is primarily through residential subdivision • Significant impact on local traffic	• Alignment is along Silvercreek Parkway South and along Paisley Road • Silvercreek Parkway south is not currently a major thoroughfare • Significant impact on Paisley Road	• Alignment is primarily though land designated for redevelopment • Minimal impact on traffic anticipated
Archaeological Features	• Located primarily within area of uncertain archaeological potential	• None	• Located primarily within area of uncertain archaeological potential	• Located primarily within area of uncertain archaeological potential	• Located primarily within area of uncertain archaeological potential	• Limited presence of areas of uncertain archaeological potential	• Limited presence of areas of uncertain archaeological potential	• Located primarily within area of uncertain archaeological potential
Heritage Features	• None	• None	• None	• None	• None	• None	• None	• None
Private Properties Affected	• Principally within municipally owned land • Limited impact on private properties	• Principally within municipally road allowance • Potential impact on private properties during construction	• Principally within municipally owned land • Limited impact on private properties	• Within municipally owned land	• Within municipally owned land	• Alignment crosses privately owned land on the east side of the Hanlon Parkway • Large portion of alignment located on roadway in subdivision • Potential impact on private properties during construction	• Principally within municipally road allowance • Potential impact on private properties during construction	• Principally within municipally owned land • Limited impact on private properties
City Wells Affected	• Limited impact to City wells	• Limited impact to City wells	• Limited impact to City wells	• Limited impact to City wells	• Limited impact to City wells	• Limited impact to City wells	• Limited impact to City wells	• Limited impact to City wells
Compatibility with Proposed Land Uses	• Feedermain located within parkland or existing municipal land • Will not impact area once installation is completed	• Feedermain located within existing roadway • Will not impact area once installation is completed	• Feedermain located within parkland or existing municipal land • Will not impact area once installation is completed	• Feedermain located within parkland or existing municipal land • Will not impact area once installation is completed	• Feedermain located within parkland or existing municipal land • Will not impact area once installation is completed	• Feedermain located within privately owned land and residential subdivision road allowance • Will not impact area once installation is completed • May require easement / property acquisition	• Feedermain located within existing roadway • Potential conflict with development of Paisley Road intersection by MTO	• Feedermain located within parkland or existing municipal land • Will not impact area once installation is completed
Proximity to City Parks	• Alignment passes through Silvercreek Park • Potential loss of tress in park • Potential disruption to use of some facilities (may be mitigated by scheduling work off-season)	• None	• Alignment located within Silvercreek Park • Anticipated loss of some trees in park • Potential disruption to use of facilities (may be mitigated by scheduling work off-season)	• Alignment located within Royal City Park • Anticipated loss of some trees, including the Butternut Tree, in park • Potential disruption to use of facilities (may be mitigated by scheduling work off-season)	• Alignment located within Royal City Park • Anticipated loss of some trees in park • Significant disruption to use of facilities, including play area (may be mitigated by scheduling work off-season) and gazebo	• None	• None	• Alignment located within Castlebury Park • Upgrades proposed to park facilities • Opportunity to coordinate work with Park upgrades
Social and Cultural Overall Rating								

LEGEND

Most Preferred

Less Preferred

Least Preferred

6.12 Technical and Operational Evaluation

The Technical and Operational aspects of the feedermain alignment alternatives were evaluated with respect to soil and ground conditions, impacts to utilities, reliability and constructability, the ability to phase with other infrastructure upgrades, and road and railway crossings, as per the evaluation criteria presented in Section 6.2. Details of the Technical and Operational impacts and evaluation for each alternative alignment within each of the five sections of the Study Area are presented below.

6.12.1 Section 1 - from the City Limit down York Road to Industrial Avenue (Clythe Feedermain)

6.12.1.1 Alternative Alignment No. 1 (Master Plan Alternative) and Alternative Alignment No. 2

The installation of the Clythe Feedermain in this alignment would be performed by open cut construction, with the exception of a railroad crossing on Watson Road which would be performed by installing the feedermain in a steel casing under the railroad right-or-way. This would be performed by horizontal directional drilling. Soil conditions in the area of study are generally sands and gravels associated with glacial deposits or alluvial activity and are appropriate for both open-cut and horizontal direction drilling.

Groundwater levels generally vary between 1.5 metres and 4 metres below grade. Depending on the localized conditions, dewatering may be required for installation of the feedermain. Some reductions in groundwater baseflow are possible, however, no impacts to regional groundwater flow or existing wells are expected.

Due to the future expansion of York Road from two to four lanes, the area available for the installation of the feedermain is adequate to provide the required horizontal separation from other existing services and limited conflict with existing utilities is expected. The existing York Trunk Sanitary Sewer is located on the south side of York Road, crossing to the north side near the eastern extent of Beaumont Crescent. Due to this, the new feedermain would likely be located on the north side from Watson Road, crossing to the south side in the same area that the York Trunk Sanitary Sewer crosses to the north.

This is a feasible alternative from a technical and operational standpoint with no significant technical challenges. The ability to phase this work in conjunction with the expansion of York Road is a benefit which should be exploited, if possible.

6.12.2 Section 2 – from Industrial Avenue to Waterworks Place (Clythe Feedermain)

6.12.2.1 Alternative Alignment No. 1 (Master Plan Alternative)

The installation of the Clythe Feedermain in this alignment would be performed by open cut construction, with the exception of a CN railroad crossing just east of Victoria Road which would be performed by installing the feedermain in a steel casing under the railroad right-or-way. This would be performed by horizontal directional drilling. Soil conditions in the area of study are generally sands and gravels associated with glacial deposits or alluvial activity and are appropriate for both open-cut and horizontal direction drilling.

Groundwater levels generally vary between 1.5 metres and 4 metres below grade. Depending on the localized conditions, dewatering may be required for installation of the feedermain. Some reductions in groundwater baseflow are possible, however, no impacts to regional groundwater flow or existing wells are expected.

Due to the future expansion of York Road from two to four lanes, the area available for the installation of the feedermain is adequate to provide the required horizontal separation from other existing services and limited conflict with existing utilities is expected. West of Victoria Road, however, York Road is currently to remain two lanes and, given that this is a matured neighbourhood, limited space for existing utilities is expected.

The crossing of Victoria Road would be performed by open-cut construction, however this would be performed in two stages to allow for continued traffic movement in the area.

Work carried out on York Road, west of Victoria Road, does not provide any synergy to be phased with other projects, though the construction methodology is generally straightforward and technically feasible.

6.12.2.2 Alternative Alignment No. 2

As with the Master Plan alignment detailed above, this alignment would primarily be open cut construction in soils suitable for that type of construction. Some dewatering may be required depending on the local groundwater levels, but impacts resulting from this would be minimal.

South of York Road, in the existing utility corridor that also contains the York Trunk Sanitary Sewer, space within the existing easement is expected to be limited and an expansion of the easement may be required. Additionally, space is also limited near a CN rail spur crossing where the alignment turns west, and additional land purchase may be required to accommodate the new service. The undercrossing of the railroad would be performed by horizontal directional drilling, with the feedermain installed inside a steel carrier pipe.

In the western reach of the section, in Eramosa River Park, adequate space is present in the existing utility corridor to accommodate the additional feedermain service. This could be installed in conjunction with the upgrades to the York Trunk Sanitary Sewer. One concern in this area is the presence of a historical landfill which may present unexpected soil conditions, including the presence of deleterious materials that will require to be managed and/or disposed of. If any potentially hazardous environmental conditions are encountered, additional measures may be required during construction for worker safety. If the groundwater is found to be impaired, treatment and disposal of dewatering may be necessary. Assessment of the environmental conditions should be performed prior to construction to identify any areas of potential environmental concern.

As with the Master Plan alignment, the construction of this alternative is technically feasible, Based primarily on the limited conflict with existing utilities and the limited roadwork and reconstruction required, this alignment is preferred over the Master Plan alignment for this Section of the feedermain.

6.12.3 Section 3 – from Waterworks Place to Gordon Street (Paisley Feedermain)

6.12.3.1 Alternative Alignment No. 1

This alignment is essentially a continuation of the Master Plan alternative alignment for Section 2. As with that alignment, construction on a busy street in a matured neighbourhood presents conflicts with existing utilities, which should be avoided. In order to limit the extent of excavation to enable one lane of York Road to remain in operation, trench boxes may be considered.

This is not a technically difficult alternative, however, it is logistically less desirable that the Master Plan Alternative, which routes the new feedermain through the parkland south of York Road.

No opportunity for phasing this work with other projects is available except for combined trenching with the York Trunk Sanitary Sewer at the undercrossing of the Speed River, which is detailed in Section .

6.12.3.2 Alternative Alignment No. 2 (Master Plan Alternative)

This alignment is essentially an extension of Alternative Alignment No. 2 from Section 2 with similar technical considerations for the installation of the feedermain through Eramosa River Park and York Road Park. The construction would be by open-cut up to the Speed River crossing.

For the entire length of the alignment through the parkland, adequate space is present in the existing utility corridor to accommodate the additional feedermain service. This would be installed in conjunction with the upgrades to the York Trunk Sanitary Sewer.

Again, the presence of a historical landfill may present unexpected soil conditions, including the presence of deleterious materials that will require to be managed and/or disposed of. If any potentially hazardous environmental conditions are encountered, additional measures may be required during construction for worker safety. If the groundwater is found to be impaired, treatment and disposal of the withdrawn water may be necessary. Assessment of the environmental conditions should be performed prior to construction to identify any areas of potential environmental concern.

The crossing of the Speed River can be performed either by trenchless technology, likely boring, or by open cut. Section 6.14, below, provides a detailed analysis of these two options to determine the preferred alternative for the river crossing with respect to operational and technical considerations..

The timing of this operation will need to be coordinated with the cool water fishery, which limits work in the waterway from April to July. Additionally, it is preferable to perform this type of river crossing when water levels are low, so it may be preferable to perform this work during the winter.

From a technical standpoint, the Master Plan alignment is preferred over Alternative Alignment No. 1 for this Section of the feedermain due to the anticipated difficulties in locating the feedermain in a limited road allowance with myriad existing utilities, as well as the difficulties associated with road construction on a busy street. The lack of project synergy with the York Trunk Sanitary Sewer upgrades is also a detail that makes the Master Plan alignment the preferred alignment.

6.12.4 Section 4 – from Gordon Street to the Hanlon Parkway (Paisley Feedermain)

6.12.4.1 Alternative Alignment No. 1 (Master Plan Alternative) and Alternative Alignment No 1A

The installation of the Paisley-Clythe feedermain in the Master Plan Alternative alignment would be performed primarily using open-cut construction. This alignment includes four (4) road crossings at Wellington Street West, Edinburgh Road, Gordon Street, and Silvercreek Parkway South.

Soil conditions in the area where the Master Plan Alternative is aligned in Section 4 are mainly sands and gravels associated with outwash deposits or alluvial activity and are appropriate for open-cut construction. However, sections of Silvercreek Park through which the alignment travels have been identified as historical landfilling areas. The soil in these areas may be contaminated and therefore efforts must be made to handle and dispose of these soils in an appropriate manner. Additionally, should dewatering be required in these areas the withdrawn water may be contaminated and require treatment and alternative disposal procedures.

It is expected that the Master Plan Alternative will have limited conflicts with existing utilities along Wellington Street West as the road is wide enough to allow for the required distances between utilities. There are some concerns, however, related to the alignment of the existing watermain in Silvercreek Park as the new feedermain will be required to cross an existing watermain within the park area. The existing watermain may be realigned or an undercrossing of the new alignment below the existing watermain may be performed at this location.

This is a feasible alternative from a technical and operation standpoint with only minor technical challenges. Additionally, the installation of the section of the feedermain that is located within Silvercreek Park may be performed in conjunction with the upgrades occurring to the York Trunk Sewer. This should be exploited, if possible.

6.12.4.2 Alternative Alignment No. 1B

The installation of the Paisley-Clythe feedermain in alignment 3 would be performed primarily using open-cut construction, with the exception of two (2) railroad crossing by which the feedermain would be installed in a steel casing under the railroad right-of-way. This will be performed by horizontal direction drilling. An allowance of approximately 16 m for Ministry of Transportation setbacks plus an addition 30 m of clearance for staging and receiving pits would need to be available on either side of the road at the location where horizontal directional drilling would occur. This would need to be

confirmed prior to construction. Additionally, this alignment includes multiple significant road crossings which would cause serious impacts to various intersections.

Soil conditions in the area where alignment 3 is aligned in Section 4 are mainly sands and gravels associated with outwash deposits or alluvial activity and are appropriate for both open-cut construction and horizontal directional drilling.

This alignment will be located within an existing right-of-way and utility corridor. There are potentially significant conflicts with existing utilities in the heavily developed road allowances as this alignment would be aligned in close proximity to a number of existing utilities, and be required to cross them in multiple locations.

There are currently no identified opportunities to phase the installation of this alignment with other infrastructure upgrades.

6.12.4.3 Alternative Alignment No. 2 and Alternative Alignment No. 2A

The installation of the Paisley-Clythe feedermain in alignment 2 would be performed primarily using open-cut construction. This alignment includes five (5) road crossings at Wellington Street West, Edinburgh Road, Gordon Street, Silvercreek Parkway South, and McCrae Boulevard.

Soil conditions in the area where alignment 2 is located in Section 4 are mainly sands and gravels associated with outwash deposits or alluvial activity and are appropriate for open-cut construction. However, sections of Silvercreek Park through which the alignment travels have been identified as historical landfilling areas. The soil in these areas may be contaminated and therefore efforts must be made to handle and dispose of these soils in an appropriate manner. Additionally, should dewatering be required in these areas the withdrawn water may be contaminated and require treatment and alternative disposal procedures.

This alignment will be partially located within an existing utility corridor. Therefore, it is expected that the Master Plan Alternative will have limited conflicts with existing utilities. There are some concerns, however, related to the existing watermain within the park area. The existing watermain may be realigned or an undercrossing of the new alignment below the existing watermain may be performed at this location.

This is a feasible alternative from a technical and operation standpoint with some minor technical challenges. Additionally, the installation of the section of the feedermain that is located within Silvercreek Park may be performed in conjunction with the upgrades occurring to the York Trunk Sewer. Again, this should be exploited, if possible.

Alternative Alignment No. 1B is not a technically preferred alternative as it involves significant technical challenges with the road and railroad crossings and interferences with existing utilities. The preferred Alternative, in this Section, from a technical standpoint is Alternative Alignment No. 1.

6.12.5 Section 5 – from the Hanlon Parkway to the Paisley Road Booster Station (Paisley Feedermain)

6.12.5.1 Alternative Alignment No. 1 (Master Plan Alternative)

The installation of the Paisley-Clythe feedermain in the Master Plan Alternative alignment would be performed primarily using open-cut construction. However, boring and casing installation will be required for the Ministry of Transportation sleeved undercrossing of the Hanlon Parkway. Additionally, this alignment includes a number of road crossings in the residential subdivision through which it is aligned and one (1) railroad undercrossing by which the feedermain would be installed in a steel casing under the railroad right-of-way. This will be performed by horizontal directional drilling. An allowance of 16 m for Ministry of Transportation setbacks plus an addition 30 m of clearance for staging and receiving pits would need to be available on either side of the road at the location where horizontal directional drilling would occur. This would need to be confirmed prior to construction.

Soil conditions in the area where the Master Plan Alternative is aligned in Section 5 are mainly sands and gravels associated with outwash deposits or alluvial activity. These conditions are appropriate for both open-cut construction and horizontal directional drilling.

The feedermain will primarily be located in an existing road allowance. It is expected that the Master Plan Alternative will have limited conflicts with existing utilities. The alignment will be a pressure pipe with no connections to other watermains in this Section.

There are no opportunities to phase the installation of this alignment with other infrastructure upgrades.

6.12.5.2 Alternative Alignment No 1A (Master Plan Alternative 2)

The installation of the Paisley-Clythe feedermain along the Master Plan Alternative alignment would be performed primarily using open-cut construction. However, boring and casing installation will be required for the Ministry of Transportation sleeved undercrossing of the Hanlon Parkway. Additionally, this alignment includes two (2) railroad undercrossings by which the feedermain would also be installed by horizontal directional drilling using boring and casing at this location. An allowance of 16 m for Ministry of Transportation setbacks plus an addition 30 m of clearance for staging and receiving pits would need to be available on either side of the road at the location where horizontal directional drilling would occur. This would need to be confirmed prior to construction. This alignment would also require a crossing of Paisley Road.

The feeder main will primarily be located in an existing road allowance. It is expected that Master Plan Alternative 2 will have limited conflicts with existing utilities. Also, as with Master Plan Alignment 1, the feedermain will be a pressure pipe with no connections to other watermains in this Section.

This is a feasible alternative from a technical and operational standpoint with only minor technical challenges. Additionally, the feedermain installation may be coordination with the development of the Lafarge lands along Silvercreek Parkway South. It is understood that an EA is currently underway for the grade separation of the railroad that crosses Silvercreek Parkway South, south of Paisley Road. The installation of the feedermain in this corridor would require to be coordinated with this to prevent the need for future realignment as the area is developed.

The undercrossing of the Hanlon Parkway at Paisley Road would need to be completed separately from these works and coordinated with future MTO upgrades, including the construction of an interchange at that intersection. Given this, there is the potential for conflicts with the Ministry of Transportation works in relation to the development of the Hanlon Parkway and Paisley Road intersection.

6.12.5.3 Alternative Alignment No. 2

The installation of the Paisley-Clythe feedermain along this alignment would be performed primarily using open-cut construction. However, boring and casing installation will be required for the Ministry of Transportation sleeved undercrossing of the Hanlon Parkway. Additionally, this alignment includes one (1) railroad undercrossing by which the feedermain would also be installed by horizontal directional drilling using boring and casing at this location. An allowance of 16 m for Ministry of Transportation setbacks plus an addition 30 m of clearance for staging and receiving pits would need to be available on either side of the road at the location where horizontal directional drilling would occur. This would need to be confirmed prior to construction.

Soil conditions in the area where Alignment 2 is located in Section 5 are mainly sands and gravels associated with outwash deposits or alluvial activity. These soil conditions are appropriate for both open-cut construction and horizontal directional drilling.

It is expected that this alignment will have limited conflicts with existing utilities and, as with the Master Plan Alternatives; the alignment will be a pressure pipe with no connections to other watermains.

This is a feasible alternative from a technical and operation standpoint with only minor technical challenges. Additionally, the feedermain installation may be coordination with the development of the

Lafarge lands along Silvercreek Parkway South, including the potential to coordinate the installation of this alignment with the construction of the sanitary sewer under the Hanlon Expressway which is associated with the development of the Lafarge lands.

Based on these considerations, this is the preferred alternative from a technical and operational standpoint.

Table 6.7 Feedermain Evaluation Matrix – Technical Considerations

Evaluation Criteria	Section 1	Section 2 - from Industrial Road to Waterworks Place		Section 3 - from Waterworks Place to Gordon Street	
	Alternative Alignment No. 1 and No. 2	Alternative Alignment No. 1	Alternative Alignment No. 2	Alternative Alignment No. 1	Alternative Alignment No. 2
Technical Considerations					
Soil and Ground Water Conditions	• Located mainly within sands and gravels associated with outwash deposits or alluvial activity • Feedermain will be located in existing road right of way and utility corridor	• Located mainly within sands and gravels associated with outwash deposits or alluvial activity • Feedermain will be located in existing road right of way and utility corridor	• Located mainly within sands and gravels associated with outwash deposits or alluvial activity • Feedermain will be located in existing utility corridor • Subsurface conditions may vary in areas of historical landfilling and some deleterious substances may be encoutered	• Located mainly within sands and gravels associated with outwash deposits or alluvial activity • Feedermain will be mainly located in existing road right of way and utility corridor • Feedermain will be located in bedrock under Speed River • Top strata of bedrock is expected to be fractured	• Located mainly within sands and gravels associated with outwash deposits or alluvial activity • Feedermain will be generally located in existing utility corridor • Feedermain will be located in bedrock under Speed River • Top strata of bedrock is expected to be fractured
Impacts to Utilities	• Limited conflict with existing utilities	• May be conflicts with existing utilities in developed area of York Road west of Victoria Road	• Limited space within existing utility corridor east of Victoria Road • Limited conflict with existing utilities in Eramosa River Park	• May be conflicts with existing utilities in developed area of York Road west of Victoria Road	• Limited conflict with existing utilities
Reliability	• Feedermain will be a pressure pipe with no connections to other watermains • This is a reliable technology	• Feedermain will be a pressure pipe with no connections to other watermains • This is a reliable technology	• Feedermain will be a pressure pipe with no connections to other watermains • This is a reliable technology	• Feedermain will be a pressure pipe with no connections to other watermains • This is a reliable technology	• Feedermain will be a pressure pipe with no connections to other watermains • This is a reliable technology
Ability to Phase with Other Infrastructure Upgrades	• Feedermain installation may be performed in conjunction with planned expansion of York Road to four lanes east of Victoria Road	• Feedermain would be installed independently of any other proposed works	• Feedermain installation in Eramosa River Park may be performed in conjunction with upgrades to the York Trunk Sewer	• Feedermain would be installed independently of any other proposed works on York Road • Feedermain installation may be performed in conjunction with upgrades to the York Trunk Sewer	• Feedermain installation in York Road Park may be performed in conjunction with upgrades to the York Trunk Sewer
Constructability	• Primarily open-cut construction • Boring / casing installation will be required for railroad undercrossings	• Primarily open-cut construction • Boring / casing installation will be required for railroad undercrossings	• Primarily open-cut construction • Boring / casing installation will be required for railroad undercrossings	• Primarily open-cut construction in a developed roadway • Open cut construction in river will require cofferdams and dewatering	• Primarily open-cut construction in park land • Open cut construction in river will require cofferdams and dewatering
Road and Railway Crossings	• 1 road crossing at Watson Parkway • 1 railroad undercrossing	• 1 road crossing at Victoria Road • 1 railroad undercrossing	• 1 road crossing at Victoria Road • 1 railroad undercrossing	• None	• None
Technical Overall Rating					

LEGEND

Most Preferred

Less Preferred

Least Preferred

Table 6.7 Feedermain Evaluation Matrix – Technical Considerations

Evaluation Criteria	Section 4 – from Gordon Street to Hanlon Parkway			Section 4 – Royal City Park Alternative		Section 5 – from Hanlon Parkway to Paisley Road Booster Station		
	Alternative Alignment No. 1	Alternative Alignment No. 1B	Alternative Alignment No. 2	Alternative Alignment No. 1 and No. 2	Alternative Alignment No. 1A and 2A	Alternative Alignment No. 1	Alternative Alignment No. 1A	Alternative Alignment No. 2
Technical Considerations								
Soil and Ground Conditions	• Located mainly within sands and gravels associated with outwash deposits or alluvial activity • Feedermain will be located in existing utility corridor	• Located mainly within sands and gravels associated with outwash deposits or alluvial activity • Feedermain will be located in existing road right of way and utility corridor	• Located mainly within sands and gravels associated with outwash deposits or alluvial activity • Feedermain will be located in existing utility corridor	• Located mainly within sands and gravels associated with outwash deposits or alluvial activity	• Located mainly within sands and gravels associated with outwash deposits or alluvial activity	• Located mainly within sands and gravels associated with outwash deposits or alluvial activity • Feedermain will be generally located in existing road allowance.	• Located mainly within sands and gravels associated with outwash deposits or alluvial activity • Feedermain will be generally located in existing road allowance.	• Located mainly within sands and gravels associated with outwash deposits or alluvial activity
Impacts to Utilities	• Limited conflicts with existing utilities • Some concerns related to alignment of existing watermain in Silvercreek Park	• Potential conflicts with existing utilities in heavily developed road allowance	• Limited conflicts with existing utilities • Some concerns related to alignment of existing watermain in Silvercreek Park	• Limited conflicts with existing utilities • Some concerns related to alignment of existing watermain in Royal City Park	• Limited conflicts with existing utilities • Some concerns related to alignment of existing watermain in Royal City Park	• Limited conflict with existing utilities	• Limited conflict with existing utilities	• Limited conflict with existing utilities
Reliability	• Feedermain will be a pressure pipe with no connections to other watermains • This is a reliable technology	• Feedermain will be a pressure pipe with no connections to other watermains • This is a reliable technology	• Feedermain will be a pressure pipe with no connections to other watermains • This is a reliable technology	• Feedermain will be a pressure pipe with no connections to other watermains • This is a reliable technology	• Feedermain will be a pressure pipe with no connections to other watermains • This is a reliable technology	• Feedermain will be a pressure pipe with no connections to other watermains • This is a reliable technology	• Feedermain will be a pressure pipe with no connections to other watermains • This is a reliable technology	• Feedermain will be a pressure pipe with no connections to other watermains • This is a reliable technology
Ability to Phase with Other Infrastructure Upgrades	• Installation of section of feedermain located in Silvercreek Park may be performed in conjunction with upgrades to York Trunk Sewer	• None	• Installation of feedermain located in Silvercreek Park may be performed in conjunction with upgrades to York Trunk Sewer	• Installation of feedermain located in Royal City Park may be performed in conjunction with upgrades to York Trunk Sewer	• Installation of feedermain located in Royal City Park may be performed in conjunction with upgrades to York Trunk Sewer	• None	• Feedermain installation may be coordinated with development of Lafarge lands along Silvercreek Parkway South • Potential conflicts with MTO development of Paisley Road intersection	• Feedermain installation may be coordinated with development of Lafarge lands along Silvercreek Parkway South • Potential synergy with installation of sanitary sewer under Hanlon Expressway associated with development of Lafarge Lands
Constructability	• Primarily open-cut construction	• Primarily open-cut construction	• Primarily open-cut construction	• Primarily open-cut construction	• Primarily open-cut construction	• Primarily open-cut construction • Boring / casing installation will be required MTO undercrossing	• Primarily open-cut construction • Boring / casing installation will be required for railroad and MTO undercrossings	• Primarily open-cut construction • Boring / casing installation will be required for railroad and MTO undercrossings
Road and Railway Crossings	• 4 road crossings (Wellington Road, Edinburgh Road, Gordon Street, Silvercreek Parkway South)	• Multiple significant road crossings, impacts to various intersections • 2 railroad crossings	• 5 road crossings (Wellington Road, Edinburgh Road, Gordon Street, Silvercreek Parkway South, McCrea Blvd.)	• None	• None	• Sleeved undercrossing of the Hanlon Expressway • Various Road crossings in residential subdivision • 1 railroad undercrossing	• Sleeved undercrossing of the Hanlon Expressway • Crossing of Paisley Road • 2 railroad undercrossings	• Sleeved undercrossing of the Hanlon Expressway • 1 railroad undercrossing
Technical Overall Rating								

LEGEND

Most Preferred | Less Preferred | Least Preferred

6.13 Financial and Economic Evaluation

The Financial and Economic aspects of the feedermain alignment alternatives were evaluated with respect to estimated capital costs, operating and maintenance costs, and land acquisition costs as, per the evaluation criteria presented in Section 6.2. Details of the Technical and Operational impacts and evaluation for each alternative alignment within each of the five sections of the Study Area are presented below.

Note that with all of these alternatives, there is the potential requirement for dewatering of impaired groundwater and disposal of contaminated soils related to work in areas of historical landfilling activities. An additional allowance of $2.6 million should be included in the total project costs as a contingency.

6.13.1 Section 1 - from the City Limit down York Road to Industrial Avenue (Clythe Feedermain)

6.13.1.1 Alternative Alignment No. 1 (Master Plan Alternative) and Alternative Alignment No. 2

As this alignment is located within a municipal right of way, no additional easements or land acquisition is anticipated to be required. Permits will be necessary, however, for the railroad undercrossing on Watson Road.

With this alternative, there are no additional operations and maintenance requirements or associated costs beyond regular maintenance provided by the City.

The estimated capital cost for this alternative, including contingencies and design, and construction is $3.7 million.

6.13.2 Section 2 – from Industrial Avenue to Waterworks Place (Clythe Feedermain)

6.13.2.1 Alternative Alignment No. 1 (Master Plan Alternative)

This alignment is located within a municipal right of way and no additional easements or land acquisition is expected to be necessary, however, permitting will be required for the undercrossing of a CN rail spur.

There are no additional operations and maintenance costs associated with the alternative above regular City maintenance.

The estimated capital cost for this alternative, including contingencies and design, and construction is $3.1 million.

6.13.2.2 Alternative Alignment No. 2

This alignment is generally located within an existing utility corridor; however, space for additional services is expected to be limited in this area. As a result, additional land purchase will likely be required in the area of a CN rail spur crossing and an expansion of the existing easement between the PDI plant and the plaza located on Victoria Road may be necessary.

No additional operations and maintenance costs are anticipated.

The estimated capital cost for this alternative, including contingencies and design, and construction is $2.3 million, including costs for additional land purchase.

Based on capital costs, this is the preferred alternative over the Master Plan Alternative.

6.13.3 Section 3 – from Waterworks Place to Gordon Street (Paisley Feedermain)

6.13.3.1 Alternative Alignment No. 1

This alignment is located within the York Road right of way and partially within York Road Park. There are no additional land purchase or easement requirements and no additional operations and maintenance costs associated with this alternative. Based on the presence of groundwater, a permit to take water may be necessary for any dewatering activities required in the parkland. A permit to take water will also likely be required for the open cut river crossing.

The estimated capital costs of the alternative, including the crossing of the Speed River, in addition to contingencies, design, and construction, is $5.4 million.

6.13.3.2 Alternative Alignment No. 2 (Master Plan Alternative)

This alignment is located within a municipal utility corridor and no additional easements or land acquisition is expected to be necessary. Based on the presence of groundwater, a permit to take water may be necessary for any dewatering activities required in the parkland. A permit to take water will also likely be required for the open cut river crossing.

There are no additional operations and maintenance costs associated with the alternative above regular City maintenance.

The estimated capital cost for this alternative, including the crossing of the Speed River and also including contingencies and design, and construction is $4.9 million.

Based on capital cost, Alignment No. 2 is the preferred alignment.

6.13.4 Section 4 – from Gordon Street to the Hanlon Parkway (Paisley Feedermain)

6.13.4.1 Alternative Alignment No. 1 (Master Plan Alternative)

This alignment is located within municipally owned property through Royal City Park and then on the north side of Wellington Street West; however, an easement may be required at the 40 Wellington development to enable the avoidance of the Butternut tree present in Royal City Park.

No additional operations and maintenance costs are anticipated to be associated with this alternative.

The estimated capital cost for this alternative, including contingencies and design, and construction is $3.3 million.

6.13.4.2 Alternative Alignment No. 1B

This alignment is located through Silvercreek Park, but instead of following the parks to Silvercreek Parkway South, it is aligned to reach the Hanlon Expressway via Edinburgh Road and Paisley Road.

This is within a municipal right of way, however, there may be significant additional costs associated with relocation of existing utilities. An easement may also be required for the alignment proximate to the 40 Wellington development to avoid the Butternut tree. Permits may be required for two railroad crossings.

The estimated capital cost for this alternative, including contingencies and design, and construction is $5.9 million.

6.13.4.3 Alternative Alignment No. 2 and Alternative Alignment No. 2A

As with Alignment 1, this alignment is located within municipally owned property through Royal City and Silvercreek Park; however, an easement may be required at the 40 Wellington development to enable the avoidance of the Butternut tree present in Royal City Park.

No additional operations and maintenance costs are anticipated to be associated with this alternative.

The estimated capital cost for this alternative, including contingencies and design, and construction is $2.9 million.

Based on capital cost, this is the preferable alignment from an economic point of view.

Due to the high capital costs associated with this alternative, as well as the Master Plan Alternative, Alignment 2 is the preferred alternative in this Section from an economic standpoint.

6.13.5 Section 5 – from the Hanlon Parkway to the Paisley Road Booster Station (Paisley Feedermain)

6.13.5.1 Alternative Alignment No. 1 (Master Plan Alternative)

This is the Master Plan alternative from Silvercreek Parkway South to the Paisley Road Pumping Station. This alignment requires a crossing of the Hanlon Express, which is administered by the MTO. A permit will be required to perform this undercrossing, which is expected to be performed by horizontal directional drilling.

No other easements or land acquisition are anticipated.

The estimated capital cost for this alternative, including contingencies and design, and construction is $4.3 million.

6.13.5.2 Alternative Alignment No 1A (Master Plan Alternative 2)

This second Master Plan alternative crosses the Hanlon Expressway at the intersection with Paisley Road. As with the other alignment alternative, a permit will be required to undercross the MTO controlled corridor.

The estimated capital cost for this alternative, including contingencies and design, and construction is $4.0 million.

6.13.5.3 Alternative Alignment No. 2

This alignment crosses from Silvercreek Parkway South through a municipally owned property and is aligned northward along the west property line of the future Lafarge Lands development where it undercrosses the Hanlon Expressway to municipally owned land at Castlebury Park.

A permit will be required for the MTO undercrossing, as well as for an undercrossing of the CN rail road.

The estimated capital cost for this alternative, including contingencies and design, and construction is $3.8 million.

Based on a financial assessment of the alignments within this Section, Alignment 2 is the preferred alternative.

Table 6.8 Feedermain Evaluation Matrix – Economic

Evaluation Criteria	Section 1	Section 2 - from Industrial Road to Waterworks Place		Section 3 - from Waterworks Place to Gordon Street	
	Alternative Alignment No. 1 and No. 2	Alternative Alignment No. 1	Alternative Alignment No. 2	Alternative Alignment No. 1	Alternative Alignment No. 2
Economic Considerations					
Estimated Capital Costs	• $3.7 Million	• $3.1 Million	• $2.3 Million	• $5.4 Million	• $4.9 Million
Operating and Maintenance/Life Cycle Costs	• No additional requirements above regular maintenance currently performed by the City	• No additional requirements above regular maintenance currently performed by the City	• No additional requirements above regular maintenance currently performed by the City	• No additional requirements above regular maintenance currently performed by the City	• No additional requirements above regular maintenance currently performed by the City
Land Acquisition Requirements	• No additional land acquisition required	• No additional land acquisition required	• Additional land acquisition or easement likely required to provide adequate space for utilities in existing corridor south of York Road and east of Victoria Road	• No additional land acquisition required	• No additional land acquisition required
Economic Overall Rating					

LEGEND

Most Preferred

Less Preferred

Least Preferred

Table 6.8 Feedermain Evaluation Matrix – Economic

Evaluation Criteria	Section 4 – from Gordon Street to Hanlon Parkway			Section 4 – Royal City Park Alternative		Section 5 – from Hanlon Parkway to Paisley Road Booster Station		
	Alternative Alignment No. 1	Alternative Alignment No. 1B	Alternative Alignment No. 2	Alternative Alignment No. 1 and No. 2	Alternative Alignment No. 1A and 2A	Alternative Alignment No. 1	Alternative Alignment No. 1A	Alternative Alignment No. 2
Economic Considerations								
Estimated Capital Costs	• $3.3 Million	• $5.9 Million	• $2.9 Million	• Included in Section 4 Cost	• +$400,000	• $4.3 Million	• $4.0 Million	• $3.8 Million
Operating and Maintenance Costs	• No additional requirements above regular maintenance currently performed by the City	• No additional requirements above regular maintenance currently performed by the City	• No additional requirements above regular maintenance currently performed by the City	• No additional requirements above regular maintenance currently performed by the City	• No additional requirements above regular maintenance currently performed by the City	• No additional requirements above regular maintenance currently performed by the City	• No additional requirements above regular maintenance currently performed by the City	• No additional requirements above regular maintenance currently performed by the City
Land Acquisition Requirements	• Easement likely required at 40 Wellington	• Easement likely required at 40 Wellington	• Easement likely required at 40 Wellington	• No additional land acquisition required	• No additional land acquisition required	• Land acquisition / easement required on private land on west side of Hanlon Expressway	• No additional land acquisition required	• No additional land acquisition required
Economic Overall Rating								

LEGEND

Most Preferred

Less Preferred

Least Preferred

6.14 RIVER CROSSING ASSESSMENT

Regardless of the alignments selected as the preferred alternatives for the York Trunk Sanitary Sewer and the Paisley Feedermain, a crossing of the Speed River is required. Generally, two alternatives exist for this crossing; open cutting then river bottom, or boring under it. Each of these options has both benefits and less desirable impacts.

Town Lattice Covered Bridge

Proposed Area of River Crossing

The following section details the requirements for the crossing with respect to each service and includes an analysis of which methodology would be preferred.

6.14.1 York Trunk Sanitary Sewer and Paisley Feedermain Requirements

The twinned pipe for the upgrades to the York Trunk Sanitary Sewer has been preliminarily sized at 1050 mm in diameter in the area of the river crossing. As previously indicated, due to the constraint of having to tie-in to existing inverts on the existing York Trunk Sanitary Sewer, the ability to adjust the depth of burial of the new pipe is limited, when gravity flow in the sewer is maintained.

Alternatively, the river crossing could be performed through the use of an inverted siphon, as is currently implemented for other river undercrossings in the City, including the undercrossing of the Speed River by the Speed River Trunk Sewer, west of Edinburgh Road.

An inverted siphon is used to undercross an obstacle by aligning the pipes in a U shape under the length of the crossing. The start of the siphon is located at a higher elevation than the exit. Gravity pushes the flow down and this force, in turn, pushes the flow back up on the other side of the diversion.

Typically, multiple smaller pipes are required in order to maintain adequate scouring velocities to prevent build-up of settled material in the low point of the siphon. Due to this, access from either end is typically provided for maintenance and flushing.

In this application, if an inverted siphon were to be used for the York Trunk Sanitary Sewer undercrossing, boring would be implemented, whereas the depth of cut for a gravity system would be shallower and open cut of the river would be the preferred method of installation.

The Paisley-Clythe Feedermain, as a pressurized pipe, is not restricted in its vertical alignment and can be aligned as required to undercross the Speed River.

Either open cut or boring could be used for its installation without impacting the operation of the feedermain.

6.14.2 Analysis of Open Cut and Boring for the Speed River Undercrossing

Open cutting of the Speed River would require tree and vegetation removal on both banks of the river. Cofferdams would be required to divert the river around the excavation, and the open cut of the river bottom would disturb aquatic wildlife habitat. This may be mitigated through reinstatement of the river bottom to promote new habitat, in addition to scheduling the work around the cool water fishery present in that part of the river.

Boring would require large staging and receiving pits on either side of the river, as well as some tree and vegetation removal. Disturbance of aquatic habitat would be limited.

From the point of view of limiting disturbance to the river and its associated habitats, boring would be the preferred alternative, however, the impacts associated with open-cutting of the river bottom can generally be mitigated.

Installation of the staging and receiving pits required for boring will require a large excavation in York Road Park which, depending on the time of year the work is performed, may impact public recreations use in the park. Additionally, the staging area was identified as an area of high archaeological potential

Open cut of the river bank to access the river bottom would not result in a large excavation in the way that a boring staging pit would be required, and the impacts would be limited to the western side of York Road Park.

This would also require disturbance of an area of high archaeological potential which will need to be assessed prior to construction.

Due to the smaller physical impact on the parkland, open cut is preferred with respect to possible impact on use of the parks and potential to disturb culturally significant areas.

The preliminary geotechnical assessment of the area indicated that the top strata of bedrock in the area of the river is likely fractured. This has less of an impact on open cut installation, however, due to this, the depth of boring would likely be approximately three times the diameter of the trunk sewer pipe, or roughly up to 3.2 metres below grade, in order to minimize damage to the existing bedrock formations. Even with this depth of burial, there is the risk of additional fracturing of the bedrock, which may impact localized groundwater flow.

Open cut installation would require cofferdams and sheet piling to isolate the area of work. Dewatering of the excavation will be necessary. Dewatering will also be required for the staging and receiving pits if boring is performed and, potentially, of the bore itself.

In terms of synergies, an open cut excavation could accommodate both the sewer and feedermain services in a combined trench. Boring would not allow this and at least two bored undercrossings would be required, one for each service. The need for multiple smaller pipes in order for the siphon to operate correctly may even require additional bored crossings.

From a technical standpoint, open-cut would be the preferable option, as it presents less risk with respect to in-situ conditions compared to boring.

The costs associated with boring have been estimated at approximately $5,000 per metre for the installation of the feedermain or smaller diameter sewage pipes for the siphon. Including erosion control, dewatering, tree protection and removal, the cost of pipes and siphon structures, excavation of receiving pits, and reinstatement, a preliminary estimate of $2,340,000 has been prepared for the completion of a bored undercrossing for the two services, including design and contingencies.

Costs associated with the open cut of the river, including erosion control, dewatering, shoring, cofferdams, rock removal, tree protection and reinstatement, pipe costs and reinstatement, total $2,136,000, including design and contingencies..

Note that these are preliminary budget numbers for comparison and do not include any contingencies. Detailed project cost estimates are presented in Section 7.9.

Additionally, yearly operations and maintenance costs would be associated with a siphon, whereas there are no additional costs associated with a gravity sewer.

Conclusion

Based on the analysis presented above, open cut is the prefer methodology for performing the undercrossing of the Speed River. Its advantages are:

- Disturbance of trees and vegetation in York Road Park can be mitigated by Renaturalization and replanting;
- There is the opportunity to perform the installation of both the York Trunk Sanitary Sewer and the Paisley-Clythe Feedermain in tandem; and,
- There is a lower capital cost associated with this option when compared to boring each service separately.

Disadvantages associated with boring of the undercrossing include:

- Staging and receiving pits require large excavations;
- There will be extensive disturbance to park use and facilities;
- Bedrock formations may be disturbed; and,
- There is limited ability to phase the two projects together.

In the development of the preferred alignments, open cut will be assumed to be the method that will be used to install both of the subject services under the Speed River.

6.15 York Trunk Sanitary Sewer and Paisley-Clythe Feedermain Evaluation Summary

Based on the Natural and Physical, Social and Cultural, Technical, and Economic Environmental considerations detailed above, the preferred alternative within each Section has been determined. These will be combined to develop one continuous alignment for the Paisley-Clythe Feedermain and York Trunk Sanitary Sewer across the extent of the Study Area.

In each section, some alternatives were identified as being preferable with respect to one consideration, however, they were ultimately determined to be less advantageous in the context of potential impact to all four of the main criteria.

At P.I.C No. 2, the preferred alignments presented here were identified. There have been no responses received to date that there are any stakeholder concerns with these alignments. Subsequent to PIC#2, the presence of a Butternut tree in Royal City Park was confirmed. As a result, a second option for routing the services through the park has been developed. The determination as to which of these options is preferable will need to be assessed during the detailed design stage.

Based on the information presented herein, Table 6.9 provides a summary of the alternative evaluations for the York Trunk Sanitary Sewer and Table 6.10 provides a summary of the alternative evaluations for the Paisley-Clythe Feedermain.

Table 6.9 Sewer Evaluation Matrix – Summary

Evaluation Criteria	Section 2 - from Industrial Road to Waterworks Pl		Section 3 - from Waterworks Pl to Gordon St		Section 4 - from Gordon Street to the Hanlon Parkway		Section 4 - Royal City Park Alternative	
	Alternative Alignment No. 1	Alternative Alignment No. 2	Alternative Alignment No. 1	Alternative Alignment No. 2	Alternative Alignment No. 1	Alternative Alignment No. 2	Alternative Alignment No. 1 and No. 2	Alternative Alignment No. 1A
Natural Environment Overall Rating	• Located within existing utility easement with Significant Natural Area in City's Natural Heritage System	• Located within Existing Road Allowance • Limited Impact on Natural Environment	• Located within Existing Utility Corridor • Disturbance to Trees and Vegetation in York Road Park • Potential Disturbance of Historic Landfill and Historical Coal/Salt Storage Area • Passes through Designated Natural Heritage and Restoration Area • Tree Removal Required on both Sides of Speed River • Open Cut of River Bottom will Disturb Wildlife Habitat • River is Part of Natural Heritage System	• Located Within Existing Road Allowance • Potential Disturbance of Historic Landfill • Passes through Designated Natural Heritage and Restoration Area • Tree Removal Required on both Sides of Speed River • Open Cut of River Bottom will Disturb Wildlife Habitat • River is Part of Natural Heritage System	• Located within Existing Utility Corridor • Disturbance to Trees and Vegetation in Royal City Park and Silvercreek Park • Potential Disturbance of Contaminated Soils and Groundwater • Passes Through Designated Natural Heritage and Restoration Area	• Located within Existing Utility Corridor • Disturbance to Trees and Vegetation in Royal City Park and Silvercreek Park • Potential Disturbance of Contaminated Soils and Groundwater • Passes Through Designated Natural Heritage and Restoration Area	• Located in Parkland • Disturbance to Trees and Vegetation in Royal City Park can be performed in coordination with Emerald Ash Borer control • Removal of Butternut Tree • Potential Disturbance of Contaminated Soils and Groundwater	• Located in Parkland • Disturbance to Trees and Vegetation in Royal City Park • Potential Disturbance of Contaminated Soils and Groundwater
Social and Cultural Overall Rating	• Located within parkland • Limited Disruption to Local Residents and Businesses • Disruption to Activities in Park (may be Mitigated by Scheduling Work Off-Season)	• Alignment Along York Road would Cause Disruption to Local Businesses and Residents • York Road / Victoria Road reconstructed	• Construction Will Impact use of York Road Park • Limited Disturbance to Roads and Traffic	• Alignment along York Road would Cause Disruption to Local Businesses and Residents	• Construction will Impact use of Royal City and Silvercreek Park	• Alignment would cause disruption to local residents	• Construction will Impact use of Royal City Park	• Construction will Impact use of Royal City Park • Temporary removal of playground, gazebo and access road required
Technical Overall Rating	• Trunk Sewer Installation in Eramosa River Park may be Performed in Conjunction with Paisley-Clythe Feedermain	• Potential Conflicts With Existing Utilities in Road Allowance • No Synergy with other Proposed Works	• Installation in York Road Park May be Performed in Conjunction with Feedermain	• Potential Conflicts with Existing Utilities in Road Allowance • No Synergy with other Proposed Works (Paisley-Clythe Feedermain)	• Some Conflicts with Existing Services in Silvercreek Park • May be Performed in Conjunction with Twinning of York Trunk Sewer • Three Road Crossings Required	• Some Conflicts with Existing Services in Silvercreek Park • Four Road Crossings Required	• Some Conflicts with Existing Services in Royal City Park • May be Performed in Conjunction with Installation of Paisley-Clythe Feedermain	• Some Conflicts with Existing Services in Royal City Park • May be Performed in Conjunction with Installation of Paisley-Clythe Feedermain
Economic Overall Rating	• Capital Cost: est. $3.6 Million	• Capital Cost: est. $5.0 Million	• Capital Cost: est. $1.6 Million	• Capital Cost: est. $2.0 Million	• Capital Cost: est. $5.1 Million	• Capital Cost: est. $5.6 Million	• Included in Section 4 Costing	• +$400,000
OVERALL PREFERENCE RATING								

LEGEND

Most Preferred

Less Preferred

Least Preferred

Table 6.10 Feedermain Evaluation Matrix – Summary

Evaluation Criteria	Section 1	Section 2 - from Industrial Road to Waterworks Place		Section 3 - from Waterworks Place to Gordon Street	
	Alternative Alignment No. 1 and No. 2	Alternative Alignment No. 1	Alternative Alignment No. 2	Alternative Alignment No. 1	Alternative Alignment No. 2
Natural Environment Overall Rating	• Located Within Existing Road Allowance, which is Already Disturbed • Adjacent to Designated Natural Heritage Area South of York Road	• Located Within Existing Road Allowance	• Located Within Existing Utility Easement • Disturbance to Trees and Vegetation in Eramosa River Park • Passes through Designated Natural Heritage and Restoration Area and Wetland	• Located Within Existing Road Allowance • Potential Disturbance of Historic Landfill • Passes through Designated Natural Heritage and Restoration Area • Tree Removal Required on both Sides of Speed River • Open Cut of River Bottom will Disturb Wildlife Habitat • River is Part of Natural Heritage System	• Located within Existing Utility Corridor • Disturbance to Trees and Vegetation in York Road Park • Potential Disturbance of Historic Landfill • Passes through Designated Natural Heritage and Restoration Area
Social and Cultural Overall Rating	• Located Within Existing Built-Up Area • Potential for Performing Work in Conjunction with Expansion of York Road to Minimize Disruption to Local Residents and Businesses	• Alignment Along York Road Would Cause Disruption to Local Businesses and Residents • York Road / Victoria Road reconstructed	• Work Will Impact use of Eramosa River Park • Limited Disturbance to Roads and Traffic	• Alignment along York Road would Cause Disruption to Local Businesses and Residents	• Construction Will Impact use of York Road Park • Limited Disturbance to Roads and Traffic
Technical Overall Rating	• Limited Conflict with Existing Utilities • Railroad Crossing Required at Ontario and Southland Railroads	• Potential Conflicts With Existing Utilities in Road Allowance • No Synergy with other Proposed Works (York Trunk)	• Feedermain Installation in Eramosa River Park May be Performed in Conjunction with Twinning of York Trunk Sewer • Railroad and Road Crossing Required	• Potential Conflicts with Existing Utilities in Road Allowance • No Synergy with other Proposed Works (York Trunk)	• Feedermain Installation in York Road Park May be Performed in Conjunction with Twinning of York Trunk Sewer
Economic Overall Rating	• Capital Cost: est. $3.7 Million	• Capital Cost: est. $3.1 Million	• Additional Land Acquisition May Be Required • Capital Cost: est. $2.3 Million	• Capital Cost: est. $5.4 Million	• Capital Cost: est. $4.9 Million
OVERALL PREFERENCE RATING					

LEGEND

Most Preferred

Less Preferred

Least Preferred

Table 6.10 Feedermain Evaluation Matrix – Summary

Evaluation Criteria	Section 4 – from Gordon Street to Hanlon Parkway			Section 4 – Royal City Park Alternative		Section 5 – from Hanlon Parkway to Paisley Road Booster Station		
	Alternative Alignment No. 1	Alternative Alignment No. 1B	Alternative Alignment No. 2	Alternative Alignment No. 1 and No. 2	Alternative Alignment No. 1A and 2A	Alternative Alignment No. 1	Alternative Alignment No. 1A	Alternative Alignment No. 2
Natural Environment Overall Rating	• Located within Existing Utility Corridor • Disturbance to Trees and Vegetation in Silvercreek Park • Potential Disturbance of Contaminated Soils and Groundwater	• Located Primarily in Existing Road Allowances (i.e. Disturbed Area)	• Located within Existing Utility Corridor • Disturbance to Trees and Vegetation in Silvercreek Park • Potential Disturbance of Contaminated Soils and Groundwater • Passes Through Designated Natural Heritage and Restoration Area	• Located in Parkland • Disturbance to Trees and Vegetation in Royal City Park • Removal of Butternut Tree • Potential Disturbance of Contaminated Soils and Groundwater	• Located in Parkland • Disturbance to Trees and Vegetation in Royal City Park • Potential Disturbance of Contaminated Soils and Groundwater	• Located Primarily in Existing Road Allowance (i.e. Disturbed Area)	• Located Primarily in Existing Road Allowance (i.e. Disturbed Area)	• Located Primarily in Lands Proposed to be Developed or Within Municipal Easement • Feedermain Proposed to be Installed adjacent to Municipal Drain • Passes Through Designated Natural Heritage and Restoration Area
Social and Cultural Overall Rating	• Construction will Impact use of Silvercreek Park	• Alignment on Paisley Road and Edinburgh Road would cause Disruption to Local Businesses and Residents	• Construction will Impact use of Silvercreek Park	• Construction will Impact use of Royal City Park	• Construction will Impact use of Royal City Park • Temporary removal of playground, gazebo and access road required	• Alignment within Subdivision Would Cause Disruption to Local Residents • Alignment Crosses Privately Owned Land • May Require Easement of Property Acquisition	• Principally within Road Allowance • Potential Impact on Private Properties and Traffic during Construction	• Principally Within Municipally Owned Property • Limited Impact on Private Properties
Technical Overall Rating	• Some Conflicts with Existing Services in Silvercreek Park • May be Performed in Conjunction with Twinning of York Trunk Sewer • Four Road Crossings Required	• Potential Conflicts with existing Utilities Located in Road Allowance • No Synergy with Other Works • Multiple Road Crossings and Two Railroad Crossing are Required	• Some Conflicts with Existing Services in Silvercreek Park • May be Performed in Conjunction with Twinning of York Trunk Sewer • Five Road Crossings Required	• Some Conflicts with Existing Services in Royal City Park • May be Performed in Conjunction with Twinning of York Trunk Sewer	• Some Conflicts with Existing Services in Royal City Park • May be Performed in Conjunction with Twinning of York Trunk Sewer	• Limited Conflict with Existing Utilities • Undercrossing of Hanlon Expressway and One Railroad Required • Various Crossings of Roads in Residential Subdivision	• Feedermain Installation may be Coordinated with Development of Lafarge Lands along Silvercreek Parkway South • Potential Conflicts with Future MTO Developments at Paisley Road	• Feedermain Installation may be Coordinated with Development of Lafarge Lands along Silvercreek Parkway South • Potential Synergy with Installation of Sanitary Sewer under Hanlon Expressway Associated with Development of Lafarge Lands
Economic Overall Rating	• Capital Cost: est. $3.3 Million	• Capital Cost: est. $5.9 Million	• Capital Cost: est. $2.9 Million	• Included in Section 4	• +$400,000	• Capital Cost: est. $4.3 Million	• Capital Cost: est. $4.0 Million	• Capital Cost: est. $3.8 Million
OVERALL PREFERENCE RATING								

LEGEND

Most Preferred

Less Preferred

Least Preferred

7. PREFERRED FEEDERMAIN AND TRUNK SEWER ALIGNMENTS

Based on the Natural and Physical, Social and Cultural, Technical, and Economic Environmental considerations detailed in Sections 5 and 6, a preferred alternative within each Section has been identified. Each of these preferred alignments will be combined to develop one continuous alignment for the Paisley-Clythe Feedermain and York Trunk Sanitary Sewer across the extent of the Study Area.

Figure 7.1 and Figure 7.2 present the preferred alignment routes, including watercourse crossings, road and railroad undercrossings, areas of archaeological potential, historical landfill activities, and interconnections with other sewer and watermain systems.

7.1 OVERVIEW OF THE PREFERRED TRUNK SEWER ALIGNMENT AND RATIONALE

The preferred York Trunk Sanitary Sewer alternative was to twin the existing York Trunk Sewer where the existing sewer is approaching or exceeding capacity. For the most part, this included the twinning of the existing sewer from Manhole 4378, located west of Victoria Road, in Eramosa River Park, to Manhole 278, located in Silvercreek Park, west of Edinburgh Road, however; one section of Pipe, located on Beaumont Crescent is undersized for future flows and should be replaced with an appropriately sized sewer. All of the other pipes around this one section are adequately sized.

This was selected as the preferred alternative as it:

- Mitigates surcharging and allows for reuse of the existing sewer system;
- Will allow for rehabilitation of the existing sewer components that are potentially damaged;
- Will provide for opportunity to realign the sewer to allow the expansion at the F.M. Woods Pumping Station and Reservoir; and,
- Provides the opportunity to relieve flows in the Speed Trunk Sewer by diverting flow into the upgrades York Trunk Sanitary Sewer, thus extending the life of that system.

This was selected over the other alternatives presented as they:

- Did not allow for future growth;
- Limited the ability to perform repairs or upgrades to the existing sewer due to capacity constraints;
- Did not resolve the conflict with the City's future plans to potentially expand the F.M. Woods Pumping Station and Reservoir; and,
- Did not improve access to the existing sewer system for maintenance, where access was limited (i.e.: existing Speed River undercrossing).

A detailed description of the York Trunk Sanitary Sewer is presented below:

The connection point to the existing York Trunk Sanitary Sewer is at Manhole 4378, located west of Victoria Road, in Eramosa River Park. The connection will require the provision of a new manhole, adequately sized to allow for both the existing service and a new connection to the twinned sewer. This connection should be at an approximately 45 degree angle to minimize hydraulic losses.

The new sewer pipe in this section of the alignment is preliminarily sized at 1050 mm diameter in order to achieve adequate scouring velocity while maintaining a minimum slope. Due to the size of the pipe, minimal hydraulic losses will result at manhole structures. This allows for a reduction in the standard drop across any sanitary structures to essentially be negated, where changes in alignment at a manhole are minimal, so the invert into the structure may be the same as out the outlet in order to minimize the total grade of the sewer.

In approximately this area, the Paisley-Clythe feedermain, which is detailed below, will be running parallel to the York Trunk Sewer. This will allow these two services to be installed in a common trench. MOE guidelines require a 0.5 metre vertical separation or a 2.5 metre horizontal separation be maintained between a watermain and a sanitary sewer. The City has requested that a 4.0 metre minimum separation be provided where the services are installed in a combined trench as an additional precaution in the event of a feedermain break, for the protection of the sewer pipes. As a result, in this area, the feedermain will be located south of the new sewer, which will also provide adequate distance from the existing York Trunk Sanitary Sewer and other services in the area, including the aqueduct from the Arkell Springs Wells.

This work will require an approximately 15 metre wide trench. This will result in the existing pathway through the park being demolished and will likely result in the removal of some of the trees and vegetated areas along the banks of the Eramosa River.

Following construction, these areas will be restored to their original condition or better. Pathway reinstatement requirements will be developed in conjunction with the City Parks and Recreation Department. Renaturalization and the replanting of trees will be performed as per City requirements.

During detailed design, tree protection and reinstatement requirements should be reviewed with the City and a detailed plan developed for all sections of the alignment. The possibility of providing an alternate, temporary, pathway to allow for continued use in the park should also be investigated.

Due to intensive park use during the summer, this work would ideally be performed in the late fall to early spring.

From the connection point to the existing York Trunk Sanitary Sewer, the alignment progresses eastward, with both the York Trunk Sanitary Sewer and the Paisley-Clythe Feedermain being installed in a combined trench. In order to preserve vegetated areas and to provide adequate separation from existing utilities, the Paisley-Clythe Feedermain will undercross the York Trunk Sanitary Sewer after approximately 100 metres and run on the north side of the twinned pipe to the end of Section 2, at the southern side of the F.M. Woods Pumping Station and Reservoir. At this point, the feedermain will tee northward to connect to the booster station.

At Manhole 1775, the twinned sewer will reconnect to the existing York Trunk Sanitary Sewer. As opposed to the initial tie-in to the existing York Trunk Sanitary Sewer, a new lead will be required from the existing service to the new service. This will allow for the realignment of the sewer to allow for the future expansion of the F.M. Woods Pumping Station and Reservoir. The existing York Trunk Sewer will be abandoned from Manhole 2888 to Manhole 1775 in order to accommodate this realignment.

Existing utilities draining toward the Eramosa River will require to be protected where they cross the excavation in this area, in particular, drainage pipes from the Pumping Station. Additionally, storm sewers are present in this area that drain into the river which will need to be maintained during construction.

The entire alignment, to this point, and beyond, to the crossing of the Speed River, is located within an historical landfill site. The presence of any potentially deleterious materials and impaired subsurface conditions, including both soil and groundwater, should be assessed through an environmental investigation performed during the detailed design phase. Additionally, a detailed geotechnical investigation will be required to be performed to assess in-situ soil characteristics and to determine if dewatering will be necessary. Additional details are presented in Section 7.5.

West of the F.M. Woods Pumping Station and Reservoir the alignment veers northwest alongside the east side of two baseball diamonds. Some disturbance of the playing fields may result from the works. The extent of disturbance to sports fields in the area of work should be evaluated during detailed design and reinstatement requirements developed in consultation with the City, particularly as upgrades to play equipment in that area are planned. Again, with respect to scheduling, this work would be more suited to be performed in the late fall to early spring to mitigate any impact on recreational use in the park. Additionally, the use of trench boxes to limit the extent of the excavation should be considered to mitigate the impacts on existing facilities.

Just west of the baseball diamonds, a reconnection to existing York Trunk Sanitary Sewer is required, at Manhole 1775. This is the point at which the abandonment of the existing service is terminated and the sewer returns to a twinned configuration. Connections will be as previously detailed, however, at this point; the twinned sewer should be aligned on the north side of the existing sewer in order to align the new sewer to cross the Speed River north of the Town Lattice Covered Bridge, while the existing alignment crosses the Speed River south of that point. The new Paisley-Clythe Feedermain is still located on the north side of the new twinned sewer.

Traveling northwest through York Road Park, the existing pathway will likely require to be temporarily realigned and disturbance to the two baseball fields and soccer pitches rehabilitated as determined through consultation with the City.

The crossing of the Speed River is anticipated to be staged immediately north of the Town Lattice Covered Bridge. The barrier-free access to the bridge is located in this area and alternate access may require to be temporarily provided during the works, if the access ramp is obstructed.

The crossing of the Speed River will be performed by open cut. The Speed River is a designated feature within the City's Natural Heritage System. Reinstatement of the river banks will need to be reviewed and developed in consultation with the City. Details of the River Crossing were provided in Section 6.14. The designation of the Speed River as a cool water system requires that work be performed at times of low flow and outside of the restricted period between March 15 and June 30. A section detailing the pipe sewer pipe inverts is presented in Figure 7.2. Note this is based on preliminary design and will need to be reassessed further during detailed design.

The terminal end of the river crossing is in a vacant lot located on the east side of Gordon Street between the Guelph Lawn Bowling Club and the Guelph Animal Hospital. During the construction works this parking lot will be inaccessible to the public and may additionally provide a staging area for construction works. The provision of alternate parking will need to be reviewed with the City.

From this point, the twinned York Trunk Sanitary Sewer has been sized at 1200mm diameter. This exact size required will need to be confirmed during detailed design.

The crossing of Gordon Street will be performed by open cut. This will need to performed in two stages and traffic control provided to maintain one open lane at all times. Public transit bus stops may need to be temporarily relocated. This will need to be reviewed with Guelph Transit during the detailed design stage. In addition, public access on sidewalks will need to be coordinate to maintain pedestrian and bicycle lane movements. Gordon Street and any disturbed sidewalk and pathways will need to be reinstated to original or better condition.

On the west side of Gordon Street, two possible alignments have been identified due to the presence of a Butternut tree (MNR designated species-at-risk) in this park area near the southwest corner of the 40 Wellington development. A buffer of 5 to 8 metres from the dripline will be required to be maintained from this tree during the works or, if it is removed, compensatory planting will be required. An arbourist will need to be present for work in this area to address any mitigation measures, such as root trimming, that may be required for work proximate to this tree.

One possible alignment veers southeast toward the tree-lined boulevard through the park, while the other runs westward just south of the southern property line of the 40 Wellington development. The alignment that runs along the 40 Wellington development will require that the Butternut tree be removed and compensatory planting provided.

The existing fence in this area will likely need to be removed and reinstated upon completion of the works.

In order to provide an adequate buffer zone if the Butternut tree is to remain, requires the alignment of the combined trench for the York Trunk Sanitary Sewer and the Paisley-Clythe Feedermain to pass south of the location of the tree, which will require the demolition and replacement of a wooden gazebo structure as well as a playground. In additional, the access roadway that runs east/west though the park will need to be removed and reinstated and the trees lining this boulevard will also likely require removal. The impact of this tree removal may be mitigated by these trees potentially being slated for removal for control of the Emerald Ash Borer.

The existing gazebo was constructed by private donations and personalized patio bricks were provided to acknowledge the patrons. If it is required to be removed, it would need to be salvaged and precisely reinstalled to match existing.

The preferred alignment in this section of the park will need to be determined during detailed design. The Royal City Plant Material Management Plan and the City will require to be consulted and a plan developed for relocation of existing trees in good condition, compensatory replanting, and reinstatement. All works within the parks will need to be coordinated with the City to ensure alternate facilities can be arranged where disturbance of facilities are unavoidable and to coordinate with other works projects within the parks.

The 40 Wellington Street West property is an area of known environmental impairment, resultant from past manufacturing uses at the site. Groundwater flow in the area is assumed to be southward toward the river and, as a result, it is likely that excavation in this area will be performed in conditions of impaired soil and groundwater, which may require additional construction measures be implemented, in addition any excavated materials being handled and disposed of correctly and any groundwater being treated prior to discharge. This will need to be assessed during the environmental assessment performed during the detailed design stage.

Additionally, an existing watermain is present is in this area of the park which will potentially be in conflict with the alignment of the combined sewer and feedermain trench. This watermain will require to be realigned to undercross the new services. A temporary bypass will likely require to be provided to maintain service while the relocation is underway. The exact location of the realignment will be determined during detailed design.

In this area, the York Trunk Sanitary Sewer should be aligned on the north side of the new feedermain to provide additional cover, as that side is topographically higher. An undercrossing of the York Trunk Sanitary Sewer will be required.

In addition, this area has also been identified as the site of an historical landfill and detailed investigation is required in the design stage to assess the in-situ soil and groundwater conditions in the area.

The combined trench will follow through the north end of the park to Edinburgh Road. Disturbance to a soccer pitch, parking area, and various willow trees will be required. These will be reinstated to original condition or better as defined during the consultation stage with the City.

In this area, the new sewer and feedermain will cross a municipal drain. The existing York Trunk Sanitary Sewer is exposed at this crossing, which is located south of the new crossing location. The new sewer will be Reconfiguration of this drain should be examined to enable the new crossing to not obstruct channel flow. This may be performed by decreasing the channel slope upgradient of the crossing to provide additional cover and using an elliptical pipe for the sewer in this location. In conjunction with these upgrades, the replacement of the exposed section of the existing York Trunk Sanitary Sewer should be examined to determine if it can be decreased in size to reduce its impact on the channel. In addition, renaturalization of this drainage channel should be examined and discussed with the City and GRCA.

The open-cut crossing of Edinburgh Road will require to be performed in stages to allow for continued vehicle access and to maintain one open lane at all times. Public transit bus stops may need to be temporarily relocated. This will need to be reviewed with Guelph Transit during the detailed design stage. In addition, public access on sidewalks will need to be coordinate to maintain pedestrian and bicycle lane movements. Edinburgh Road and any disturbed sidewalk and pathways will need to be reinstated to original or better condition.

Just west of Edinburgh Road, the twinned York Trunk Sanitary Sewer has the opportunity to connect to the siphon of the Speed River Trunk Sewer that currently passes underneath the existing York Trunk Sanitary Sewer. This connection will serve to relieve excess flow from that trunk sewer system. The twinned York Trunk Sanitary Sewer should be sized to accommodate this excess flow. Preliminary design has sized this sewer at 1200 mm diameter; however, this will need to be confirmed during detailed design.

West of the connection to the Speed River Trunk Sewer, the combined trench alignment passes through a parking area and beach volleyball courts before the twinned sewer rejoins the existing York Trunk Sanitary Sewer at Manhole 298. Scheduling this work around peak times of use of the park facilities would be preferred, which would require the work to be performed from late fall to early spring. Reinstatement of the park will be as per the plan developed with the City.

West of the termination point of the new twinned sewer, the existing York Trunk Sanitary Sewer is exposed as it crosses the Silver Creek drainage outlet. As with the previous drainage outlet crossing, consideration should be given to regrading the existing channel to improve cover as well as replacing

that section of the sewer with an elliptical pipe to reduce the diameter of the pipe. In tandem, this may allow the pipe to be below the channel base depth to remove the existing sewer as an obstruction to flow in the channel. Additionally, this area should be reviewed for renaturalization potential with the City and the GRCA.

7.2 OVERVIEW OF THE PREFERRED FEEDERMAIN ALIGNMENT AND RATIONALE

The preferred Paisley-Clythe Feedermain alignments selected for each Section of the Study Area are as follows:

Section 1 – Clythe Reservoir and Booster Station to Industrial Road – Alternative Alignment No. 1

The alignment is generally located within the existing York Road corridor from Watson Road to Industrial Avenue, which includes York Road, and various utilities, including the York Trunk Sewer.

This was selected as the preferred alternative as it:

- Is located within an existing road allowance;
- May be completed in conjunction with the future expansion of York Road to four lanes; and,
- Has limited conflict with existing utilities.

Section 2 – Industrial Road to F.M. Woods Pumping Station and Reservoir – Alternative Alignment No. 2

This alignment extends south at Industrial Avenue through the municipal right-of-way to the CN Rail spur before turning west through the municipal right-of-way between the PDI plant and the commercial development to the north. It crosses Victoria Road South and enters Eramosa River Park where it is aligned with the York Trunk Sanitary Sewer to the F.M. Woods Pumping Station and Reservoir.

This was selected as the preferred alternative as:

- It is located within an existing utility corridor and publicly owned land;
- There is limited disturbance to roads and traffic;
- Disturbance of trees and vegetation in Eramosa River Park can be mitigated by naturalization and replanting following construction;
- It has limited conflict with existing utilities; and,
- It can share a construction corridor with the York Trunk Sanitary Sewer.

This was selected over the other alternatives presented as they:

- Significantly impacted traffic and private property due to limited space available within the existing road allowance;
- Presented potential conflict with existing utilities, railways, etc; and,
- Had a higher capital cost.

Section 3 – Waterworks Place to Gordon Street – Alternative Alignment No. 2

This alignment extends from Waterworks place, alongside the York Trunk Sanitary Sewer, though York Road Park. At the Speed River, an open cut undercrossing is proposed, with this section of the alignment terminating in a municipally owner parking area on the east side of Gordon Street, immediately north of the Guelph Lawn Bowling Club.

This was selected as the preferred alternative as:

- It is located within an existing utility corridor and publicly owned land;
- There is limited disturbance to roads and traffic;

- Disturbance of trees and vegetation in York Road Park can be mitigated by naturalization and replanting; and,
- It can share a construction corridor with the York Trunk Sanitary Sewer.

This was selected over the other alternatives presented as they:

- Significantly impacted traffic and private property due to construction;
- Presented potential conflict with existing utilities; and,
- Had a higher capital cost.

Section 4 – Gordon Street to Silvercreek Parkway South – Alternative Alignment No. 2

Alignment 2 is aligned through Silvercreek Park to Wellington Street West where it continues along the south side of Wellington Street West through Silvercreek Park to the Hanlon Expressway.

This was selected as the preferred alternative as:

- It is located within an existing utility corridor and publicly owned land;
- There is limited disturbance to roads and traffic;
- Disturbance of trees and vegetation in Silvercreek Park can be mitigated by naturalization and replanting; and,
- It can share a construction corridor with the York Trunk Sanitary Sewer.

This was selected over the other alternatives presented as they:

- Significantly impacted traffic and private property due to construction;
- Presented potential conflict with existing utilities;
- Required multiple road and railroad crossings; and,
- Had a higher capital cost

Section 5 – Silvercreek Parkway South to the Paisley Road Pumping Station – Alternative Alignment No. 2

Alignment 2 continues from Section 4 north along Silvercreek Parkway South, through a tract of municipally owned land and up the west side of the Lafarge lands, crossing the Hanlon Expressway approximately halfway between Wellington Street West and Paisley Road, and continuing along an existing municipal drain to Paisley Road where it travels west to the Paisley Pumping Station and Reservoir.

This was selected as the preferred alternative as:

- It is generally located within municipally owned property;
- There is limited impact to private properties; and,
- There is synergy with the development of the Lafarge Lands.

This was selected over the other alternatives presented as they:

- Would result in significant disruption to residents;
- Would require land acquisition or an easement;
- Presented potential conflict with future MTO development of the Hanlon Expressway; and,
- Had a higher capital cost.

The preferred alignments for the York Trunk Sanitary Sewer and the Paisley-Clythe Feedermain allow these two services to be installed in a combined trench. Over the length of the twinning of the York Trunk Sanitary Sewer, they share the same alignment, as was discussed above in Section 7.1

This section will detail the remained of the preferred alignment for the Paisley-Clythe Feedermain, from the Clythe Reservoir and Booster Station to Victoria Road, and from the York Trunk Sanitary Sewer terminus in Silvercreek Park to the Paisley Reservoir and Booster Station.

The connection to the Clythe Pumping Station and Reservoir should be made to the low-pressure side of the reservoir. The exact location and configuration of this connection will need to be determined during the detailed design stage.

From the pumping station, the alignment heads east to Watson Road North, then south, along the west side of the street, to the intersection of Watson Road and York Road. This will be performed by open cut and will require lane closures and traffic control measures to be implemented, as well as the provision of alternate routes for pedestrian traffic, and coordination with Guelph Transit, where the works may impact their services.

In this section, an undercrossing of the CN railroad is required. This is expected to be performed by horizontal directional drilling with the staging and receiving pits located within the road allowance.

The alignment turns west, along the north side of York Road, within the road allowance. Efforts should be made to coordinate the construction of the feedermain along York Road with the proposed expansion of the roadway from two to four lanes. This would reduce impacts to local business and residents, and diminish impacts to traffic and transit in the area. Temporary access to affected properties will be required to maintain access, or the work scheduled around times of use, if this is not possible.

Other services within this area include watermains, the existing York Trunk Sanitary Sewer, as well as utilities such as phone, gas, and cable. Temporary disruptions to these services may be required. The exact location of the feedermain within this corridor will be determined in detailed design, however, adequate separation from existing services must be provided. The York Trunk Sanitary Sewer is located on the south side of York Street at Watson Parkway North, however, it crosses to the north side of York Road, approximately 200 metres east of that point. In order to accommodate the new feedermain, it is expected that the feedermain alignment will cross to the south side of York Road, undercrossing the existing York Trunk Sanitary Sewer. Adequate vertical separation will be required and the provision of an impermeable barrier, such as grout, extending a minimum of 1.5 metres beyond the crossing, should be considered.

At Industrial Avenue, the alignment turns south through an existing utility easement that contains the existing York Trunk Sanitary Sewer. Wetlands are present on the east side of this property and mitigation measures will be required to ensure that no impacts on this area result from the works.

After approximately 100 metres, the alignment undercrosses a CN railroad spur. The area of the existing easement is limited at this location and additional land purchase or the expansion of the existing permanent easement will be required to accommodate the new service. Additionally, the undercrossing of the rail line would be performed by horizontal directional drilling and temporary easements may be required to accommodate the staging and receiving pits.

As the alignment heads east, between a plaza and the PDI plant, the existing easement will also likely require to be expanded to provide room for the new feedermain. As indicated, the existing York Trunk Sanitary Sewer is located within this corridor, however, watermains are also present. At least one of these is known to be abandoned, which may provide the space required for the new service, however, this would need to be determined during detailed design.

If this easement were to be expanded, it would need to be extended to the north, toward the plaza as a subsurface clay barrier has been constructed at the PDI facility to contain groundwater, which will need to be avoided when laying out the new feedermain location.

The crossing of Victoria Road South would be performed by open cut. This will need to be performed in stages to allow for continued traffic movement and traffic control measures will need to be implemented. Provisions for pedestrian and cycle traffic will also be required, and impacts to transit assessed with Guelph Transit. Existing utilities, including watermains, and sanitary and storm sewers,

will need to be protected during the works. It is expected that the feedermain can undercross these services and that relocation of the existing services will not be required.

Past Victoria Road South, a small section of Florence Lane will be required to be excavated and reinstated prior to the feedermain turning south, behind a row of houses, and into Eramosa River Park.

There are significant existing utilities in this area, including the aqueduct from the Arkell Springs Wells, which will need to be protected during the work. Details of the crossing of this pipe will need to be determined during detailed design.

From this point through to Silvercreek Park, the alignment of the feedermain and the York Trunk Sanitary Sewer are identical. Details of their combined alignment were presented above, in Section 7.1.

From the terminal end of the York Trunk Sanitary Sewer, the Paisley-Clythe Feedermain continues through Silvercreek Park to just east of the Hanlon Expressway. This section of the alignment included an undercrossing of the Silver Creek outlet to the Speed River. As detailed in Section 7.1, this area should be assessed for renaturalization potential. This is a short undercrossing which is expected to be performed by open cut with a temporary bypass of the drainage channel provided. Horizontal directional drilling would, however, also be a reasonable alternative which would mitigate any potential impacts to the channel. This will need to be assessed in detailed design and in coordination with the GRCA.

East of the Hanlon Expressway a crossing of Wellington Street West is required, where the feedermain alignment turns north toward Silvercreek Parkway South.

The open-cut crossing of Wellington Street West is proximate to a major interchange on the Hanlon Expressway. Traffic control measures will need to be implemented and construction staged to ensure that traffic flow is maintained. Public transit bus stops may need to be temporarily relocated. This will need to be reviewed with Guelph Transit during the detailed design stage. In addition, public access on sidewalks will need to be coordinated to maintain pedestrian access. Wellington Street West and any disturbed sidewalk and pathways will need to be reinstated to original or better condition.

From the north side of Wellington Street West, the alignment turns northwest, crossing an area identified as having been the site of historical landfilling, to the south end of Silvercreek Parkway South. A crossing of the access road to Waterloo Street will be required, in addition to an undercrossing of the Speed River Trunk Sewer.

The road crossing should be performed as previously detailed, with traffic control measures implemented and the construction phased to ensure traffic flow is maintained.

The undercrossing of the Speed River Trunk must ensure that the existing pipe is protected and supported. Adequate vertical separation will be required. The addition of an impermeable barrier (non-shrink fill, etc) between the two services, and extending at least 1.5 metres beyond the crossing point should be considered during detailed design.

The open-cut installation of the new feedermain on Silvercreek Parkway South will require lane closures as the construction progresses northward. The feedermain is tentatively located on the west side of the road, however, adequate separation from, and protection of, existing utilities will be required in this area as there are existing storm and sanitary sewers, and a watermain within this right of way, which will need to be considered to determine the optimal location for the feedermain. Temporary by-passes or relocation of existing services may be required and will need to be identified during the detailed design stage. The road should be reinstated to existing condition or better. Potential synergies with the future development of the Lafarge Lands and upgrades to Silvercreek Parkway South should be reviewed with the City with respect to reinstatement requirement or alterations to the existing roadway layout.

Approximately 100 m up Silvercreek Parkway South, an undercrossing of a CN rail line is required. This would be performed by horizontal directional drilling, with staging and receiving pits located within the roadway.

North of the railroad undercrossing, the feedermain alignment turns west through a vacant, municipally owned, property. No significant concerns have been identified as being present in this area.

At the Hanlon Expressway, the alignment turns north, running parallel though municipal land along the west property line of the Lafarge Lands development. A future sanitary sewer for the Lafarge Lands is proposed to undercross the Hanlon Expressway. The proposed location for the feedermain undercrossing is within this same area. Depending on scheduling, the installation of this sewer and the new feedermain may be performed concurrently. Separate crossings would be required, however, staging and receiving areas may be shared, which may be a consideration as a temporary easement may be required to accommodate the staging area on the east side of the Hanlon Expressway in order to provide the required setback from the MTO corridor. Typically, the MTO required that the casing of a service undercrossing their roads extend 16 metres beyond their property line. In order to achieve this, the staging area may need to be located on the Lafarge Lands. Setback requirements will need to be reviewed with the MTO during detailed design.

West of the Hanlon Expressway, the feedermain alignment turns north and follows on the west bank of a municipal drain. This drain is a regulated waterway and a permit from the GRCA will likely be required for work within this area. Sedimentation controls, such as silt fencing and potentially check dams will be required to protect the watercourse, though no in-water work is expected to be required.

Reinstatement requirements should be reviewed with the City during detailed design. Upgrades to Castlebury Park are being developed and the reinstatement of this area may include the provision of a pathway or access road overtop of the excavation.

At Paisley Road, the alignment turns west, along the south side of Paisley Road, through the municipal right of way. Two crossings of residential roads are required. Traffic controls, staging, and reinstatement requirements will be as previously described. Impacts on public transit should be reviewed with Guelph Transit in order to provide alternate services, if required, including the relocation of bus stops.

The feedermain continues along Paisley Road for approximately 250 metres before turning south to connect to the west side of the Paisley Pumping Station and Reservoir. The connection should be made to the low-pressure side of the system. The exact location and configuration of this connection will be required to be determined during detailed design.

The area around the pumping station is parkland. Tennis courts, basketball courts, a soccer pitch, and a play area are present. As such, consideration should be made to scheduling of the work in this area outside of times of peak use, such as the summer months, particularly as this is located within a residential subdivision and use of the area by neighbourhood children is likely high during this period. In addition, particular consideration should be given to hoarding off the construction zone and the provision of alternate pedestrian routes.

7.3 PERMANENT AND TEMPORARY EASEMENT REQUIREMENTS

Where alignments are proposed outside of the existing right-of-ways or easements, a new permanent easement from the landowner or public agency that administers the land will be required. A permanent easement is registered against the property title and restricts development within the area.

Where work may be required on neighbouring properties during construction (staging, horizontal direction drilling staging and receiving pits, etc) a temporary easement will be required to be arranged with the property owner.

Based on the preferred alignments for the York Trunk Sanitary Sewer and Paisley-Clythe Feedermain, the following permanent easements are anticipated to be required;

- → The existing utility easement located north of the PDI plant will require to be expanded to accommodate the new feedermain service.

A temporary easement may be required to perform the horizontal directional drilling undercrossing of the Hanlon Expressway, depending on the setback that the MTO requires. Typically, a 16 metre

setback beyond the limit of their right-of-way is required, which would require that the staging pit for the undercrossing of the Hanlon Expressway by the feedermain would be located on or near the Lafarge lands.

7.4 LAND ACQUISITION REQUIREMENTS

The existing utility easement south of York Road where the utilities turn west, at the Guelph Junction Railway, likely does not have enough space available to install the new feedermain service without being expanded. This may require the purchase of land or the securing of a permanent easement in this area which is currently administered by Infrastructure Ontario or by PDI, depending on the final layout design in that area. This will need to be reviewed with Infrastructure Ontario early in the preliminary design stage.

7.5 STAGING AREAS

It is expected that staging and storage areas will be required for the installation of the feedermain and trunk sanitary sewer. For the most part, these can likely be located within the park areas or within other municipally-owned properties, such as the vacant lot on the east side of Gordon Street or at the booster station sites. Given the location of the works, it may not be feasible to locate the storage areas outside of the GRCA floodplain.

The location of potential staging areas will be confirmed during the detailed design phase.

7.6 HYDROGEOLOGICAL AND GEOTECHNICAL CONSIDERATIONS

As part of Phase 1 of this Study, a desktop Hydrogeological assessment (refer to Section 4.7) was completed by GENIVAR to assist in the identification and evaluation of potential alignment alternatives.

Additional investigation will require to be undertaken at the detailed design stage to verify these preliminary design assumptions with regard to subsurface soil conditions and groundwater impacts as they relate to this project.

7.6.1 Hydrogeological Considerations

7.6.1.1 Potential Impacts to Groundwater and Surface Water

Open cut construction is the recommended construction method for the installation of both the twinned sewer and the feedermain. The desktop study indicated that groundwater levels are expected to be between 1.5 metres and 4 metres below grade. As such, dewatering will likely be required in some areas. In addition, with respect to the open cut crossing of the Speed River, the upper portion of the bedrock in that area is anticipated to be fractured and hydraulically connected to the river, which will require dewatering of the excavation. This may be mitigated somewhat through engineered barriers, such as shoring.

The detailed geotechnical investigation will determine where dewatering will be required. Should it be found that water-taking is required extensively; an alternate construction method may be desired to be examined.

Due to historical landfilling in the area of work, some environmental impairment of the groundwater may be present. An assessment of the environmental condition of the subsurface soil and groundwater conditions should be performed, either separately, or in conjunction with the geotechnical investigation, in order to determine if additional measures, such as treatment of dewatered groundwater prior to discharge is required, if additional health and safety practices will be required to be implemented during the works.

7.6.1.2 Potential Impacts to Private and Municipal Wells

There are not expected to be any private wells in the area of work as the area is municipally serviced and has been for some time. Significant water-takers in the area, particularly the Cutten Fields Golf Course, take their water from the river and should not be impacted adversely if dewatering is required.

Some reductions in groundwater baseflow are possible, with dewatering, however; no impacts are anticipated to any of the municipal wells in the area.

7.6.2 Geotechnical and Environmental Considerations

As part of the detailed geotechnical assessment in detailed design, boreholes should be advanced along the length of the alignment to a depth of at least 1 metre below the bottom grade of the service to assess the in-situ condition of the soil across the area of work.

7.6.2.1 Open Cut Construction

With the exception of the railroad undercrossings and the undercrossing of the Hanlon Expressway, which would likely be performed by horizontal directional drilling, the two new services are expected to be installed by open cut.

The soils in the Study Area have been identified as being sands and gravels associated with outwash deposits or recent alluvial activity. This should not present any significant technical concerns with respect to construction.

Soil types are expected to vary across the area of work, however, due to the presence of areas of historic landfilling activities. Deleterious materials may also be present in these areas. The extent and composition of the soils will require to be performed during the detailed design investigations.

The open cutting of the Speed River will likely require rock removal, as it will likely occur within the top, fractured, zone of the bedrock in that area. As indicated previously, dewatering will likely be required.

7.6.2.2 Trenchless Construction

As previously indicated, railroad undercrossings and the undercrossing of the Hanlon Expressway will be performed by horizontal directional drilling. The geotechnical investigation will confirm the soil conditions in these areas, however, if large rocks or other obstacles are found to be present, the installation methodology may require to be revised.

Steel carrier pipes are typically required. These are sensitive to being forces out of alignment during the drilling process by subsurface obstacles. Should the pipe deflect, it runs the risk of not being able to be pulled through the bore. If this is identified as a risk, alternate installation methods, such as jack and bore, should be assessed, as well as the use of an alternate carrier pipe material, such as HDPE, which is sometimes suitable for use in this application, depending on the site conditions.

7.6.2.3 Historical Landfills and Potentially Impaired Soil and Groundwater

As discussed in the previous sections, historical landfilling operations took place within the area of work, principally within the parkland on the north side of the Speed and Eramosa Rivers.

The City provided a report entitled *"Preliminary Investigations Report of Abandoned Landfill Sites in Guelph"*, the findings of which were presented in Section 4.3.2 of this Study.

An environmental investigation of the in-site soil and groundwater conditions should be performed to assess the subsurface condition of the area of work with respect to the presence of deleterious material and their impact on construction, particularly with respect to disposal requirements for excavated materials and construction safety precautions, in addition to treatment requirements of dewatered groundwater prior to discharge.

7.7 NATURAL ENVIRONMENTAL CONSIDERATIONS

The installation of the York Trunk Sanitary Sewer and the Paisley-Clythe Feedermain will have possible impacts to the natural environment, particularly plant and animal habitats.

The mature Butternut tree located in Royal City Park requires a 5 metre to 8 metre buffer beyond the dripline of the tree. Protection measures, such as fencing and root pruning may be required. Working distance from the tree and the extent of any encroachment within the required setback will need to be assessed during detailed design. Alternatively, the tree may be removed and compensatory planting

provided. Separate alternative alignments were identified depending on which alternative is determined to be the most feasible during detailed design.

Additionally, other species-at-risk that may be present within the area of work will need to be assessed through investigation of the work area and mitigation plans developed. This will also include areas identified within the City's Natural Heritage System, such as overwintering areas used by waterfowl. MNR consultation will be required to identify timing constraints and windows of time where construction may be, or may not be allowed, proximate to these species.

Detailed inventories of plants and trees will be required to be performed and compensatory planting plans developed during the detailed design phase. Any opportunities to transplant and affected trees in good condition should be explored. Ultimately, however, the avoidance of trees should be considered during detailed design. The Royal City Plant Material Management Plan will require to be consulted in the development of the detailed design plan.

Animal crossing zones within the area of work should be protected and alternate facilities provided, where possible.

7.8 TRANSPORTATION CONSIDERATIONS

7.8.1 Traffic Considerations

The installation of the Paisley-Clythe Feedermain will impact transportation on York Road and, for a short distance, on Watson Road South. This may, to a certain extent be mitigated if the work is performed in tandem with the proposed expansion of York Road from two lanes to four lanes. The open cut construction on York Road and the horizontal directional drilling undercrossing of the railroad tracks on Watson Road South will cause temporary traffic disruption which will result in lane closures, traffic marshalling, and, potentially, detours.

One other significant roadway impact, due to open cut construction, would be on Silvercreek Parkway South, however, this is not currently a thoroughfare, and so public use is limited. Constructing this section of the feedermain in conjunction with future redevelopment of Silvercreek Parkway South and the Lafarge lands would mitigate repeated traffic disruption in the area.

Major road crossings are required at:

- Victoria Road South;
- Gordon Street;
- Edinburgh Road; and,
- Wellington Street West.

Other impacts, directly related to construction activities, will be construction vehicle access to the area of work, particularly in the parkland areas, which would be accessed off of major roads (Victoria Road, York Road, Wellington Street West, and Gordon Street).

Traffic management plans will be required to be developed in the detailed design phase to determine how construction within roadways will be phased and performed to minimize impact associated with lane closures, and construction traffic.

7.8.2 Property Access Considerations

Construction staging and traffic management plans should ensure that vehicular access to businesses and institutions is maintained at all times.

Based on the preferred alignment, this will have the greatest impact on York Road. If access to properties cannot be maintained, alternate access points should be provided, or the work scheduled around times of use.

7.8.3 Transit Considerations

With the exception of the work on York Road, to install the Paisley-Clythe feedermain, impacts to public transit should be generally limited. Lane closures for road crossings may cause delays to public transit which should be reviewed with Guelph Transit during the detailed design stage and incorporated into the traffic management plan. Discussion should also include the temporary relocation of bus stops, as required.

7.8.4 Pedestrians and Cyclists

Pedestrian and cyclist routes should be maintained while construction is underway. This will be a significant consideration in the parks and at road crossings.

Construction at roadways should be phased so that a sidewalk is always available and access and signage provided to promote their use. Hoarding and construction fences should be installed both for public safety and to provide temporary access around areas of work to maintain existing routes.

Existing pedestrian pathways and routes should be reviewed with the City during detailed design to assess the possibility of incorporating upgrades to trails, road crossings, etc, into the reinstatement plan for the proposed works.

7.8.5 Park Facilities

Efforts should be made to limit the impact on facilities located within the parks. Work impacting sports fields will be limited from October 1st to early May and site restoration will require to be performed as quickly as possible to ensure that the facilities can be used as early as they can be made available. Coordination with Community and Social Services and City Operations will be necessary during both detailed design and during construction to ensure that alternate sports field locations can be arranged and to minimize any conflicts with necessary park use, as well as to consult on the final alignment location and restoration plans to coordinate with existing and future works.

In addition, these authorities will need to be consulted annually during the period of construction for coordination of services and during construction for approval of restoration works.

In order to maintain facilities during construction, where possible, a minimum five (5) metre separation distance should be maintained from construction hoarding/fencing to sports field run-out zones. Adequate parking will also need to be maintained. This should be coordinated with the City during both detailed design phasing development and during construction.

Where park facilities are disturbed, any replacement or reinstatement of existing should be provided such that all current health and safety and materials standards are provided.

7.9 CONSTRUCTION COSTS

The base capital cost estimate for the construction of the York Trunk Sanitary Sewer is estimated at $15.6 million. This includes an additional $2.6 million contingency for dewatering, possible treatment of dewatered groundwater prior to discharge, and for disposal of potentially impaired soil.

The total capital cost for the Paisley-Clythe Feedermain is $14.9 million, including the same contingency. Performed separately, the $2.6 million contingency would also be applied to this, making the total cost for both projects, performed independently, $30.5 million.

Performed together, cost reduction due to the ability to perform the Speed River crossing, savings in mobilization fees, and a reduction in the contingency related to dewatering and soil disposal requirements, could reduce the total cost for both projects to approximately $27.9 million.

These cost estimates include estimates for engineering design and an additional contingency to address unforeseen issues during construction totalling 20%.

7.10 IMPLEMENTATION AND SCHEDULING

Construction is anticipated to commence in fall, 2012. It is expected that construction will proceed in phases, determined by both seasonal limitation on work (cool-water spawning season, peak-use periods of park use, etc) in additional to the possibility of performing the work in tandem with other infrastructure upgrades, as detailed below.

7.10.1 Coordination with the Future Infrastructure Construction

Optimally, the work should be performed in conjunction with other upgrades to minimize overall construction impacts. These other projects include:

- The expansion of York Road from two lanes to four lanes;
- The upgrades to Silvercreek Parkway South;
- The development of the Lafarge Lands; and
- Upgrades to Castlebury Park.

7.10.2 Implementation Plan

Due to the extent of the construction, windows of construction, and yearly budgets available, the project will likely be required to be phased over several contracts. In addition, consideration must be given to available capacity within the sewer system with respect to existing and future flows and priority given to areas of work which may need upgrades sooner than others to ensure adequate servicing is available. Based on this, a preliminary phasing schedule is presented below:

Contract No. 1 – West End of the York Trunk to Speed River Crossing - 1.6 km

- → This would include the installation of the feedermain through Silvercreek and Royal City Park, and undercrossing Gordon Street to terminate in the municipally owned parking lot. Temporary connections to existing watermains will be provided at each terminal end of the new feedermain.
- → The twinned trunk sewer would follow the same alignment as above, connecting into the existing system at manhole 298. A bulkhead would be provided at the upstream terminal end. The connection to the Speed River Trunk Sewer siphon would be performed at this time.
- → Estimated Construction Period assuming – 1 month ramp up and down – 5 months of active construction – July/August start – March/April Completion.
- → Estimated construction cost - $ 9.2 million.

Contract No. 2 – River Crossing and East – 2.1 km

- → This would include the river crossing for both services, the connection to the eastern extent of the work performed in Contract No. 1, and the extension of both services eastward, terminating just west of Victoria Road South, at the connection to the existing York Trunk Sanitary Sewer.
- → The Paisley-Clythe Feedermain would be connected at the F.M. Woods Pumping Station. The temporary connection at the east end of Contract No. 1 will be removed. A new temporary connection will be provided at the eastern end of the new feedermain.
- → The existing York Trunk Sanitary Sewer will be abandoned south of the F.M. Woods Pumping Station where the twinned sewer has made the existing service redundant to allow for future expansion of the Pumping Station.
- → Estimated Construction Period assuming – 1 month ramp up and down – 3 months in river – 5 months construction – August/September Start (River) – Parks closed in October – April/May Completion

- Estimated Construction Cost - $9.9 million.

Contract No. 3 – Paisley Termination – 2.6 km

- This work would include the extension of the feedermain from the temporary connection at the western terminus in Silvercreek Park to the Paisley Pumping Station and Reservoir. The temporary connection from Contract No. 1 would no longer be required.
- Estimated Construction Period – 1 month ramp up and down – 4 months of active construction – work may be performed at any time of the year.
- Estimated Construction Cost – $4.7 million

Contract No. 4 – Clythe Termination – 2.6 km

- This work would include the extension of the feedermain from just west of Victoria Road South to the Clythe Pumping Station and Reservoir. The temporary connection from Contract No. 3 would no longer be required.
- Consideration should be given to coordinating the timing of this work with the future expansion of York Road from two to four lanes.
- Estimated Construction Period – 1 month ramp up and down – 4 months of active construction – work may be performed at any time of the year.
- Estimated Construction Cost - $4.1 million.

NORTH

PAISLEY PUMPING STATION AND RESERVOIR

PREFERRED NEW FEEDERMAIN ALIGNMENT

APPROXIMATELY 10m WIDE CONSTRUCTION ENVELOPE

CONNECTION TO EXISTING YORK TRUNK SANITARY SEWER

CONNECTION TO SPEED RIVER TRUNK SEWER

APPROXIMATELY 15m WIDE CONSTRUCTION ENVELOPE

PREFERRED NEW FEEDERMAIN ALIGNMENT

PREFERRED NEW SANITARY ALIGNMENT

WATERMAIN REALIGNMENT

EXISTING YORK TRUNK SEWER

RIVER CROSSING

EXISTING YORK TRUNK SANITARY SEWER TO BE ABANDON

CONNECTION TO EXISTING YORK TRUNK SANITARY SEWER

MATCHLINE

SECTION No. 5 | SECTION No. 4 | SECTION No. 4 | SECTION No. 3

LEGEND

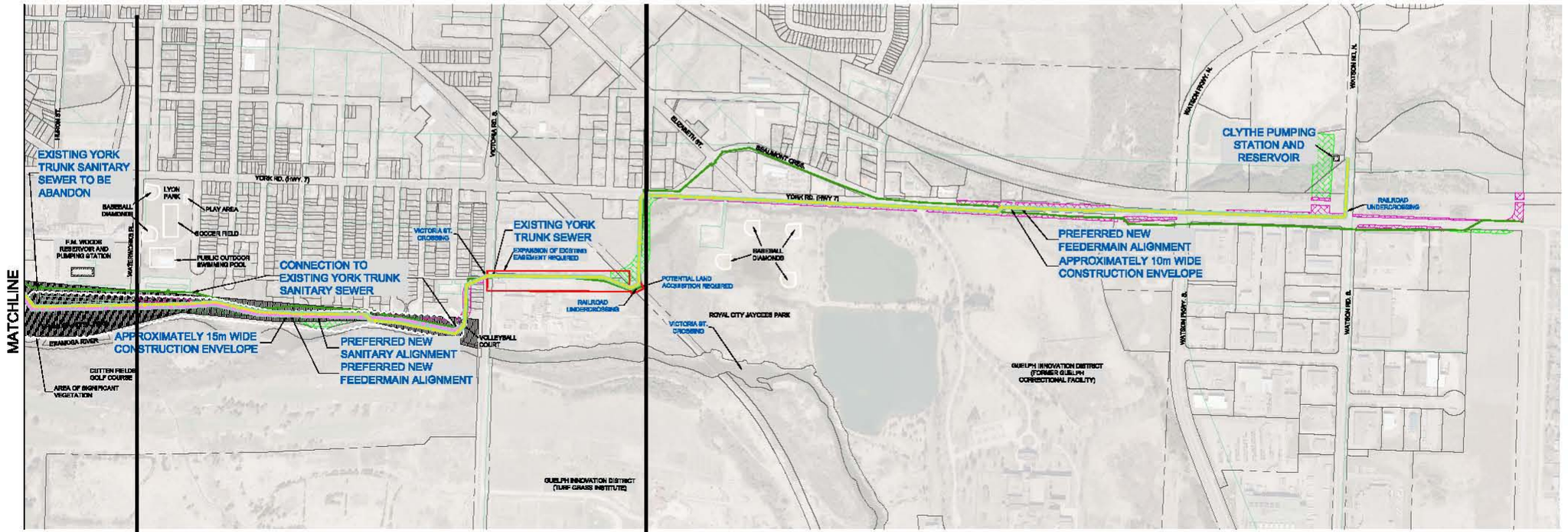
- HIGH ARCHEOLOGICAL POTENTIAL: NOT PREVIOUSLY DISTURBED
- UNCERTAIN ARCHEOLOGICAL POTENTIAL: LAND MAY HAVE BEEN AFFECTED BY ADJACENT DEVELOPMENT, REQUIRED STAGE 2 ASSESSMENT PRIOR TO CONSTRUCTION
- EXISTING TRUNK SEWER
- FEEDERMAIN ALTERNATIVE ALIGNMENT NO. 2
- FEEDERMAIN ALTERNATIVE ALIGNMENT NO. 2A
- TRUNK SEWER ALTERNATIVE ALIGNMENT NO. 1
- TRUNK SEWER ALTERNATIVE ALIGNMENT NO. 1A

CITY OF Guelph Making a Difference

YORK TRUNK SEWER AND PAISLEY-CLYTHE FEEDERMAIN PREFERRED ALIGNMENTS FIGURE 7.1

SCALE: 1:5000

GENIVAR



LEGEND

- HIGH ARCHEOLOGICAL POTENTIAL: NOT PREVIOUSLY DISTURBED
- UNCERTAIN ARCHEOLOGICAL POTENTIAL: LAND MAY HAVE BEEN AFFECTED BY ADJACENT DEVELOPMENT, REQUIRED STAGE 2 ASSESSMENT PRIOR TO CONSTRUCTION
- EXISTING TRUNK SEWER
- FEEDERMAIN ALTERNATIVE ALIGNMENT NO. 2
- FEEDERMAIN ALTERNATIVE ALIGNMENT NO. 2A
- TRUNK SEWER ALTERNATIVE ALIGNMENT NO. 1
- TRUNK SEWER ALTERNATIVE ALIGNMENT NO. 1A

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YORK TRUNK SEWER AND PAISLEY-CLYTHE FEEDERMAIN PREFERRED ALIGNMENTS
FIGURE 7.1 - SHEET 2

SCALE: 1:5000

GENIVAR

NORTH

APPROXIMATELY 15m WIDE CONSTRUCTION ENVELOPE

WATERMAIN REALIGNMENT

40 WELLINGTON ST. W.

BASEBALL DIAMOND

GORDON ST. CROSSING

SPEED RIVER

RIVER CROSSING

MATURE TREES AND PARKLAND

BUTTERNUT TREE

GAZEBO

PLAY AREA

GUELPH LAWN BOWLING CLUB

BASEBALL DIAMOND

EXISTING YORK TRUNK SEWER

HISTORIC LANDFILL AREA

TOWN LATTICE COVERED BRIDGE

EXISTING YORK TRUNK SEWER

LIMIT OF REGULATED FLOOD PLAIN

GORDON ST.

PREFERRED NEW SANITARY ALIGNMENT

PREFERRED NEW FEEDERMAIN ALIGNMENT

LEGEND

- HIGH ARCHAEOLOGICAL POTENTIAL: NOT PREVIOUSLY DISTURBED
- UNCERTAIN ARCHAEOLOGICAL POTENTIAL: LAND MAY HAVE BEEN AFFECTED BY ADJACENT DEVELOPMENT, REQUIRES STAGE 2 ASSESSMENT PRIOR TO CONSTRUCTION
- EXISTING SANITARY TRUNK SEWER
- FEEDERMAIN ALTERNATIVE ALIGNMENT NO. 2
- FEEDERMAIN ALTERNATIVE ALIGNMENT NO. 2A
- TRUNK SEWER ALTERNATIVE ALIGNMENT NO. 1
- TRUNK SEWER ALTERNATIVE ALIGNMENT NO. 1A

CITY OF Guelph
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YORK TRUNK SEWER AND PAISLEY-CLYTHE FEEDERMAIN PREFERRED ALIGNMENTS RIVER CROSSING FIGURE 7.2

SCALE: 1:1000

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8. MITIGATION MEASURES

To construct the various components of the twinned York Trunk Sanitary Sewer and the Paisley-Clythe Feedermain, some environmental impacts will be unavoidable. In such situations, measures must be taken to either minimize or offset these effects. Actions taken to reduce the effects of a certain project on the environment are called “mitigating measures”.

It is a key objective to avoid, prevent or minimize any adverse environmental impacts. The Class EA process requires development of mitigating measures after identification of the magnitude of the net negative impacts of the preferred alternative solution. These measures are to allow the project to be undertaken at a reasonable cost, while at the same time protecting the environment against net negative impacts. General mitigating measures for potential adverse environmental effects specific to this project are described below.

Construction of the trunk sanitary sewer will have the potential for environmental impacts, and where these can be anticipated in the design stage, special provisions should be written into the construction package. The provisions will dictate the construction methods that are permitted and more importantly the construction methods that are not allowed during specific operations. Unforeseen problems that arise during construction will be addressed on the site, and the proponent’s best judgment used will ensure that changes to the contract do not cause negative environmental impacts.

Staff responsible for inspecting the contractor’s work must be made aware of such provisions in order to ensure compliance during construction. It will be the responsibility of the proponent to ensure that inspectors enforce compliance with the environmental provisions, as well as the traditional engineering provisions of the construction package.

The York Trunk Sanitary Sewer is to be constructed within most of its existing alignment corridor, which will have minimal environmental impacts. Careful planning is to be conducted during the detailed design and construction phases for both the sanitary sewer and feedermain to ensure the following mitigation measures are practiced.

8.1 NATURAL ENVIRONMENT MITIGATION MEASURES

8.1.1 Proximity to Natural Heritage Features and Vegetation

8.1.1.1 Vegetation

A key mitigation measure to be implemented in the park areas is to use natural heritage area buffers as setbacks. Impacts to vegetation will, for the most part, be limited to trees located within the park and along the existing roadways adjacent to the sewer and feedermain alignment. Where possible, mature trees will be protected with temporary construction fencing around their driplines to ensure that they are not damaged during construction. It is expected that vegetation restoration will be coordinated with the City of Guelph and the Grand River Conservation Authority. A Species-at-Risk, a Butternut tree has been identified in Royal City Park within the proposed work area for the preferred sewer and feedermain. The tree has been identified as a retainable tree by a qualified Butternut Health Assessor and as such appropriate mitigative measures, as outlined by the MNR, must be followed. In addition to tree protection fencing, mitigative measures prohibit the encroachment of construction and related activities within a 5 – 8 m buffer surrounding the butternut dripline.

8.1.1.2 Wildlife and Wildlife Habitats

Since a considerable length of both the sewer and the watermain will be constructed within park areas, it is likely that there may be an impact on wildlife inhabiting the area along the work corridor. In order to minimize the impacts to species in the area, particularly species-at-risk, various mitigation strategies at both the planning and construction stage will be implemented. During all stages of the Class EA process, the routing of the sewer and the watermain have been planned in consideration of wildlife and wildlife habitat area information. The alignments for both infrastructure works were planned to minimize the impact to species-at-risk in accordance with the Species at Risk Act. Prior to the construction of the sewer and feedermain, it will be necessary to develop a detailed construction phasing plan to ensure that construction is undertaken during the timing windows recommended by

the MNR. Additional mitigative measures used during the construction phase include the installation of hoarding and construction fencing to prevent wildlife from entering active work areas.

8.1.1.3 Aquatic Habitats and Communities

During construction of the sewer and feedermain the greatest impacts to aquatic habitats and communities will occur at channel crossings. Impacts to aquatic habitats and communities can be minimized by restricting construction to suitable timing windows and implementing erosion and sedimentation control measures. Specific mitigation measures include:

- Scheduling river crossings around the cool water fishery (limited from March 15 to June 30)
- Minimizing removal of riparian vegetation and renaturalization of the disturbed areas using native vegetation that supports existing wildlife species; and,
- Minimizing erosion and sedimentation by using effective sediment barriers downstream of the work area and erosion control blankets where necessary.

8.1.2 Groundwater & Subsurface Conditions

To maintain or improve the existing integrity of the groundwater and soil conditions within the sites of the future sewer and watermain, several mitigation measures can be implemented at the planning, design and construction stages. At the planning stage, several alternative alignments have been developed to provide options for the routing of the infrastructure, in order to avoid high impact areas. At the design stage, the groundwater regime can be maintained through careful engineering design. For instance, once the pipe is installed, there would be provision for backfilling the ground to match existing conditions. The construction phase is the stage of the implementation process that requires increased care to mitigate adverse effects to groundwater and soils. The key mitigation measures include:

- Scheduling the construction activities during seasons in which groundwater levels are typically lower;
- Employing environmental management practices during construction, specifically in terms of the operation and storage of equipment;
- Locating the construction activities away from water bearing formations, where possible; and,
- Using proper dewatering techniques, including treatment of impaired groundwater and options to minimize necessary water taking.

8.1.3 Crossing Natural Features

To minimize the impacts to natural environmental features within the sewer and watermain corridors, mitigation measures were considered during the planning phase. The alignments for both the sewer and the watermain were designed in an attempt to minimize the number of water crossings and encroachment on wetland areas. Mitigation measures to be implemented post-construction include:

- Renaturalization of the construction zones; and,
- The maintenance of existing wildlife habitats.

8.1.4 Channel Crossings and Fish Habitat

To maintain natural areas surrounding channel crossings during construction, proper planning for the timing and execution of construction activities will be required to ensure the mitigation of potentially adverse effects on fish and fish habitat. Before construction activities begin:

- A schedule for the construction work will be developed which ensures that construction activities do not interfere with seasonal constraints such as high water levels, surrounding land uses, or fish spawning season, which typically occurs from March 31st to July 31st;
- A spill control and emergency management plan will be established before construction begins. This plan will be implemented throughout the construction process in the event of a spill; and,

- A plan for diverting water around active construction zones will be developed to facilitate the passage of fish and water to unaffected areas downstream.

Immediately following construction, renaturalization of the riparian zone surrounding the channel crossing will begin. It is also expected that construction activities will minimize the need for tree removal, observe natural heritage buffers and setbacks and restore river beds to pre-construction conditions or better.

8.1.5 Proximity to Valleylands and Flood Plains

To mitigate the impact of construction on valleylands and flood plain areas, the following mitigation measures will be employed:

- Creating an inventory of work to avoid nesting and breeding areas prior to any removal of vegetation;
- Minimizing tree removal and implementing a reinstatement plan that is consistent with the City's Natural Heritage System Approvals; and,
- Replacing impacted vegetation with native species.

8.2 SOCIAL & CULTURAL MITIGATION MEASURES

8.2.1 Impact on Recreation Areas

Since a considerable length of the sewer and watermain will be constructed within a park area, it is imperative that that consideration is made to the staging of construction activities to minimize the disruption to sports fields and park areas. That being said, construction would be better suited to take place from October 1st to early May, when the fields and park areas are less used. Once construction is complete, all disrupted fields, playgrounds and flowered areas will be reinstated as quickly as possible and as per the reinstatement plan developed in coordination with the City. Upgrades to existing facilities to ensure compliance with current standards and codes will be necessary.

Community and Social Services and City Operations will need to be consulted during the construction works to ensure alternate facilities can be provided and to maintain existing facilities to the greatest extent possible. In addition, these authorities will need to be consulted annually during the period of construction for coordination of services and during construction for approval of restoration works.

8.2.2 Archaeological Features

The Stage 1 Archaeological Assessment conducted for this study identified general areas of potential archaeological significance within the sewer and watermain Study Area. With this in mind, a Stage 2 Archaeological Assessment will have to be conducted prior to the design and construction of the sewer and watermain to identify any specific archaeological artefact or feature that may require a new alignment for either infrastructure work. A Stage 2 Archaeological Assessment involves a test-pit survey of wood lots and non-cultivated lands. Test pits are excavated by hand to subsoil in order to facilitate the identification of any subsurface cultural deposits.

Should the results from the Stage 2 Archaeological Assessment identify an area of high archaeological potential; a Stage 3 Archaeological Assessment will be required. This involves further controlled surface collection, typically using larger and deeper test pits than are used in the Stage 2 Archaeological Assessment. Upon gathering further information regarding the archaeological potential in the Study Area, the alignments for the sewer and the watermain may require to be altered to avoid sites of high archaeological potential.

8.2.3 Proximity to Built-up Areas & Private Properties Affected

To minimize disruption to residents and business owners in close proximity to construction areas, the City will employ necessary measures to decrease harmful environmental impacts. For instance, noise and dust control measures will be implemented to maintain lower decibel levels in the area to eliminate the risk of causing hearing damage and lower the chance of annoying nearby resident, business owners and pedestrians and cyclists passing by. Techniques for noise and dust mitigation may include: using machinery with exhaust mufflers and well maintained tools and equipment with

appropriate noise reduction devices to reduce noise; creating barriers with acoustical fences, fixed barriers or enclosures to ensure pedestrian path control and to reduce dust propagation outside the immediate construction area. Additionally, pedestrian walkways will be maintained by providing temporary detours around construction sites.

8.2.4 Traffic Impacts during Construction

The impacts to traffic will be minimized by virtue of the construction being primarily completed within park lands. The section of the sewer and watermain that will pose the greatest impact to traffic is located on York Road between Watson Road and just east of Victoria Road. Additionally, the section of the watermain from just west of the Hanlon Parkway to the Paisley Pumping Station and Reservoir will also have localized traffic impacts within the residential development through which it is planned. The main impact to traffic will be the increase in construction traffic for delivery of material and equipment and haulage of tunnel spoils. In order to mitigate these impacts:

- Construction signage will be posted on the impacted roads to make motorists aware of the construction entrances;
- The location of the compound entrances for the tunnelling activity will be selected to ensure the least disruption to traffic;
- Where compounds are located in close proximity to intersections, entrances will generally be located off the secondary road;
- Pedestrian walkways and bicycle lanes will be hoarded off and temporary road crossings provided; and,
- During detailed design haulage routes will be identified that will limit the construction traffic to major roads to mitigate heavy trucks travelling on secondary roads where the impacts are magnified; and,
- Traffic management plans will be developed with the City of Guelph.

In order to reduce the prevalence of traffic impacts, proper scheduling and communication with the public and the City Departments and public services will be required. First, the schedule for the construction should be phased with other capital projects to avoid the duplication of disruptions in a given area. The construction phasing should also be planned such that it minimizes the period of disruption. Second, communication with City and public services that make use of affected City streets will have to be consulted to inform them of temporary access routes. This includes consulting with Canada Post, the City department responsible for garbage collection, the City of Guelph Transit department and the Parks and Recreation Department. A transportation management plan will also have to be developed to ensure mandatory access for emergency response vehicles.

9. REVIEW AGENICES AND APPROVALS

9.1 MINISTRY OF THE ENVIRONMENT

A Certificate of Approval from the MOE will be required for the construction of the York Trunk Sanitary Sewer and the Paisley-Clythe Feedermain as well as a revision of the Drinking Water Licence for the water distribution system.

A Permit to Take Water (PTTW) is required under Section 34 of the *Ontario Water Resources Act* for a temporary water taking, which exceeds 50,000 L per day. The dewatering on this project will likely exceed the limit for the open-cut construction across the Speed River, therefore, a PTTW should be obtained during the detailed design phase of the project.

9.2 GRAND RIVER CONSERVATION AUTHORITY

The Grand River Conservation Authority (GRCA) will have to be consulted during the detailed design stage of both the sanitary sewer and feedermain to coordinate the issuance of permits for each watercourse crossing. The GRCA has a Memorandum of Understanding and a Level III Agreement with the Department of Fisheries and Oceans (DFO) which means that the Authority can screen and process some applications on behalf of DFO. At the detailed design stage, a permit for each crossing shall be submitted to GRCA to determine if there is a potential Harmful, Alteration, Disruption, or Destruction (HADD) of fish habitat.

9.3 MINISTRY OF NATURAL RESOURCES

The project team has had meetings with the MNR regarding endangered species within the Study Area. After conducting a tree survey of the Study Area, a Butternut tree was observed to be in close proximity to the preferred sewer alignment; therefore, further consultation with the Ministry of Natural Resources will be required to coordinate the issuance of the necessary permits to allow for the infrastructure works to be constructed within range of the Butternut tree and to ensure that the proper mitigation strategies are used to avoid any harmful impacts to the tree.

9.4 MINISTRY OF TRANSPORTATION

The Ministry of Transportation (MTO) will have to be consulted during the detailed design and construction of both the sanitary sewer and feedermain, regarding the sections of each works that are within, over or under provincial highway right-of-ways. The ministry will have to issue an encroachment under the *Public Transportation and Highway Act (section 31)*, for each encroachment, prior to any work commences. As part of the permitting process, design drawings must be submitted to MTO for their review and approval detailing the crossing designs and settlement monitoring program to ensure that all MTO regulations have been met.

9.5 CANADIAN NATIONAL RAILWAY

The Canadian National Railway will have to be consulted during the detailed design of the sanitary sewer and feedermain to coordinate the issuance of permits to allow for the construction of sanitary sewer and feedermain sections that cross CN rail lines.

9.6 GUELPH JUNCTION RAILWAY

The Guelph Junction Railway will have to be consulted during the detailed design of the sanitary sewer and feedermain to coordinate the issuance of permits to allow for the construction of sanitary sewer and feedermain sections that cross Guelph Junction Railway lines.

9.7 MINISTRY OF INFRASTRUCTURE

Where acquisition or easement through provincially owned lands is required, the City will need to comply with the requirements of the Ministry of Infrastructure's Class EA, to support a subsequent Ministry of Infrastructure (MOI) Class EA that will have to be undertaken by Infrastructure Ontario (IO). The IO is required to follow the MOI Class EA Process for Realty Activities Not Related to Electricity Projects when undertaking any realty or planning activities including leasing or letting, planning

approvals, disposition of lands, granting of easements, and demolition and property maintenance and repair.

For this project, the Ministry of Infrastructure Class EA will be triggered due to required easements on provincial lands located southeast of the intersection of York Road and Victoria Road. Compliance of the MOI Class EA process can be achieved in a straight-forward manner utilizing the results from the City's current Class EA. The work and consultation activities completed for the MEA Class EA process currently used by the City will provide sufficient information to complete the future MOI Class EA.

9.8 APPROVALS AND LAND ACQUISITION

9.8.1 Permanent and Temporary Working Easements

Final approval of the design will be required from municipal authorities and regulatory agencies prior to commencing construction. During the detailed design phase of the project, consultation with these approval authorities will ensure that their requirements are adequately addressed on the design drawings and restrictions are included in the contract specifications.

10. PUBLIC AND AGENCY CONSULTATION

Consultation with the public (which includes stakeholders and interested parties) and government review agencies is a necessary and important component of the Municipal Class Environmental Assessment (EA) process. To meet the Class EA consultation requirements for this Schedule B project, the City of Guelph ensured that the public and review agencies were informed of the Study and given the opportunity to provide input (both written and verbal) on the assessment and evaluation process for the trunk sanitary sewer alignment alternatives. The following section provides a summary of the key points of contact that were undertaken throughout the course of the project, as well as a summary of comments received.

10.1 PUBLIC NOTICES

10.1.1 Notice of Study Commencement

The Notice of Study Commencement was been developed to target the public, ministries, organizations, agencies and other stakeholders that may be affected by the York Trunk Sanitary Sewer and Paisley-Clythe Feedermain project.

The Notice of Study Commencement was published in local newspapers (Guelph Mercury and Guelph Tribune) with the objective of informing the general public and other stakeholders of the Study. The notice briefly outlined the purpose of the study and gave a brief background on the proposed project.

The Notice of Study Commencement can be found in Appendix C.

10.1.2 Public Information Centres (PICs)

The purpose of each Public Information Centre (PIC) was to update the public and relevant stakeholders on the status of the study, and to address any concerns they may have, at each stage of the Class EA process. Notices for each PIC were published in the local newspaper and sent to stakeholders on the mailing list. Stakeholders remained on the mailing list for the duration of the public consultation process unless they requested to be removed. Individuals attending the PIC's were asked to identify themselves on the sign-in sheet and complete the comment sheet to ensure that their input was documented.

Public Information Centre No. 1

For the York Trunk Sanitary Sewer and Paisley-Clythe Feedermain Class EA, PIC No. 1 was held on October 6th, 2010 at City Hall from 6:00 to 8:00 pm, to present an overview of the project background, the potential alternative solutions and to provide a forum for discussion with the public regarding the Study. The purpose of this PIC was to familiarize the public with the Study and provide an opportunity to receive comments on the alignment alternatives. One attendee was recorded.

The sign-in sheet from this information centre is presented in Appendix D. There were no comment survey sheets. A copy of the presentation materials from the PIC is also included in Appendix E

Public Information Centre No. 2

PIC No. 2 was held on June 8, 2011 at City Hall from 6:00 to 8:00 pm to present the background information on the study, the evaluation of alternative solutions, and the recommended sewer and feedermain alignments (refer to Appendix F for PIC No. 2 Notice of Commencement). The purpose of the PIC was to invite the public and stakeholders to comment on the recommended sewer and feedermain alignments. Six attendees were recorded.

A total of six people signed- in (refer to Appendix G) at the PIC No. 2 and two completed surveys (refer to Appendix H). A copy of the presentation materials is included in Appendix I. Public comments are detailed in Section 10.3.

10.1.3 Notice of Study Completion

This Notice is relevant for two reasons: it provides the public and relevant agencies with a final period of thirty (30) days to review the final conclusions of the Study, and it informs the general public of the outcome of the Study and the nature of the resulting project. The Notice of Study Completion will be filed in Fall 2011.

10.2 AGENCY AND MUNICIPAL CONSULTATION

Various means of consultation were conducted with regulating agencies and municipalities during the Class EA Study. Copies of the correspondence exchanged between the project team and the agencies and municipalities are in Appendix L. The project team held meetings with the Grand River Conservation Authority, the Ministry of Natural Resources.

As part of the EA consultation process, there is a necessity beyond general public consultation to solicit input from government agencies, non-governmental organizations (NGO) and large water users in the municipality. This is done in accordance with the EA requirements by notification and provision of project documentation for review. Agencies are provided with the opportunity to comment at the start of the project and will only be removed from the circulation list if they so request. A copy of the mandatory contact list is presented in Appendix J. A copy of the letter sent to the mandatory contacts is included in Appendix K. All of these agencies will receive a copy of the Phase 1 & 2 report unless they specifically request not to.

Table 10.1 Mandatory Agency and Industry Contacts

Local Agency	Provincial Agency	Federal Agency
Residents	Ministry of the Environment Ministry of Natural Resources Ministry of Culture Ministry of Agriculture, Food, and Rural Affairs	Department of Fisheries and Oceans Environment Canada

All correspondence received via the mandatory contacts, or through the public consultation, is presented in Appendix L. Their comments have been incorporated into the analysis and preliminary design of the preferred alternative identified in Section 6.

10.3 PUBLIC AND AGENCY COMMENTS AND RESPONSES

A summary of the comments received from agencies and the public during the Class EA process are included below. Please note that not all comments were provided in writing, but copies of the actual written correspondence received are provided in Appendix L.

10.3.1 Public and Agency Comments and Responses

10.3.1.1 Public Comments and Responses

Public Information Centre #2

Comment:

- A comment was made regarding interest in the area of the proposed alignment along the southern boundary of the property located at 40 Wellington Street West.
- An inquiry was made regarding the effects of construction on this property.
- A request was made to get in contact with the biologist working on the current Class EA to discuss the environmental impacts that may occur at the 40 Wellington St. Property.

Response:

- Confirmed that the preferred alignments for both the York Trunk Sewer and the Paisley Feedermain are adjacent to 40 Wellington St.

- Indicated that the existing trees that border the property are not considered as significant trees and can be removed to allow for the installation of the works.
- Indicated that the configuration of the alignment along the property would be that the 500 mm diameter watermain would be offset approximately 3 m south from the property line and the sanitary sewer would be offset 4 m south of the watermain.
- The total disturbed surface in this construction area would be 10-15 m.
- The reinstatement in this area would be limited to either grass or naturalized native vegetation due to the potential risk of damage to the underground infrastructure.
- The presence of the Butternut tree and its potential impact on the project and 40 Wellington St. development was identified.

Comment:

- A request was made to consider the implementation of a pedestrian underpass at the junction with Edinburgh Feedermain and Sanitary Sewer.
- A request was also made to consider a pedestrian underpass at the Guelph Junction Rail (GJR) junction to facilitate the east side trail.
- Noted that effluent reuse is important and the economics of a purple pipe to the golf course should be carefully examined.

Response:

- No response on record
- Improvements or upgrades to existing pathways and road crossings has been identified in this document as an item to be considered and reviewed with the City during detailed design.

Following Public Information Centre #2

Comment: An inquiry was made regarding the cost of the preferred sewer alternative.

Response: The estimated cost for replacing and upgrading the sewer is $14.9 M in construction fees and $19.4 M in construction, engineering and contingency fees.

Comment: An inquiry was made regarding which sanitary sewers will be twinned.

Response: The sanitary sewer from Victoria Road to a few hundred metres west of Edinburgh is close to or over capacity and will therefore be twinned.

Comment: An inquiry was made on whether a schematic that illustrated the proposed changes in sewer was available.

Response: This schematic will be available in the Class EA Project File. Generally, the east most section of pipe, up to Edinburgh will be 1050 mm in diameter and the section of pipe west of Edinburgh will be 1200 mm in diameter. An additional note was made that the sizing of the pipe has been based on achieving the required minimum velocity in the pipe, rather than only aiming to increase its capacity.

10.3.1.2 Regulatory Agency Comments and Responses

Government and agency responses have been received predominantly by regular mail and/or email. Responses received to date are documented below:

Ministry of the Environment

Comment:

- Confirmed their receipt of the Notice of Study Commencement for the project.
- Confirmed that the work planned for through the current Class EA is the result of

recommendations made in the 2009 Water and Wastewater Servicing Master Plan.

- Noted that the Notice of Study Commencement did not indicate the Class EA Schedule for the project and recommended that the schedule be assigned prior to the issuance of the next notice regarding the project.
- Noted that as part of the required stakeholder and agency consultation, proponents are advised to contact potentially affected Aboriginal communities in the project area. Also provided an internet link to agencies that can be contacted to identify which Aboriginal communities may be potentially affected in the project area.

Response:

- No response on record
- These items have been incorporated into this document

Ministry of Municipal Affairs and Housing

Comment:

- Confirmed that the project is a Municipal Class Environmental Assessment for municipal water projects and that its intent is to: assess the existing infrastructure and environment; identify the problem and alternative solutions; determine needs for future growth; and evaluate alternatives for routing, construction methods and mitigation measures; and to develop a preferred alternative to meet the project objectives for both the sewer and the feedermain.
- Confirmed that the Municipal Services Office provides access to provincial services on municipal government, finance and administration, as well as land use planning and development issues covered under the *Planning Act.*
- Indicated that the current policy on land use planning matters for Ontario, and specific to the City of Guelph is the Provincial Policy Statement 2005 (PPS) and the Growth Plan and that both these documents have status under the Planning Act and should therefore consideration should be given to applicable policies within them. And, if there is a conflict between the Growth Plan and the PPS, the Growth Plan prevails unless the conflict is between policies relating to the natural environment or human health. In these situations, the policies that provide more protection to the natural environment or human health prevail.
- Indicated that the City of Guelph's Official Plan policies regarding municipal water services and management are integrated into the assumptions regarding the preferred solutions identified through the evaluation process.

Response: No response on record.

Ministry of Transportation

Comment:

- Noted that the ministry controls all encroachments within the provincial highway right-of-way, including any installation or other work upon, over or under, or within these limits.
- Noted that the ministry's control of encroachments is intended to maximize highway safety, maintain the free flow of traffic and minimize the likelihood that an encroachment may interfere with any highway maintenance operations or future reconstruction or expansion of the highway corridor.
- Noted that all work within the provincial highway right-of-way is subject to the approval of the ministry. Also provided a link with the details on the encroachment permit application process.

Response: No response on record.

Indian and Northern Affairs Canada

Comment:

- Confirmed receipt or Notice to attend Public Information Centre #1 on October 6, 2010
- Provided an account from the agency's inventory of active litigation in the vicinity of the Study Area. Was unable to comment with respect to the possible effect of the claim as the case had not yet been adjudicated. Recommended consulting with legal counsel for a better understanding of the effect the action could have on the lands in question.
- Indicated that copies of the pleadings can be obtained from the Court for a fee.
- Indicated that no comments regarding claims filed under other departmental policies can be made. Provided the contact information for other contacts at the Specific Claims Branch and at the Treat and Aboriginal Government Central Operations Branch.

Response: No response on record

Indian and Northern Affairs Canada, Consultation and Accommodation Unit

Comment:

- Confirmed that the Consultation and Accommodation Unit's Consultation Information Service has been established to coordinate departmental responses to consultation-related queries within INAC. Also confirmed that the CIS provides information to federal officials, related to Aboriginal groups and their Aboriginal and/or treaty rights, to the extent that these are known by INAC.
- Noted that INAC officials do not participate in environmental assessments that pertain to projects off-reserve nor do they track how other parties carry out their Environmental Assessment or consultation activities where no reserve lands or INAC programs are involved.
- Asked that INAC be omitted from any public information notifications for projects that do not intersect with reserve lands or engage INAC programs.

Response: No response on record

Infrastructure Ontario

Comment:

- Thanked the proponent for circulating Infrastructure Ontario (IO) on the Notice of Public Information Centre #2 Notice
- Stated that IO is responsible for managing real property that is owned by the Ministry of Infrastructure.
- Confirmed that IO-managed lands are located directly in the Class EA's Study Area, and as result the project may have the potential to impact the property and/or the activities of tenants present on the IO-managed lands. Also included a map identifying the lands in question.
- Stated that any negative environmental impacts associated with the project design and construction should be avoided and/or properly mitigated in accordance with applicable regulations best practices and MNR and MOE standards.
- Noted that if IO-managed land takings are suggested as part of any alternative in the Class EA that these should be appropriately mapped and quantified within the final Class EA report along with details of appropriate mitigation and or next steps related to compensation for any required takings.
- Requested that the draft Class EA be circulated by IO for comments and discussion at least 30 calendar days prior to finalization if potential impacts to IO-

managed lands are present as part of this study.

- Noted that if the proposed activities impact cultural heritage features, on IO managed lands, a request to examine cultural heritage issues which can include the cultural landscape, archaeology and places of sacred and secular value could be required.
- Noted that the IO is required to follow the MOI Class EA Process for Realty Activities Not Related to Electricity Projects (MOI Class EA) and that this Class EA applies to a wide range of realty and planning activities including leasing or letting, planning approvals, disposition, granting of easements, demolition and property maintenance/repair. Also, if the MOI Class EA is triggered, there must be explicit reference to the undertaking of the MOI Class EA in the project file of the current Class EA.

Response: No response on record

10.4 FIRST NATIONS' CONSULTATION

First Nations Consultation has become a mandatory part of the Municipal Class EA process, but the details of the process are currently not well defined or uniformly accepted. The following initiatives have been undertaken to coordinate the engagement of Aboriginal peoples in the Class EA process:

- Using the City of Guelph's list of First Nations' communities that are consulted with regards to projects occurring within the City
- First Nations' communities were contacted to verify their mailing addresses.
- Each of the potentially affected First Nations communities was sent a Notice of Study Commencement by mail. Notices of the Public Information Centres were also sent to each First Nation group.
- Follow-up phone calls were placed with each of the groups to ensure that they have received the package, to answer questions and to inquire if they have any issues or concerns pertaining to the Study. However, none of the First Nation groups elected not to comment.

In addition, during the Study, the project team documented all correspondence and maintained an up to date First Nations contact list.

10.4.1 First Nations Comments and Responses

Limited feedback has been received from First Nations on this Study. The comments which have been expressed are summarized below. All correspondence with First Nations organizations has been included in Appendix L.

Given the nature of the Study Area and location of the preferred alignment, it is not anticipated that there will be any adverse impacts to First Nation Communities or Heritage Sites. However, a Stage 2 Archaeological Assessment must be completed during the detailed design phase.