Region of Peel

GENIVAR

Schedule 'C' Municipal Class Environmental Assessment for West Trunk Sewer Environmental Study Report

April 2009

GENIVAR

April 14, 2009
File: 06-2520

Mr. Simon Hopton, P.Eng.
Capital Works Manager
The Regional Municipality of Peel
11 Indell Lane
Brampton, ON L6T 3Y3

Re: West Trunk Sewer - Schedule 'C' Municipal Class Environmental Assessment
Environmental Study Report
April 2009

Dear Mr. Hopton:

GENIVAR is pleased to present the Environmental Study Report (ESR) for the West Trunk Sewer's Schedule 'C' Municipal Class Environmental Assessment (Class EA) study.

The ESR provides an overview of the entire study, including details of the evaluation processes applied in determining the preferred route and recommended design under the Municipal Class EA process. The report illustrates the different phases of this process.

The preferred alignment is Alternative 1, which follows Erin Mills Parkway. Based on the findings of this study, this route should almost entirely be tunneled, except where it meets the existing sewer along Lincoln Green Way, north of the QEW. Public and agency correspondence, as well as First Nations' consultations, are also presented in the appendices of the report, and were critical in the outcome of the study.

The Environmental Study Report will be published for review and remain open to comments for thirty (30) days ending May 13, 2009, after which, if there are no comments, the preferred route may be implemented.

Yours truly,
GENIVAR Ontario Inc.

Brian Barber, P.Eng.
Consultant Project Manager

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Executive Summary

ES-1 Background and Justification

The Region of Peel has completed a Class Environmental Assessment (Class EA) study to determine the preferred alternative for the twinning of the existing West Trunk Sewer. The study involved:

- Selection of several possible trunk sewer alignments for the twinning of the existing sewer;
- Evaluation of the alternative routes and selection of a preferred alignment;
- Evaluation of design alternatives for the preferred alignment; and
- Preparation of monitoring and mitigation plans, where necessary, for the construction and post-construction phases of the project.

The Region of Peel's "Water and Wastewater Servicing Master Plan" has identified the need for increased capacity of its western trunk sanitary sewer system. This Class EA Study specifically addresses the need for an extension of the West Trunk Sanitary System, to accommodate the projected population growth in northwest Brampton. This upgrade will also increase the conveying capacity of the existing sanitary trunk system within the City of Mississauga, while contributing to necessary improvements of the sub-trunks of the sanitary sewer system.

The Region's Master Plan has determined that the twinning of the existing Trunk Sewer is the most feasible solution and the Region of Peel has commenced construction for the extension of this Sanitary System, north of the Study Area. This current Class EA study is, therefore, being conducted to determine the most feasible alternative for continued expansion of the existing sanitary trunk sewer system from Highway 401 in the north, to north of the QEW in the south.

The preferred servicing option identified in the Master Plan highlights possible routes for the proposed system extension. These routes have been included in the study as possible alternatives and assessed, along with other alternatives, using set screening and evaluation criteria, to determine the preferred alignment.

ES-2 Alignment Alternatives

The alternative alignments were identified in the early stages of the EA process following a detailed review of the study area extending from Highway 401 to the north, the QEW to the south, Erin Mills Parkway to the west, and Mavis Road to the east. Orthographic images and site visits were utilized to conceptually identify the routes that would be suitable for construction of the project by applying the set screening criteria. The possible routing alternatives included existing transportation corridors, open spaces, utility and hydro corridors.

The following alternatives were evaluated in this report:

Alternative 1, Erin Mills Parkway

- Starts at Credit Valley Trunk Sewer section, northeast of Creditview Road and Highway 401;
- South along Creditview Road to Argentia Road;
- West along Argentia Road to Erin Mills Parkway;

- South along Erin Mills Parkway to Sheridan Park Drive, which turns to Lincoln Green Way east of Erin Mills Parkway; then
- East along Lincoln Green Way to Lincoln Green Close, then beneath the Credit River to the existing Credit Valley Trunk Sewer through the Hydro corridor.

Alternative 2, Creditview Road and Mississauga Road

- Starts at Credit Valley Trunk Sewer section, northeast of Creditview Road and Highway 401;
- South along Creditview Road to north of Highway 403 (hydro corridor);
- West along Highway 403 to Mississauga Road; then
- South on Mississauga Road to 500 m south of Dundas Street

Alternative 3, Credit View Road and Dundas Street West

- Starts at Credit Valley Trunk Sewer section, northeast of Creditview Road and Highway 401;
- South along Creditview Road, continuing on to Erindale Station Road, which is the southern continuation of Creditview Road, to north of Dundas Street West;
- West along Dundas Street West to Mississauga Road; then
- South on Mississauga Road to 500 m south of Dundas Street

Alternative 4, Mavis Road

- Starts at Credit Valley Trunk Sewer section, northeast of Creditview Road and Highway 401;
- South along Creditview Road to Britannia Road;
- East along Britannia Road West to Mavis Road;
- South on Mavis Road to south of Queensway West (north of QEW);
- Southwest across the Credit River at the Mississauga Golf and Country Club; then
- East along the south side of Mississauga Road to 500 m south of Dundas

Alternative 5, Credit River Valley

- Starts at Credit Valley Trunk Sewer section, northeast of Creditview Road and Highway 401;
- South along Creditview Road to the existing trunk sewer north of Britannia Road West; then

South along the existing trunk sewer to 500 m south of Dundas

ES-3 Design Alternatives

As development and growth continues in areas in Mississauga and Brampton, sewer modelling indicated that the existing sanitary sewer system would not have adequate capacity to accommodate the anticipated sewage flows. The Master Plan considered the overall drainage area for the West Trunk sewer and developed projected flows to 2031. Based on the preliminary sewer modelling, the size of the West Trunk Sewer was established as an 1800mm diameter sewer. Confirmation of the size of the sewer is required during the detailed design.

Based on the connection elevation and ground profile of the study area, it is expected that the tunnel will be constructed within the shale bedrock utilizing a rock Tunnel Boring Machine. Tunnel support will likely consist of roof rock anchors and steel mesh. The final sewer will be either a cast-in-place liner or a pre-cast sewer pipe installed after the tunnel has been completed. The tunnel will be located within the existing road allowance, with the exception at shaft locations. Limitations on the tunnel turning radius may result in the tunnel not always being at a typical offset from the property line. During construction of the tunnel, alignment holes will be drilled from the surface along the route to ensure the tunnel is in the design location. As the

Tunnel Boring Machine passes the alignment hole, if necessary, adjustments are made and any errors are corrected.

ES-4 Environmental Impacts and Mitigation Measures

To construct the various components of the West Trunk Sewer, some environmental impacts will be unavoidable. In such situations, measures will therefore 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”.

During design, the environment affect by a project will be established and the specific net effects 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 may then include special provisions to ensure the impact on the environment is minimized.

Some construction operations have potential for environmental impacts, and where these can be anticipated in the design stage, special provisions will be written into the construction package. The provisions will spell out those 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 used to 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.

ES-5 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 Class Environmental Assessment process. To meet the Class EA consultation requirements for this Schedule C project, the Region of Peel 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 Sewer alignment and the alternative designs. Copies of specific documentation (notices, information bulletins, etc.) from the public and agency consultation program are provided in Appendix A. 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.

ES-6 First Nations’ Consultation

First nations refer to the first known populations of Canada, the Aboriginal Peoples. The Ontario Ministry of the Environment (MOE) is holding discussions to determine the formal requirements of First Nations Consultations. The MOE, in conjunction with the Municipal Engineers Association (MEA), have posted the Interim Directives for Consultation with Aboriginal Peoples, to guide First Nations Consultations until a decision is made on the formal process.

Our First Nations Consultation found no bands or organizations affected by the alternatives for the proposed sewer that would arise out of the West Trunk Sewer Class EA.

ES-7 Conclusions and Recommendations

- Based on the projected population growth data in the Peel Water and Wastewater Master Plan a new trunk sewer is required to expand the capacity of the existing Credit Valley Trunk Sewer from Highway 400 and approximately 300m north of the QEW. The estimated size of the trunk sewer is 1800mm diameter, however the size is to be confirmed during the detailed design.
- The preferred alignment for the West Trunk Sewer is Alternative 1 (Erin Mills Parkway) as described in this report. It was evaluated as preferred in the following criteria:
    - Impacts to the Natural Environment,
    - Socio-cultural Impacts,
    - Technical and Operational Impacts, and
    - Constructability
- Although not the most cost effective Alternative, it is competitive in terms of overall cost and the impacts to natural, socio-cultural and technical considerations outweighed the cost difference.

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1. Introduction and Background

1.1 Introduction

The Region of Peel has completed a Class Environmental Assessment (Class EA) study to determine the preferred alternative for the twinning of the existing West Trunk Sewer. The study involved:

- Selection of several possible trunk sewer alignments for the twinning of the existing sewer;
- Evaluation of the alternative routes and selection of a preferred alignment;
- Evaluation of design alternatives for the preferred alignment; and
- Preparation of monitoring and mitigation plans, where necessary, for the construction and post-construction phases of the project.

1.2 Project Rationale

The Region of Peel's "Water and Wastewater Servicing Master Plan" has identified the need for increased capacity of its western trunk sanitary sewer system. This Class EA Study specifically addresses the need for an extension of the West Trunk Sanitary System, to accommodate the projected population growth in northwest Brampton. This upgrade will also increase the conveying capacity of the existing sanitary trunk system within the City of Mississauga, while contributing to necessary improvements of the sub-trunks of the sanitary sewer system.

The Region's Master Plan has determined that the twinning of the existing Trunk Sewer is the most feasible solution and the Region of Peel has commenced construction for the extension of this Sanitary System, north of the Study Area. This current Class EA study is, therefore, being conducted to determine the most feasible alternative for continued expansion of the existing sanitary trunk sewer system from Highway 401 in the north, to north of the QEW in the south.

The preferred servicing option identified in the Master Plan highlights possible routes for the proposed system extension. These routes have been included in the study as possible alternatives and assessed, along with other alternatives, using set screening and evaluation criteria, to determine the preferred alignment.

The Region's Official Plan has projected that the Region is expected to grow to a population of approximately 1.3 million by the year 2021 and 1.6 million by the year 2031. The twinning of the existing Sanitary Trunk System with the West Trunk Sewer proposed by this study is expected to support the wastewater volume of the 2031 population.

The study area is divided by the Credit River, and includes critical natural, socio-cultural and historical features. Stakeholder participation, including relevant agencies, organizations and the public, are important in determining the best alternative.

1.3 Background Studies and Undertakings

1.3.1 Regional Official Plan

The Regional Official Plan is a long term planning document used to assist the Region in managing growth development. The main purpose of the plan is to:

- Provide Regional Council with a long term regional strategic policy framework for guiding growth and development in Peel while having regard for protecting the environment, managing the renewable and non-renewable resources, and outlining a regional structure that manages this growth within Peel in the most efficient manner.
- Interpret and apply the intent of Provincial legislation and policies within a Regional context using the authority delegated or assigned to the Region from the Government of Ontario.

The Regional Official Plan was initially adopted by Council on July 11, 1996. As required by the *Planning Act*, a municipality is to revise its Official Plan every five years to ensure that it conforms to current provincial initiatives; takes into account matters of provincial interest; and is consistent with policy statements issued under the Act.

Since the last review of the Peel Region Official Plan, which was initiated in 2002, the Government of Ontario has released three documents that the Official Plan must also conform to: *Places to Grow Act, 2006*; the *Greenbelt Plan, 2005*; and the *Provincial Policy Statement, 2005.*

The Region of Peel is currently working toward a June 16, 2009 deadline to bring its Official Plan policies into conformity with provincial requirements, and in particular, the *Places to Grow Act* and by extension, the *Growth Plan for the Greater Golden Horseshoe*.

1.3.1.1 Greenbelt Plan

The *Greenbelt Plan* was established under Section 3 of the *Greenbelt Act*, 2005, to take effect on December 16, 2005, and municipalities are required to amend their official plans to conform to it.

The *Greenbelt Plan* identifies where urbanization should not occur in order to provide permanent protection to the agricultural land base and the ecological features and functions occurring on this landscape. The Greenbelt encompasses 1.8 million acres of land and spans 325 kilometres: from the east end of the Oak Ridges Moraine near Rice Lake to the Niagara River in the west. It includes 80 per cent of Caledon and 1% of Brampton, which amounts to 45 per cent of Peel Region. The Region of Peel, the City of Brampton and the Town of Caledon are required to implement the *Greenbelt Plan* through their official plans.

1.3.1.2 Places to Grow

The *Growth Plan for the Greater Golden Horseshoe*, 2006, was prepared and approved under the *Places to Grow Act*, 2005, to take effect on June 16, 2006.

It is a framework for implementing the Government of Ontario's vision for building stronger, prosperous communities by better managing growth to 2031, and includes a wide variety of policy directions:

- growth forecasts (of 1.64 million for Peel Region by 2031);
- intensification policies and targets (40 per cent for built areas); and

- density targets (200 persons and jobs per hectare) for urban growth centres (which includes downtown Brampton and the Mississauga City Centre) and greenfield areas (50 residents and jobs per hectare).

The *Places to Grow Act* requires municipalities to bring official plans into conformity with the *Growth Plan for the Greater Golden Horseshoe* by June 16, 2009.

1.3.1.3 Provincial Policy Statement

The *Provincial Policy Statement (PPS)* was issued under the authority of Section 3 of the *Planning Act* and came into effect on March 1, 2005.

The *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; and 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 Region's role in planning for growth, intensification and redevelopment. New settlement area policies will only permit expansions where it is demonstrated that opportunities for growth are not available through intensification, redevelopment or in designated areas. The *PPS* also requires municipalities to co-ordinate and provides direction on policies with cross municipal boundaries, such as natural heritage systems and resource management. It also provides the context for the Region's participation in the *Growth Plan for the Greater Golden Horseshoe.*

1.3.2 Water and Wastewater Master Plan

Municipalities undertake Water and Wastewater Master Plans to determine opportunities and strategies to provide municipal water and wastewater servicing to the existing and growth areas that are identified through the Official Plan process. Similar to the Official Plan process, these master plans are updated every five years to reflect current planning initiatives and growth projections.

The Region of Peel completed the *Water and Wastewater Servicing Master Plan for the Lake based System, May 1999* with an amendment completed in 2002 that identified the long-term water and wastewater servicing strategies and associated capital program to service the South Peel system (lake based) service areas and the North Peel system (groundwater based) service areas. This study also identified key infrastructure requirements to provide water servicing support to the Region of York.

In 2006, the Region of Peel initiated an update of the Water and Wastewater Servicing Plan to reflect the current planning legislations and growth projections within the Region. Water and wastewater servicing strategies were updated to ensure that they met technical servicing requirements, optimizing the existing infrastructure, minimizing impact to or enhance natural, social and economic environments, and to provide cost effective solutions. The plan then established the preferred long-term servicing strategy to meet the existing and future servicing needs of the Region and developed a detailed capital improvement and implementation plan.

The study was undertaken in accordance with the planning provisions outlined in the Municipal Class Environmental Assessment guideline document and included two Public Information Centres. The Notice of Completion was issued on July 4th, 2007.

1.3.3 Relevant Associated Projects: Credit Valley Trunk Sewer

The extension and twinning of the western sanitary sewer system within the South Peel system was identified in the Water and Wastewater Master Plan. As this is a significant capital undertaking, the project was staged over time to both utilize the existing system to its potential and also to spread the capital cost over time. The first stage of this twinning was to extend the existing sanitary sewer system northward from Creditview Road and Highway 401 to Queen Street and Mississauga Road. A Schedule C Class EA was completed that evaluated alternative routes and identified environmental and social impacts associated with it's construction. Once the Class EA was completed, the Region initiated detailed design and construction. The Credit Valley Trunk Sewer is currently constructed from the north side of Highway 401 to Eldorado Park just south of Queen Street on Creditview Road. The final contract is currently underway that will complete the sewer construction along Creditview Road and Queen Street to Mississauga Road.

The proposed West Trunk Sewer will connect to the Credit Valley Trunk Sewer on the east side of Creditview Road north of Highway 401.

1.4 Municipal Class EA Process

The Municipal Engineers Association (MEA) in conjunction with the Ontario Ministry of the Environment (MOE) created the *Municipal Class Environmental Assessment*, guideline in June, 2000. This guideline was further amended in 2007. This guidance document is intended to assist municipalities in complying with the Environmental Assessment Act in planning for their roads, water and wastewater projects.

The Municipal Class EA document applies to a group of projects, which are approved under the Environmental Assessment Act, as long as they are planned according to the requirements of the Class EA process. The specific requirements outlined in the guidance document depend on the type of project, its complexity and the significance of potential environmental impacts. As such, four types of projects are identified in the 2007 document:

- *Schedule 'A'* Projects are limited in scale and have minimal adverse environmental impacts. These projects generally include normal or emergency operational and maintenance activities. An example of a Schedule 'A' wastewater project is the extension of a sanitary sewer to connect the system to an existing system along an existing road allowance or utility corridor. This type of project is pre-approved and may proceed to construction without further following the Class EA process.
- *Schedule 'A+'* Projects are similar to Schedule 'A' projects in scope and level of environmental impact, and include normal or emergency operational and maintenance activities but includes a water crossing. An example of a Schedule 'A+' wastewater project is an extension of a sewage collection system and all works necessary to connect the system to an existing system, provided all such facilities are in either an existing road allowance or are in an existing utility corridor, *" including the use of Trenchless Techology for water*

crossings". Schedule 'A+' also includes the requirement for public review, which generally involves a public notice.

- *Schedule 'B'* Projects have the potential for some adverse environmental impacts and are approved provided they are "screened" by the public and government review agencies. These projects generally include improvements and minor revisions to existing facilities. An example of a Schedule 'B' wastewater project is the extension of a sanitary sewer that is not in an existing road allowance or existing utility corridor. This type of project requires the completion of Phases 1 and 2 of the planning process.
- *Schedule 'C'* Projects are more complex and have the potential for significant environmental impacts. These projects generally include the construction of new facilities and major expansions to existing facilities. This type of project is subject to the full Class EA process and requires the preparation of an Environmental Study Report (ESR).

The Municipal Class EA process in Ontario, Figure 1-1, follows a logical decision-making process and incorporates:

- Phase 1, Identification of the problem or need for the project;
- Phase 2, A thorough evaluation of the planning options or alternative solutions to the problem – final phase for a Schedule 'B';
- Phase 3, An assessment of design alternatives for the preferred solution;
- Phase 4, The Environmental Study Report (ESR) for Schedule 'C', and
- Phase 5, The implementation of the project including design, with appropriate monitoring during construction.

In order to ensure that all parameters and concerns are considered, this study is being completed as a Schedule 'C' Environmental Assessment.

Once completed, if an affected agency or the public has a concern that cannot be resolved by discussion and negotiation with the proponent, then they can request the Minister of the Environment to issue a Part II Order of the EA Act. Through issuance of a Part II Order, Schedule 'B' and Schedule 'C' projects may be elevated to an Individual EA, requiring the proponent to comply with Part II of the EA Act. Schedule 'B' projects could also be elevated to a Schedule 'C'.

Figure 1–1 Municipal Class Environmental Assessment Process

1.5 Problem Statement

For a Schedule 'C' Class EA, it is mandatory to complete each phase of the process. Phase 1 requires a problem or opportunity statement, which identifies and justifies the project.

The need for the twinning of the West Trunk Sewer was identified in the Region of Peel Water and Wastewater Servicing Master Plan for the Lake Based System (May 1999) and Updates, which identified the required expansion of the existing wastewater systems to meet the future system demands based on expected population increases. Monitoring programs and modeling conducted on the existing sewer networks established capacity limitations to support continued growth.

1.6 Project Justification

The Official Plan identified the Region's population in 2001 to be approximately 989,000. The population has been projected to increase to approximately 1.2 million by 2011, 1.3 million by 2021 and 1.6 million by 2031. The anticipated population increase is therefore approximately 21% by 2011, 31% by 2021 and a further 62% by 2031. The Water and Wastewater Master Servicing Plan shows that continued development and the associated wastewater increase would not be sustained by the existing sewer system. A summary of the population projections is presented below, as it reflects the population changes that the Trunk Sewer System is expected to service.

Table 1.1 Baseline Population Data

Year	2001	2011	2021	2031
	Population	Population	Population	Population
Brampton	325,000	481,000	553,000	695,000
Caledon	51,000	65,000	84,000	84,000
Mississauga	613,000	660,900	690,900	730,000
Total	989,000	1,206,900	1,327,900	1,571,000

Caledon's growth may be limited by its location, within both the Niagara Escarpment Plan Area (NEPA) and the Oak Ridges Moraine Study Area (ORMSA), but Mississauga and Brampton are limited only by available land. While both Brampton and Mississauga are expected to continue spreading, Brampton is expected to grow more rapidly based on the available land. Proposed growth within northwest Brampton as well as west Mississauga have influenced the size of the proposed West Trunk Sewer.

1.7 Service Area

The extension and twinning of the Region of Peel's west trunk sanitary sewer system will satisfy the need for greater sewer capacity to service northwest Brampton as well as relieve flows from the existing trunk sewer system throughout Brampton and Mississauga.

1.8 Public and Agency Consultation

Public consultation is a key feature of the Class EA process. Through an effective public consultation program the Region of Peel can provide an opportunity for the exchange of ideas and information with the public and affected agencies. One of the principal aims of public consultation is to achieve resolution of different points of view thus reducing or averting controversy, and potentially avoiding the use of the "Part II Order" process. In addition, contact with government agencies will ensure compliance with all public policy and regulatory requirements.

To initiate the study, the Region of Peel placed a "Notice of Study Commencement" in the local newspapers to inform the public of the initiation of the West Trunk Sewer study. In addition, a Public Information Centre (PIC#1) was held to inform the public of the project and to solicit comments.

A second PIC was held during Phase 2 of the EA process once the alternative alignments had been identified and evaluated. Also, during this phase of the project was an evaluation of the general inventory of the natural, social, economic and cultural environments to determine the possible impacts each alternative solution may have on the environment. In addition to the PIC, separate meetings were also held with key stakeholders to review the preferred alignment prior to proceeding to the following Phase of the project. The purpose of this consultation activity was to provide the public and agencies the opportunity to comment on the selection of the preferred solution alignment and to resolve any concerns.

The third PIC was held at the completion of Phase 3 of the EA process once design alternatives were evaluated and preliminary design drawings were developed. At this time, additional individual meetings were held with specific stakeholders affected by the proposed sewer construction including property owners where permanent and/or temporary working easements were required.

The "Notice of Completion" forms the final point of contact to advise the public of the completion of the planning process. The Notice identifies the preferred solution, the review period and the date by which submissions and/or "Part II Order" requests are required and where comments are to be submitted. If no "Part II Order" requests are received during the specified period (a minimum 30 calendar days) then the Region of Peel may proceed to design and construction of the project.

2. Existing Conditions

2.1 Description of the Study Area

The Study Area was determined based on the connection locations to the existing Trunk Sewer system. A connection is required on the north-east corner of Creditview Road and Highway 401 to the north, and in the vicinity of Mississauga Road and Lincoln Green Road, north of the QEW to the south. The study area was therefore defined as Highway 401 to the north, QEW to the south, Erin Mills Parkway to the west, and Mavis Road to the east. The entire study area falls completely within the City of Mississauga.

The City of Mississauga is the largest and most developed of the three (3) cities within the Region of Peel and has the greatest population. The city is highly developed and as such contains limited sensitive natural environmental features and species relative to the neighboring Towns of Brampton and Caledon. The Oak Ridges Moraine Study Area (ORMSA) and the Niagara Escarpment Plan Area (NEPA) both cross into the Town of Caledon whereas the City of Mississauga has no such interaction with these sensitive areas.

This study area, like much of Mississauga, is largely developed with commercial, industrial and residential areas. With the exception of the Credit River, and affiliated sensitive environmental features, the area is lined with streets, residential areas, schools and commercial / industrial developments. The Credit River Valley and adjoining tributaries have an extensive trail system that is utilized for a variety of recreation activities such as hiking and cycling, and the river and tributaries themselves are also utilized for recreational activities, including canoeing and fishing.

The study area is home to a number of important natural features, sensitive species and critical socio-cultural or heritage locations, such as the Community of Streetsville. The sensitive natural features and heritage interests within the study area are largely associated with the Credit Valley and the Credit River that run through the area.

To assess the existing features within the study area, specialized investigations were undertaken for the documentation and evaluation of the natural environment, geotechnical, hyrogeological, and archeological features. These reports are included for reference in the Appendices to this report. The following sections provide a brief summary of the findings of these investigations.

Figure 2–1 Study Area

2.2 Natural Environment

The preliminary overview of the natural environment within the study area is discussed here, with the detailed reports located in Appendix A.

2.2.1 Physical Environment

The Credit River Valley runs down the centre of the study area, with a few tributaries fanning out along either side. The area encompasses two geological formations, the Peel Plain and the South Slope. Elevation starts in the south of the area at approximately 300 m above sea level (asl) and goes to 800 m asl in the north. The Peel Plain comprises level to undulating topography with a gradual, uniform slope toward Lake Ontario. The underlying geology of the plain, in the north, consists of till with large amounts of shale and limestone. The South Slope is represented in the southern portion of the study area but generally occurs south of the Oak Ridges Moraine and north of the Lake Iroquois Sand Plain. The principal landforms that characterize the South Slope are drumlins, which, in the study area, are considered more subdued with irregular knoll and hollow relief.

2.2.2 Surface Water Features

The Region of Peel has a Lake Ontario-based water supply system. The lake, as well as the tributaries, rivers and manmade channels that feed the lake, are therefore critical to this study. The health of the watershed ecosystem is dependant on the maintenance of the ecosystem balance.

The proposed sewer route alternatives cross the main branch of the Credit River and four tributaries of the Credit River: Mullet Creek, Carolyn Creek, Sawmill Creek, and Loyalist Creek.

Credit River

The Credit River headwaters are found north of Orangeville, Ontario. Within the study area the river is approximately 25 m wide and flows in a southerly direction. The Credit River is managed as a large warmwater community.

The fish community of the Credit River consists of a mixture of warmwater and coolwater species with a few coldwater migrants such as Chinook and Coho salmon. The Credit River is a Type 1 fishery.

Mullet Creek

Mullet Creek originates north of the study area. The northern section, which flows through the study area, is within a concrete-lined channel. Mullet Creek has two tributaries within the study area flowing through engineered channels. One originates as Lake Wabukayne and flows east across Erin Mills Parkway, and the other also flows east across Erin Mills Parkway. At the road-crossings, the banks are stabilized with gabion baskets. The main branch of Mullet Creek flows through a concrete spillway in the northern part of the study area.

The fish community composition in Mullet Creek is warmwater species. Within the study area, it is a Type 2 fishery.

Carolyn Creek

Carolyn Creek originates within the study area at Braeben Golf Course. This watercourse is an engineered channel throughout much of the study area. Upstream of Creditview Road, the watercourse is currently being altered to create a series of ponds, which will flow into a storm-water control structure. Downstream of Carolyn Road, the watercourse flows through a naturalized channel with good riparian cover.

The fish community composition in Carolyn Creek is unknown, however, the creek is managed as a Type 1 fishery.

Sawmill Creek

Sawmill Creek originates within the study area at Erin Mills Parkway, north of Eglinton Avenue. The watercourse is buried upstream of Erin Mills Parkway. Sawmill Creek has two tributaries within the study area; both are buried west of Erin Mills Parkway. The first tributary starts north of Dundas Street West, north of the track field and has a 5 m wide channel with gabion baskets stabilizing the banks. The second originates north of Dundas Street West, south of the Erindale Secondary School and has a one-metre wide silt and detritus lined channel.

The fish community composition in Sawmill Creek is warmwater species. It is a Type 2 fishery at the route 1 crossing and Type 1 at the route 2 crossing, near the confluence with the Credit River.

Loyalist Creek

Loyalist Creek originates within the study area at Erin Mills Parkway north of Lincoln Green Way. Upstream of Erin Mills Parkway the watercourse is an engineered channel with armour-stone banks. Downstream, the watercourse flows through a naturalized channel, then into a buried pipe along Lincoln Green Way. The riparian vegetation along Loyalist Creek is favourable, with trees and shrubs providing shade to the watercourse. The watercourse emerges from the pipe downstream of Lincoln Green Way into a storm-water control structure, which is a major barrier to fish migration. In the vicinity of the connection to the existing trunk sewer, Loyalist Creek is an engineered channel with armour-stone banks.

Fish community composition in Loyalist Creek are warmwater species. It is a Type 1 fishery within our study area, and likely only to the storm-water control structure.

Table 2.1 in the Natural Sciences Investigation section of Appendix A provides a summary of existing fish communities within these watercourses. The Surface Water environment is discussed further in Appendix A under the natural science existing conditions report.

Figure 2–2 Environmental Features

2.2.3 Geology and Hydrogeology

Bedrock Geology

The bedrock of the general study area consists of a combination of shale deposits of the Queenston and Georgian Bay formations. Based on a review of available bedrock geology maps, the alignment of the proposed West Trunk Sewer is expected to closely follow the top of rock interface between the Queenston and Georgian Bay formation. Available background bedrock geology data suggest that the overburden soils within the northern and southern portions of the proposed route will be underlain by shale of the Georgian Bay Formation whereas the central portions of the proposed sewer route between about the CP railway level crossing on Argentia Road and Burnhamthorpe Road the overburden soils will be underlain by shale of the Queenston Formation, followed by shale bedrock of the Georgian Bay Formation at depth. The shale bedrock of the Queenston formation is predominantly red in colour and is known to contain inter-beds of significantly stronger dolostone, whereas the shale bedrock of the Georgian Bay formation is predominantly grey in colour and is known to contain inter-beds of significantly stronger limestone and sandstone.

The top surface of the bedrock is expected to generally be quite shallow within and immediately beyond the proposed trunk sewer alignment although it is known that the top surface of the bedrock contains down-cut former river valleys. Of particular reference to the present study, is one such deep bedrock channel that is known to be present roughly below the present day alignment of the Credit River. In addition to this main south flowing deep channel, more localized east/west flowing downcut “feeder” channels are often present immediately east and west of the main channel, even though their exact locations are not well known.

Surficial Geology

The overburden soils of the Toronto area in general, and proposed West Trunk Sewer limits are known to consist primarily of deposits that were laid down during the Quaternary period when much of Southern Ontario (and Canada) was glaciated. Specifically, the near surface deposits within the general area of the proposed sewer were deposited during the later stages of the Quaternary period, i.e., Wisconsinan period. During this period, a series of glacial till, glacio-lacustruce and glacio-fluvial sand, silt and clay materials were deposited on top of the underlying older till deposits and/or bedrock, including downcut bedrock channels that were largely in-filled with cohesionless materials as the elevation of their outfalls were submerged and/or blocked. Within the general limits of the proposed West Trunk Sewer to the north of the former Lake Iroquois Shoreline, this final layer of till deposits is referred to as the Halton Till that was laid down as a basal till. However, during the final retreat of the Ice Sheet from the study area a series of ice marginal lakes developed along the face from the retreating ice which led to the development of a series of generally thin glacio-lacustrine sand, silt and clay deposits on top of the underlying till and/or underlying shale bedrock that is known to be quite shallow immediately west of the Credit River to the south of Highway 403.

The prevalent deposits within the south limits of the proposed sewer as located to the south of the former Lake Iroquois Shoreline, i.e., approximate east half of the Lincoln Green Way/Lincoln Green Close segment are anticipated to consist of a relatively thin layer of surface

sand overlying a sequence of predominantly cohesive glacial till deposits. However, given that this area of the proposed sewer also protrudes into the anticipated limits of the infilled downcut bedrock channel that is known to be present in close proximity to the present day Credit River, some over-consolidated deposits of lacustrine clayey material and/or fine grained cohesionless materials should also be expected.

Subsequent to glaciation, modern alluvium deposits have developed within the floodplain areas of the surface creeks and in particular, within the wide floodplain area of the Credit River.

Hydrogeology

The primary source of regional groundwater flow within the immediate area of the proposed West Trunk Sewer is the topmost portion of the shale. However, the previously noted deep bedrock channel that is generally in-filled with a series of fluvial silt, sand and gravel deposits with a capping confinement layer of low permeability till serves as a significant source of groundwater immediately north of the north project limit.

Regional groundwater flow is generally from topographic highs toward the Credit River and then southerly toward Lake Ontario. Recharge through the surficial overburden soils in the vicinity of the West Trunk Sewer is expected to by quite low and generally less than 50 mm/yr, increasing to perhaps 200 mm/yr within the alluvial deposits of the Credit River floodplain.

2.2.4 Wildlife and Wildlife Habitat

A significant percentage of the fauna common to South-Central Ontario's urban centres are found in the study area. Many of these species are adapted to human landscapes and disturbance and may be found in agricultural and semi-urban settings. Pre-settlement species of large mammals were destroyed, or run out of the area due to the clearing of forests for agricultural and eventually urban use.

A list of the bird species in the study area was obtained from the City of Mississauga Natural Areas Survey (2006). A review of this list indicates most species are urban tolerant. Some interior species such as ovenbird (*Seiurus aurocapillus*), pileated woodpecker (*Dryocpus pileatus*) and redheaded woodpecker (*Melanerpes erythrocephalus*) are found in the Credit River valley corridor. Colonial or field species such as bobolink (*Dolichonyx oryzivorous*), and forest-edge species such as warblers are also found within this study area.

Various amphibians and reptiles, also called herpetofauna, are found in the study area. These include bullfrogs, map turtles and the eastern milksnake (*Lampropeltis triangulum triangulum*), a species of 'Special Concern' in Ontario. Several species of salamander, including the Jefferson Salamander (*Ambystoma jeffersonianum*), a species considered 'Threatened' in Ontario, are found within the Credit River valley corridor, indicating that there are high quality woodlots remaining in the area.

Environmentally Sensitive Areas (ESA)

Environmentally Significant Areas (ESA) represent another important repository or storehouse for significant natural heritage features within the study area and encompass a variety of known functions including aquifer recharge sources, headwaters, unusual or sensitive habitats, rare

species habitat, breeding and overwintering habitat and vital landforms. Several of these are described in Table 2.2 and further, in Appendix A.

These areas are recognized at local, regional, and provincial levels of government through criteria developed by Conservation Authorities such as the Credit Valley Conservation Authority, the Ontario Ministry of Natural Resources (MNR) and municipal governments. Land use outside of these designated areas includes residential subdivisions, existing remnant agricultural land, with some commercial and industrial use.

Table 2.1 ESA and ANSI within and adjacent to the Study Area

Name	Significance	Significant Attributes
Meadowvale Station Woods	Life Science ANSI, ESA	▪ Upland/lowland forest ▪ 25 ha
Creditview Wetland	Life Science Site	▪ Shallow marsh, hummock, thicket swamp, and open water wetland habitats ▪ locally significant waterfowl habitat ▪ 4.5 ha
Roy Ivor's Woodlot	Life Science ANSI	▪ Upland ravine ▪ 25 ha
Credit River at Erindale	Life Science ANSI, ESA	▪ River floodplain ▪ 140 ha ▪ Sycamore and Black Walnut trees
Credit River –Eglinton to Dundas	ESA	▪ Further info required
Stavebank Oak Woods	Life Science ANSI, ESA	▪ Upland and slope forest ▪ 12 ha ▪ Largest known stand of black oak (northerly)
Credit River Marshes	PSW	▪ Coastal wetland (marsh) ▪ 13.43 ha
Credit River Floodpalin at Reed Dam	ESA	▪ Further info required
Roy Ivor's Bird Sanctuary	ESA	▪ Further info required
Streetsville Woods	ESA	▪ Further info required

ESA – Environmentally Significant Area

ANSI – Area of Natural and Scientific Interest

Vulnerable, Threatened or Endangered (VTE) Species – Species at Risk

The Natural Heritage Information Centre (NHIC) keeps records of rare flora and fauna from various studies and investigations. Records of known but rare flora and fauna that are actively tracked by the NHIC are shown in Tables 4, 5 and 7 of the preliminary Natural Science Investigation, shown in Appendix A. The corresponding listings include rankings from the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), MNR and "S Rank" which provides information based on occurrences in Ontario. Due to the sensitivity of the actual

location where these species are found, these occurrences are referenced in the database as 1km by 1km blocks or centroids to provide a measure of protection for the species.

Fish Species at Risk

The NHIC lists several element occurrences of Redside Dace from 1954 to 1999. Redside Dace is a species recognized as 'Endangered' by COSEWIC and as 'Threatened' by MNR. It is protected under Schedule 3 of the Federal *Species at Risk Act*.

Wildlife Species at Risk

The NHIC database indicates that there were elemental occurrences of Jefferson Salamanders within the study area in 1975 and 1990. Endangered species such as Henslow's sparrow was documented in 1932. Several species of rare damselflies were also documented in the 1930s and 1940s.

2.3 Social, Economic and Cultural Environment

2.3.1 Land Use

As established in the description of the study area, above, the study area is well developed and consists largely of residential complexes, businesses and commercial centres. As is common in the Mississauga area, there are several educational and medical institutions, housing structures, schools, hotels and other businesses.

The Credit River Valley is known for its ecological importance, with the existence of several ESA, ANSI and VTE Species, as well as its recreational activities, including canoeing, kayaking, hiking, bird watching and fishing. The vegetation in this valley is also important in preventing erosion during flood periods, and maintaining the stability of the ground for houses near the riverbanks.

2.3.2 Traffic and Road Use

Within the study area the major north/south arterials are Mavis Rd and Erin Mills Pkwy, with Creditview Rd/Erindale Station Rd and Mississauga Rd being the other throughways considered as part of the alternative alignments. Mavis Rd and Erin Mills Pkwy are multi-lane regional roads and as a result experience higher volumes of traffic than Creditview Rd and Erindal Station Rd, which are 4-lanes, and Mississauga Rd, which is two-lane. Introducing heavy construction traffic on Creditview Rd, Erindale Station Rd and Mississauga Rd poses a significant impact to local traffic as they are used primarily as collector routes for residential traffic to access the connecting arteries.

Argentia Road, Britannia Road, and Dundas Street West were identified as east/west components of the various routes. Argentia Road is a 5-lane collector servicing primarily industrial and office properties, with large boulevards and parking adjacent the right-of-way. Britannia Road and Dundas Street are high traffic, 7-lane arterials servicing a variety of commercial, industrial, retail big box, and high and medium density residential areas. The population density generally increases from north to south in the study area and as such traffic volumes also increase on the southern routes. Within the City of Mississauga the east west arterials generally see higher

traffic volumes than the north south counterparts as they are utilized by commuter traffic as alternatives to the QEW, and Highways 403 and 401.

2.3.3 Archaeological and Heritage Features

The Stage 1 archaeological assessment of the Proposed West Trunk Sewer study area was conducted in July of 2007 and has identified three significant cultural heritage concerns which should be considered during the Class EA process. These include:

1) The presence of forty-nine registered archaeological sites within the study area.
2) The high archaeological potential of the study area, both for pre-Contact and Historic-era remains.
3) The high potential for further cultural resources within the study area, including both built heritage and cultural landscape features.

Based on the results of the Ontario Ministry of Culture Archaeological Sites Database, it was determined that the majority of the forty-nine registered archaeological sites are located to the east of Mississauga Road. Areas of concentration appear to be along the Credit River, Mississauga Road, and between Eglinton Ave. W. and Britannia Rd. W. As such, the western portion of the study area clearly provides a more suitable option for the proposed alignment of the West Trunk sanitary sewer system.

At the time of the study, a visual survey of the study area was carried out in order to determine the extent to which the modern land uses and the rapid urbanization may have impacted its archaeological potential. Several examples of modern disturbances to the natural terrain were noted. These include: sidewalks (Plate 8), modern roads (Plate 9), residential, commercial and industrial developments, educational and religious institutions, landscaped parks, and golf courses. It must not be assumed, however, that the existence of any of these disturbances removes all archaeological potential from the areas where they are present. Confirmation of this can only be achieved through a Stage 2 archaeological survey. As such, it is recommended that a Stage 2 archaeological assessment be conducted, prior to construction, on any lands to be impacted by activities relating to the proposed construction of the West Trunk sanitary sewer system.

The high potential for further cultural resources was determined by examining the heritage inventory of the City of Mississauga.

2.4 Agricultural Environment

Based on an evaluation of the study area, a review of the Region of Peel's existing *Water and Wastewater Servicing Master Plan for the Lake Based System, 1999* and *Official Plan, 2001*, as well as feedback from the Ministry of Agriculture, Food and Rural Affairs, reveal that there are no significant agricultural areas within the study area.

A small area of agricultural land lies within the north limit of the study area, just east of Creditview Road.

2.5 Technical Environment

2.5.1 Existing Utilities and Infrastructure

Within the study area, the existing infrastructure and utilities include major highways such as Highways 401, 403, and the QEW, hydro and utility corridors, municipal and regional roads, water and wastewater lines, gas lines, and telephone and cable lines.

Typically, the following utilities are contained in the road right-of-ways;

- municipal sanitary and storm sewers;
- small to medium diameter distribution watemains;
- local hydro lines (buried and overhead);
- small diameter natural gas mains; and
- cable / telephone lines.

There are some roadways within the study area, most notably Mississauga Rd, that are not urbanized, and utilize shoulders and ditches to handle stormwater as opposed to curb and gutter, catchbasins and storm sewers. The majority of the roadways however, have both storm and sanitary sewers located within the paved roadway. Depending on the space constraints and location of other utilities the preferred location of the distribution watermains is in the boulevards, however in many cases this is not possible and therefore they are located in the paved roadway. The standard placement of gas mains is 0.9m from the property line and depending on the area can be on one or both sides of the street. Hydro lines within the study area are for the most part located on poles with some buried services. Cable and telephone lines are located both on the hydro poles and direct buried through the area.

Hydro Corridor - Immediately north of Highway 403, extending parallel to the highway, is a hydro corridor that falls under the Highway Park Belt Plan Area (HPBPA) and extends across the study area, beyond Mavis Road in the east and Erin Mills Parkway in the west. The HPBPA extends further, on the east and west sides of the Credit River, in this area, immediately north and south of Highway 403. Within this area are high voltage power lines and an oil pipeline.

Sanitary Sewers – The existing Credit Valley Trunk sanitary sewer extends throughout the study area from the QEW in the south, to Highway 401 in the north. The sewer is primarily located within the Credit River Valley and has numerous watercourse crossings along its length. This sewer has experienced areas requiring repairs and protection from the meandering Credit River. The majority of all streets and roadways within the study area also have local collector sanitary sewers that connect into sub-trunk sewers and then into the existing Credit Valley Trunk sanitary sewer.

Watermains – There are trunk Regional Feedermains located within the Erin Mills Road allowance with connections into the Erin Mills Reservoir and Pumping Station. There are also local distribution watermains located on the majority of streets and roadways within the study area.

3. Alignment Alternatives

The alternative alignments were identified in the early stages of the EA process following a detailed review of the study area extending from Highway 401 to the north, the QEW to the south, Erin Mills Parkway to the west, and Mavis Road to the east. Orthographic images and site visits were utilized to conceptually identify the routes that would be suitable for construction of the project by applying the set screening criteria. The possible routing alternatives included existing transportation corridors, open spaces, utility and hydro corridors.

3.1 Screening Criteria

The screening criteria were based largely on the categories of; the natural environment, land use, social and cultural environment, financial, and technical feasibility.

Screening and evaluation criteria have been developed to address the natural environment as well as social, cultural, economic and technical aspects of the study. A more detailed discussion on the evaluation criteria is presented in Section 4.2. The preliminary screening criteria listed below provided for a short-listing of suitable alternatives. Where impacts were unavoidable the mitigation measures were identified and factored into the selection process.

Natural Environment

The study area includes lands both within and adjacent to the Credit Valley River and tablelands. The affiliated ecosystem and the related natural environment are sensitive to certain changes. The following features were used as flags.

- Vulnerable, Threatened or Endangered (VTE) species
- Designated Natural Heritage Areas
- Vegetation
- Groundwater Recharge/Discharge Areas
- Watercourses and Fisheries

Social, Cultural and Economic Environment

The City of Mississauga is known for its cultural and historical attractions, including Museums, Art Galleries and Historical Sites, such as the community of Streetsville. The Region is also highly developed in terms of residential, commercial and industrial areas as well as various institutions. Criteria for screening included the following features.

- Residential Buildings
- Recreational Areas
- Traffic Impacts
- Archaeological Sites and Cultural Areas
- Private Properties
- Private Wells
- Future Planning Policies

Technical Feasibility and Financial

The technical feasibility of a project greatly affects all other aspects of the project and as such must be given careful consideration. Generally speaking technical difficulties associated with

construction can be mitigated resulting in an increase to cost. Technical complexity of a project can increase the potential risk to human life, the environment, and traffic, which must also be evaluated. Criteria for screening included the following features.

- Impact on Existing Utilities
- Impacts within Existing Infrastructure Systems
- Compatibility with Existing Infrastructure Systems
- Ease of Construction
- Capital Costs
- Operating and Maintenance Costs

Figure 3–1 Alignment Alternatives

3.2 Alignment Alternatives

In applying the above screening criteria, the following shortlist of potential alternative alignments were developed.

3.2.1 Alternative 1, Erin Mills Parkway

- Starts at Credit Valley Trunk Sewer section, northeast of Creditview Road and Highway 401;
- South along Creditview Road to Argentia Road;
- West along Argentia Road to Erin Mills Parkway;
- South along Erin Mills Parkway to Sheridan Park Drive, which turns to Lincoln Green Way east of Erin Mills Parkway; then
- East along Lincoln Green Way to Lincoln Green Close, then beneath the Credit River to the existing Credit Valley Trunk Sewer through the Hydro corridor.

3.2.2 Alternative 2, Creditview Road and Mississauga Road

- Starts at Credit Valley Trunk Sewer section, northeast of Creditview Road and Highway 401;
- South along Creditview Road to north of Highway 403 (hydro corridor);
- West along Highway 403 to Mississauga Road; then
- South on Mississauga Road to 500 m south of Dundas Street

3.2.3 Alternative 3, Credit View Road and Dundas Street West

- Starts at Credit Valley Trunk Sewer section, northeast of Creditview Road and Highway 401;
- South along Creditview Road, continuing on to Erindale Station Road, which is the southern continuation of Creditview Road, to north of Dundas Street West;
- West along Dundas Street West to Mississauga Road; then
- South on Mississauga Road to 500 m south of Dundas Street

3.2.4 Alternative 4, Mavis Road

- Starts at Credit Valley Trunk Sewer section, northeast of Creditview Road and Highway 401;
- South along Creditview Road to Britannia Road;
- East along Britannia Road West to Mavis Road;
- South on Mavis Road to south of Queensway West (north of QEW);
- Southwest across the Credit River at the Mississauga Golf and Country Club; then
- East along the south side of Mississauga Road to 500 m south of Dundas

3.2.5 Alternative 5, Credit River Valley

- Starts at Credit Valley Trunk Sewer section, northeast of Creditview Road and Highway 401;
- South along Creditview Road to the existing trunk sewer north of Britannia Road West; then
- South along the existing trunk sewer to 500 m south of Dundas

4. Evaluation of Alternative Alignments

4.1 Approach to Assessing Alternatives

The evaluation criteria for this study focused on minimizing environmental, social, cultural, and land use impacts, as well as considering cost and technical suitability. In assessing alternative alignments, the alternatives were compared on the basis of each criterion. In addition, the intent of comparing alternatives based on a variety of criteria was to identify potential impacts, and where possible, avoid them. In some cases, this may not be possible and action was proposed to address and mitigate the impacts. Detailed evaluation criteria are presented in the following section.

The alternatives were rated by color as green for “most preferred”, yellow for “moderate” and orange for “least preferred” for each of the screening criterion

4.2 Evaluation Criteria

The evaluation criteria mentioned briefly in Section 3.1, represent a more focused and refined representation of the screening criteria, and have been utilized in the selection of the Preferred Alternative.

For each criterion and for each possible alignment, the potential effects on the environment (natural, social, etc.) were identified and evaluated relative to the other alternatives as being most preferred, moderate, or 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. The following considerations were taken into account:

- Natural Environment – Protection of the physical features of the environment (e.g., water, air, land, vegetation).
- Social/Cultural Environment – Residents, neighbourhoods, businesses, community characteristics and heritage features of the area.
- Technical – Technical suitability and constructability.
- Financial – Capital and operation/maintenance costs.

Mitigation measures were identified to avoid or minimize any potential negative effects, as discussed in Section 5. The selection of the preferred route is based on the relative advantages and disadvantages of the net environmental effects, including the results of applying mitigating measures.

Table 4.1 provides a summary of the key evaluation criteria applied to each of the alternative alignments.

Table 4.1 Evaluation Criteria

Environmental Feature	Criteria
Natural Environment	Watercourse crossings Environmentally Sensitive Areas (ESA) Areas of Natural Scientific Interest (ANSI), Provincial or Regional significance Vunerable, Threatened and Endangered Species (VTE Sp.) Environmentally Sensitive Species (ESS) Greenspaces Residential woodlands Provincially significant wetlands and other wetlands Potentially contaminated sites
Socio-cultural Environment	First Nation impacts Other heritage or archaeological sites Land use Noise and dust Traffic Recreation Safety Impact on other Planning Initiatives Public and agency support and feedback
Technical Environment	Construction methodology and route profile (tunnel versus open-cut) Route width (traffic obstructions) Route is fairly straight Substrate for tunnelling (or open-cut) – tbd Availability of shaft / staging areas Easement requirements Ability to interconnect to existing sewer network Soil and groundwater conditions
Construction Feasibility	Duration Construction constraints Existing utilities
Costs	Capital costs Restoration costs Property and easement acquisition costs Permits and approvals costs

4.3 Comparative Evaluation of Alternatives

Figure 4-1 presents the detailed assessment of South Alignments 1 through 5 for each of the criteria listed in Table 4-1. A summary of the key considerations for each group of criteria is presented below. In comparing these alignments, significant consideration was given to potential natural environment impacts, traffic impacts, dewatering requirements, and impacts on surrounding residential areas and private properties. It is important to note that dewatering requirements will be further assessed during the detailed design phase, and comments herein are based on preliminary information.

Preliminary profiles were developed for each of the alternatives to establish the potential depth of construction required for the sewer along each alternative alignment. As there is a fixed elevation at both the upstream and downstream connection locations, a preliminary sewer profile was developed. All Alternatives with the exception of Alternate 5 will require the sewer to be constructed in tunnel. Generally, it is not feasible to complete construction of major sewer projects by open cut methods when the depth of excavation exceeds 10m. For the Alternatives that are located outside of the Credit River Valley, the depth of the sewer ranges from 20m to 50m in depth which will result in construction utilizing tunneling methods.

The comparative evaluation of the alternatives identified Alternative 1 as preferred, having the least environmental impact, while being the most technically feasible and cost effective of the alternatives. Notwithstanding the multiple creek crossings associated with Alternative 1, it was identified as having the least impact to the natural environment as all the crossing will be completed in tunnel within the bedrock. There is a potential exception with the Loyalist Creek Crossing located at the south connection to the Credit Valley Trunk Sewer as the tunnel will be limited to 4-5 m of cover to the creek invert and may not be feasible. There are also no crossings of the Credit River, which was heavily weighted in the evaluation. All of the other alternatives have crossings of the Credit River, which, depending on the location, may have to be completed by open cut. Alternative 5 follows the Credit River alignment and thus is the least preferred in the evaluation of the natural environment, because it is largely open-cut and thus directly impacts many of the ecological features found directly within the Credit River Valley.

In terms of socio-cultural impacts, Alternative 1 has no archaeological sites, while approximately forty-three (43) have been noted within the study area, within the vicinity of Alternatives 2, 3 and 4. A Stage 2 archaeological study would be required to verify these findings. Alternatives 2, 3 and 4 also adversely affect the City of Mississauga's road renovation plans, and Alternative 3 would disrupt the function of the Erindale Train Station during construction.

Impacts to Natural Environment

The majority of the environmental impacts associated with the construction of the West Trunk Sewer have potential effects on the Credit Valley and River, tributaries and adjacent naturalized areas. As the backbone of the natural environment in the study area, direct impacts to the Credit River carried the most weight in the evaluation. Alternative 5 is located within the Credit Valley and requires multiple crossings of the river and as such it was determined to have too great an impact to be considered a viable alignment for this EA.

Alignment 1 is the only alternative with no direct crossing of the Credit River, which was one of the primary factors in its selection as the preferred alternative. All other Alternatives require one or more crossings of the Credit. The impacts associated with each individual crossing cannot be specifically identified without a detailed analysis of the tunnelling methodology and dewatering requirements, which is not in within the scope of this report. Regardless of the extent of impacts, crossings of Credit River were heavily weighted in the evaluation process.

Figure 4–1 Evaluation Matrix

The construction of tunnel shafts and temporary compounds is the other element of the project with potential impacts to the environment. Alignment 1 is the least developed of the alternatives and has the most flexibility in shaft locations allowing for the selection of sites with minimal impact. There is significant vegetation and wooded areas lining Alignment 2, along Mississauga Road. The narrow road right-of-way provides limited options for tunnel shaft locations making it likely that significant tree / shrub clearing would be required to accommodate the shaft construction and staging of material. Alignments 3 and 4 are similar in their impacts to the natural environment having two crossings of the Credit River and Valley.

The south connection to the existing Credit Valley Trunk Sewer is located off the Mississauga Road right-of-way within the east floodplain of Loyalist Creek. This work will require an extensive siltation control and restoration program subject to Credit Valley Conservation Authority. Alignment 1 requires a crossing of the Loyalist Creek as it continues west to Erin Mills Parkway. The crossing methodology will be determined during detail design once the exact elevations and subsurface ground conditions are confirmed however; the conditions may require open cut construction at this location requiring additional mitigation measures. The creek is channelized with rip rap and there is an existing concrete encased utility in the creek bed.

Impact to Socio-Cultural Environment

Alignment 1 was determined to have the least impact to the socio-cultural environment having no heritage / archaeological sites identified in the area, while alignments 2, 3 and 4 have 43 documented archaeological sites between Britannia Road and Eglinton Avenue potentially affected. There is high potential for encountering heritage / archaeological finds within the Credit Valley as well as significant impacts to the hiking / biking trail network associated with Alternative 5. The City of Mississauga also has planned naturalization and rehabilitation initiatives for areas of the Credit Valley that would be impacted by the sewer construction. There are significant impacts associated with Mississauga Road as it is a designated Heritage Site for the section falling within Alternative 2. The traffic impacts are magnified on this route as it is two-lane for a substantial portion of the route, making mitigation less effective. Alternatives 3 and 4 have moderate socio-cultural impacts being located in areas with higher densities of residential and commercial / industrial properties than Alternative 1. Both Alternative 3 and 4 have east /west components on high traffic arterials, Britannia Road and Dundas Street respectively, which are utilized by commuter traffic as alternatives to the QEW, Highway 403 and Highway 401. The change in alignment would require shaft locations in close proximity to the major intersections, increasing the impact to traffic due to the introduction of construction traffic and site entrance / egress.

Currently there are a number of existing undeveloped properties along Erin Mills Parkway that could be utilized for shaft construction and temporary mining compounds that do not exist on the other Alternatives. This provides the opportunity to be more selective when choosing shaft locations to ensure that the impacts are minimized.

Technical & Operational Impacts

The technical issues associated with the project that were evaluated for the selection of the preferred alternative are the availability of shaft / staging areas, easement requirements, life cycle

and the ability to interconnect to the existing sewer network. Alternative 1 is preferred in terms of all the technical aspects of the project. It has the most options for shaft locations and larger compound and staging areas reducing the impacts to the other evaluation criteria. The easement requirements are minimized, being limited to shaft locations adjacent to the road right-of-way and the hydro corridor at the south end. Alignments 2 and 3 have very few potential shaft / compound locations along the right-of-way, leading to the selection of locations that could be less than ideal and potentially having a greater impact on the other criteria. There is potential to intercept existing sub-trunk sewers in the southern section of Alternative 2, while 3 and 4 are limited in the ability to interconnect to the existing sewer network.

Alignment 5 poses a different set of technical difficulties as it would have to be constructed in part by open cut. There is very limited space for the staging of material and numerous easements would be required for the construction traffic and hauling routes. An existing easement was obtained for the possible twinning of the Credit Valley Trunk Sewer; however much of this easement is no longer suitable for the alignment as it has been identified as interfering with the natural meander of the Credit River. The potential to connect to the existing trunk sewer notwithstanding, there is little technical merit to the selection of Alternative 5 as the preferred alternative.

Constructability Impacts

The constructability impacts associated with Alignments 1, 2 and 3 are very similar as they take approximately 3 years to construct and will be completed predominantly by tunnel in favourable bedrock conditions. Alignments 2 and 3 will potentially require more open cut installation in areas of lower elevations including crossings of the Credit Valley and the southern section of Mississauga Road. There are significant construction constraints associated with the locations of tunnel shafts and compounds on Alternatives 2 and 3 in contrast to Alternative 1 having multiple site options. The section within the existing Hydro corridor north of Hwy 403 in Alternative 2 poses issues dealing with existing infrastructure, and future plans for a rapid transit line that has been proposed for that area. Alternative 1 is preferred in terms of constructability as it has the least constraints in comparison to the rest.

Alternatives 4 and 5 have major constructability issues that greatly impact their viability as potential trunk sewer alignments. There is variable ground conditions expected along Alternative 4 with portions of the tunnel within the bedrock and others encountering sand pockets. This is a serious technical difficulty as tunnel boring machines are specifically selected for the ground conditions and are not typically suited for both rock and soils. There may also be greater requirements for dewatering in these areas if sand and silt is encountered. After further evaluation of Alignment 5 for the section south of Dundas Street it was determined that it is not technically possible to make the sewer grades compatible with the existing Credit Valley Trunk Sewer as the ground elevations of the Credit Valley are too low at the proposed crossing location, rendering the route not feasible without revisiting the south alignment.

Following the existing Credit Valley Trunk sewer alignment poses a number of constructability issues that are unique to Alternative 5. There is very limited access to the construction areas and designated haulage routes would need to be constructed and maintained. Working within the floodplain of the Credit River increases the risk of flooding of the excavation and working area and extensive mitigation measures will need to be maintained for the duration of the project. As tunnelling would not be an option for some of the Credit River crossing locations due to lack of

cover the project would be subject to Fisheries timing restrictions for in-water works. It is expected that there would be significant dewatering requirements, especially in areas where saturated aquifer deposits are encountered.

Cost Assessment

It is generally accepted that open cut construction is more cost effective than tunnelling, however there are significant technical and environmental issues associated with Alternative 5 that greatly reduce the cost savings. There is also potential for encountering conditions during construction not anticipated during the design that could cost addition money to contend with.

The cost of the tunnelling alternatives is a function of the total length of the route, and the spacing of the shafts as the longer the distance between shafts the higher the unit cost will be. There are some minor differences associated with the alignments that will affect the cost including dewatering and surface preparation (compounds and shafts). Alternative 1 is the shortest tunnel route, and is the most cost effective at $77M. Alternatives 1, 2 and 3 fall in the middle of the pack at $87M, $87M, and $89M respectively, with Alternative 4 being the highest at $109M. These cost estimates are preliminary and a detailed cost estimate will be completed in the detailed design phase.

4.4 Preferred Alignment

The preferred or recommended alignment is Alternative 1, along Erin Mills Parkway. This route was selected as it has been found to have the least impact on the natural, socio-cultural and environmental impacts, and is the most feasible in terms of construction. The estimated capital costs are comparable to the other alternatives, but overall, this alternative provides the most favourable solution.

Figure 4–2 Preferred Alignment Alternative

5. Evaluation of Alternative Designs

5.1 General

The preferred alignment for the West Trunk Sewer is the Erin Mills Parkway – Alternative #1 route. This alignment will connect to the recently constructed Credit Valley Trunk Sewer on the east side of Creditview Road, north of Highway 401, extend south along Creditview Road, west along Argentia Road, south along Erin Mills Parkway, and then east along Lincoln Green Way and Lincoln Green Close to connect into the existing West Trunk Sewer on the west side of Mississauga Road.

To establish the ground profile along the proposed sewer route and to evaluate alternative designs and construction techniques, a topographical survey was completed along the preferred alignment. As the elevations are fixed at both of the connection locations, a gravity sewer profile was generated assuming a constant grade along the sewer alignment. It was determined that the sewer depth ranged from 10m at the northern connection point, to up to 60m in depth at the mid-point along Erin Mills Parkway. The preliminary sewer plan and profile is shown on Figure 5-1, which illustrates the ground surface and sewer elevation.

An important factor in evaluating construction techniques and methodologies is to understand the soil conditions that the sewer will be constructed in. A geotechnical investigation was completed which included drilling boreholes to sample and classify the soil as well as to confirm elevations of the bedrock. This information was also supplemented with previous geotechnical investigations within the area completed for other infrastructure projects. Based on the results of this investigation, it was determined that the shale bedrock is relatively close to the ground surface along the majority of the alignment and that the gravity sewer construction would therefore be entirely within the shale bedrock. The approximate elevations of the bedrock in relation to the sewer depth is shown of Figure 5-1.

5.2 Alternative Design/Construction Techniques

5.2.1 Open-Cut Construction

Sewer installation by open-cut construction is a common construction technique that involves the excavation of a trench from the surface utilizing excavators. 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. The trench is excavated to the required depth, the sewer pipe 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 10m due to equipment restrictions, safety concerns, and economical feasibility. 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.

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

Based on the profile of a gravity sewer for this alignment, the sewer depth ranges from 10m to 60m. This is necessary due to the connection requirements at the north and south limits of the project. In addition, based on the preliminary geotechnical investigation, the sewer will be installed within the shale bedrock. As this material is not easily excavated and the depth of the sewer is significant, the option of constructing the sewer by open-cut construction is not feasible. It will be necessary however, to complete the connection to the existing West Trunk Sewer at the southern limit of the project by open-cut construction.

5.2.2 Pumping Station/Forcemain

As an alternative to an entirely gravity sewer system, pumping stations and sewer forcemains could be considered in combination with shallow gravity sewers. The advantage of this option is the reduced depth of the gravity sewers, which would enable the sewer to be installed at shallower depths by open-cut construction. This option would require the construction of a large sewage pumping station, or a series of pumping stations, to lift the sewage from depth, to a shallow gravity sewer.

There are a number of negatives associated with this option including the possibility of sewage spills due to power failures, extensive impacts on traffic due to open cut construction, social impacts on adjacent properties, cost and property requirements for the construction of a significant sewage pumping station to accommodate the projected flows, and high on-going operations and maintenance costs.

The option of pumping stations and forcemains were not the preferred solution for the twinning of the West Trunk Sewer in the Water and Wastewater Master Plan and have not been evaluated further.

5.2.3 Tunnelling

The construction of deep gravity sewers 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 material that the tunnel will be mined through and whether groundwater is a consideration. Based on the geotechnical conditions at the depth of the sewer being shale bedrock, and the length of tunnel to be constructed, a Tunnel Boring Machine (TBM) will likely be the method of construction to be employed on this project.

The conventional TBM includes the front face comprising of 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 sewer.

As this tunnel is expected to be completed entirely within the shale bedrock, it is likely that the tunnel will be completed using a rock tunnel boring machine. This machine utilizes cutting discs at the face of the machine to score and break the rock. This is collected at the front of the machine and through the use of conveyors, the material passes through the body of the machine

and deposits the excavated material into “muck cars”. These cars travel back and forth to the mining shaft on a rail system installed on the bottom of the tunnel and are powered by a small locomotive. With the tunnel being in rock, it is also likely that a primary liner of steel ribs and wood lagging will not be used but rather a system of crown rock bolts and steel wire mesh installed on the crown of the tunnel.

This method of tunnelling cannot deal with excessive amounts of groundwater. If it is expected that groundwater is a concern then advance dewatering will be necessary. Based on the preliminary geotechnical investigation however, the tunnel is expected to be in solid competent shale bedrock and below the 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 this project by tunnelling, the sewer installation will have relatively minor impacts on traffic, environmental, or construction related impacts. The only sign of construction will be at the shaft locations where the excavated material will be removed and the final lining system installed.

5.3 Environmental Impacts

The environmental impacts associated with the preferred alternative were evaluated as being the least severe with the greatest potential for mitigation. Although having multiple crossings of tributaries that flow into the Credit River, this alignment has no direct crossings of the Credit River. In addition, all crossings of these watercourses will be completed in tunnel deep within the shale bedrock and therefore will have negligible impact. The connection to the existing sewer at the southern limit of the project falls within the floodplain of the Loyalist Creek. At this location Loyalist Creek is a channelized watercourse, which increases the effectiveness of mitigation measures and reducing the impacts. Erosion control measures will be implemented to prevent construction runoff from entering into the watercourse.

As the sewer is expected to be entirely within the bedrock it is not anticipated that major dewatering will be required for the tunnel, however it is anticipated that minor dewatering will be encountered where isolated fissures or fractures provide conduits to transport groundwater into the tunnel. It is also expected that localized dewatering may be necessary at construction shaft locations and at the southern connection location. Preliminary dewatering requirements are detailed in the desktop Hydrogeological Report in Appendix D; however a comprehensive dewatering program will be completed during the detailed design phase.

5.4 Design / Construction Consideration

5.4.1 Sewer Design Consideration

The need for the West Trunk Sewer twinning was identified in the long term planning in the Region’s Water and Wastewater Master Plan. As development and growth continues in areas in Mississauga and Brampton, sewer modelling indicated that the existing sanitary sewer system would not have adequate capacity to accommodate the anticipated sewage flows. The Master Plan considered the overall drainage area for the West Trunk sewer and developed projected flows to 2031. Based on the preliminary sewer modelling, the size of the West Trunk Sewer was

established as an 1800mm diameter sewer. Confirmation of the size of the sewer is required during the detailed design.

The sewer will be a gravity sewer constructed of either a cast-in-place concrete, or pre-cast concrete sewer.

Connections to Existing Sewers

The overall twinning and extension of the Region of Peel western sanitary sewer system is being completed in stages to spread the capital cost over a number of years. The northern extension of the sewer, the Credit Valley Trunk Sewer, began construction in 2007 and is expected to be completed to Mississauga Road and Queen Street by the spring of 2010. This sewer is providing sewage servicing to development areas in northwest Brampton. The sewer has a temporary connection to the existing West Trunk Sewer on the north side of the Highway 401, east of Creditview Road. A connection stub has been left in this area for the future connection to the new West Trunk Sewer. Once the proposed sewer has been completed, a bulkhead will be removed in the stub, and a new bulkhead installed in the temporary connection so that the Credit Valley Trunk Sewer flow will be directed to the new sewer.

At the southern connection point near Loyalist Creek and Mississauga Road, a new transition structure will need to be designed and constructed over the existing sewer. As there is no existing manhole at this location, the connection structure will need to be hydraulically designed to merge the new sewage flows into the flow in the existing sewer. The logistics of the connection procedure will also need to maintain the flows in the existing sewer at all times.

Manholes

Historically, municipal sanitary sewer systems typically had a maximum spacing of maintenance holes of approximately 100m or at locations where there was a change in direction of the sewer. This was to facilitate limitations in equipment used to inspect and/or facilitate cleaning or repairing of the sewers. This standard is still used in open-cut construction projects, however, where projects are completed in tunnel the distances between manholes are less rigid. Sewer inspection technologies have improved significantly and no longer is a controlling factor in determining manhole spacing. In tunnel projects, the manhole locations are controlled more by the locations of connections, or construction shafts. On this project, the locations of manholes will be dictated by the construction shaft locations to minimize construction costs and also to minimize land requirements. Manholes will typically be 1500mm/1800mm in diameter and will be installed within the vertical construction shaft. The remaining void around the manhole will be backfilled with compacted material. Safety platforms will also be installed at 5m intervals for the depth of the manhole.

5.4.2 Tunnel Design Considerations

As previously discussed, it is expected that the tunnel will be constructed within the shale bedrock utilizing a rock Tunnel Boring Machine. Tunnel support will likely consist of roof rock anchors and steel mesh. The final sewer will be either a cast-in-place liner or a pre-cast sewer pipe installed after the tunnel has been completed. The tunnel will be located within the existing road allowance, with the exception at shaft locations. Limitations on the tunnel turning radius may result in the tunnel not always being at a typical offset from the property line. During construction of the tunnel, alignment holes will be drilled from the surface along the route to

ensure the tunnel is in the design location. As the Tunnel Boring Machine passes the alignment hole, if necessary, adjustments are made and any errors are corrected.

Construction Shafts/Working Compounds

Tunnel construction shafts are required along the tunnel alignment for a number of tasks including but not limited to:

- Launching the Tunnel Boring Machine (TBM);
- Turning the TBM at sharp alignment deflections;
- Removing excavated material from the tunnel;
- Supplying construction materials, power, and ventilation into the tunnel; and
- Removing the TBM.

Ideally, construction shafts are provided approximately every 1 to 1.5km along the tunnel alignment. This distance can be increased; however, production rates typically drop when the distance from the shaft to the tunnel face increases.

The tunnel access shafts are located within a working compound, which is usually enclosed by plywood hoarding and a lockable gate to create a secure and defined work area. Site offices, construction equipment, construction materials, excavated material, storage trailers, vehicles, etc. are all located within these working compounds. The preferable size for a working compound is approximately 5,000 m^2, however, it is recognized that this is not always possible. Typically, a contractor will require more space at key compound locations where the main mining operation is undertaken. At an intermediate mining shaft this area could be significantly reduced since the compound may only be used for a crane and a few construction materials. As the construction methodology varies between contractors, it is generally advisable to obtain as large an area as possible to accommodate the different approaches.

In identifying potential shaft/working compound locations along the preferred route, the following criteria were established;

- Utilize vacant land as much as possible, or land that is not slated for immediate development,
- Locate shaft/working compounds away from the travelled portion of the roadway to minimize impacts on traffic,
- Situate shafts at a distance of 1 to 1.5km in distance,
- Avoid locations close to watercourses or other sensitive features,
- Ensure that the shaft location and manhole construction does not impact the ability to develop the property in the future,
- Negotiate with property owners to avoid the necessity for expropriation.

Figure 5–1 Preliminary Sewer Plan & Profile

5.4.3 Preliminary Design

Preliminary plan and profile design drawings have been prepared for the Erin Mills Parkway alignment. These drawings are included in Appendix XX and illustrate the proposed design depth, topographic elevations, surface features including buildings, roadway, and property lines.

5.4.4 Capital Cost Estimates

A detailed cost estimate was completed for the Erin Mills Parkway alignment taking into consideration current construction pricing trends and contingencies. The estimated capital cost associated with this preferred alternative is $87M.

Figure 5–2 Tunnelling Equipment

5.5 Approvals and Land Acquisitions

5.5.1 Easement Requirements

The preferred trunk sewer alignment will be constructed primarily by tunneling, which significantly reduces the size of the work area required when compared to open-cut methods. For the tunnel operation, surface impacts will generally be limited to shaft / compound locations and alignment hole locations. The proposed trunk sewer alignment primarily follows existing Regional and City road right-of ways. It is anticipated that alignment holes will be installed within the right-of-way, however, most of the shaft and working compound locations will need to be located outside of the right-of-ways to minimize impacts on traffic. Therefore, the easements required for the construction of this alternative are specific to the shaft / compound locations.

5.5.2 Permanent and Temporary Working Easements

Temporary working easements will be required at the majority of working compound locations. As discussed above, the required size of the easement will vary depending on the location, and size and conditions of the site. For example, the proposed compound footprint will avoid buildings, large trees and other obstacles as much as possible.

Tunnel access shafts are generally positioned as close to the right-of-way as possible in order to minimize the required curves in the tunnel. This also aids in reducing the amount of permanent easement requirements. A 10 m wide permanent easement centered over the trunk sewer will be required wherever the alignment is outside of the right-of-way, which usually occurs at shaft locations. Once the tunnel is complete and the sewer is installed, manholes are constructed within the shafts. Therefore, the access points for the Region’s maintenance and operations staff will also be located within these permanent easements.

5.5.3 Proposed Compound Locations

The following is a summary of the easements required at each of the proposed compound locations. The locations of the compound locations are illustrated on Figure 5-2.

Figure 5–3 Proposed Compound Locations

Compound No.	Location	Landowner
1	East end of Lincoln Green Close	City of Mississauga
2	SE corner of Lincoln Green Way and Erin Mills Parkway	Hydro One
3	NE corner of Dundas Street and Erin Mills Parkway	Peel Distric School Board
4	West side of Erin Mills Parkway north of Burmanthorpe Rd	City of Mississauga
5	SE corner of Eglinton Avenue and Erin Mills Parkway	Region of Peel
6	SE corner of Thomas Street and Erin Mills Parkway	Region of Peel
7	East side of Erin Mills Parkway north of Britannia Road	Orlando Development Corporation
8	SE corner of Argentia Road and Erin Mills Parkway	Wal-Mart Canada
9	North side of Argentia Road	City of Mississauga
10	East of Creditview Road at Argentia Road	David Harris (Private Resident)
11	East of Creditview Road north of Highway 401	MTO

Individual consultations have been held with each of the landowners of the proposed compound locations. Preliminary agreements have been established with the understanding that detailed discussions will occur during the detailed design phase.

5.6 Approval Requirements

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. The key permits required are indicated in Table 5.6 and the typical approval review duration is indicated.

City of Mississauga

Construction of the project is completely within the City of Mississauga. In addition, construction will occur along City streets and compounds will be located within City property. Approvals and reviews will be required by the City to ensure that municipal standards, guidelines and by-laws are adhered to. Detailed Traffic Management Plans will be developed during the detailed design stage, including an outline of all lane closures and detour routes, and will be subject to City of Mississauga review and approval.

Credit Valley Conservation Authority

Credit Valley Conservation Authority (CVCA) approval is required under Ontario Regulation 166/06 for any development, interference with a wetland, alteration of a shoreline or a

watercourse. The CVCA has registered "Regulations Lines" associated with several watercourses on Erin Mills Parkway and the Loyalist Creek adjacent to Mississauga Rd. Fill excavation or fill placement within the Regulated Area, construction of any structures within the Regional Storm Floodplain or alteration of any watercourse requires a "Development, Interference with Wetland, Alteration to Shoreline or Watercourse" permit prior to completing any works.

CVCA also serves to identify fish habitat impacts for the Federal Department of Fisheries and Oceans (DFO). The type of crossing and appropriate crossing window will be specified in the permits provided by the CVCA. If impacts to fish habitat are inevitable or could not be avoided, an authorization to destroy fish habitat under Section 35 of the *Fisheries Act* shall be obtained from the DFO through the CVCA and CEAA (Canadian Environmental Assessment Agency) issues would be investigated if this occurs.

Ministry of the Environment

A Certificate of Approval from the Ministry of the Environment (MOE) will be required for the construction of the sewer. The Region of Peel currently have the Transfer of Review Authority to undertake the design approval review prior to submission to the MOE for an Approval #.

A *Permit to Take Water* is required under Section 34 of the *Ontario Water Resources Act* for temporary water taking from groundwater, which exceeds 50,000 L per day. The dewatering on this project will be temporary and may exceed the limit, therefore, application and approval should be considered during the detailed design phase of the project.

Ministry of Transportation

An Encroachment Permit will be required from the Ontario Ministry of Transportation (MTO) for the crossing of Highways 401 and 403. 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.

Canadian Pacific Railway

A crossing permit will be required from CP Rail for the crossing of the mainline rail tracks crossing Erin Mills Parkway. Following CPR's design criteria the primary casing of the sewer pipe must be sufficient to withstand the E-80 loading applied by over passing trains. Approval requirements also include a settlement monitoring program to ensure that ground movement at the track location are within the acceptable tolerance level.

Table 5.2 Proposed Working Compounds

Approval	Approval Authority	Duration	When Applied	By Who)
• Certificate of Approval	Ministry of Environment (MOE)	2 Months	95% Design Completion	Peel Region (Consultant)
• Permit To Take Water	Ministry of Envirionment (MOE)	4 Months	75% Design Completion	Peel Region (Consultant)

• Application for Development, Interference with Wetlends, Alterations to Shorelines and Watercourses	Credit Valley Conservation Authority (TRCA)	4 Months	60% Design Completion	Peel Region (Consultant)
• Crossing Permit	Canadian Pacific Railway (CPR)	2 Months	90% Design Completion	Peel Region (Consultant)
• Encroachment Permit	Ministry of Transportation (MTO)	3 Months	90% Design Completion	Peel Region (Consultant)

6. Potential Effects and Mitigating Measures

To construct the various components of the West Trunk Sewer, some environmental impacts will be unavoidable. In such situations, measures will therefore 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”.

During design, the environment affect by a project will be established and the specific net effects 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 may then include special provisions to ensure the impact on the environment is minimized.

This Class EA Report describes the process by which the various alternatives were analyzed and the most suitable design is chosen. The construction stage presents another set of alternatives as to how the work will be undertaken.

Many projects that undergo the Class EA planning process are carried out by a contract let by competitive tender and normally awarded to the low bidder. The contractor will have estimated costs and planned the method of operation during the tendering stage subject to the specifications and special provisions in the contract and any relevant legislation.

Contractors differ in their approach regarding sequence of operation, techniques, methods of operation, type, make and size of equipment utilized, and speed of operation. There is, however, a fairly general uniformity in construction operation, being the natural result of economic competition.

Some of these construction operations have potential for environmental impacts, and where these can be anticipated in the design stage, special provisions will be written into the construction package. The provisions will spell out those 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 used to 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.

6.1 Social, Economic and Cultural Impacts

6.1.1 Traffic

The impacts to traffic will be minimized by virtue of the construction being primarily completed in tunnel. As outlined in previous sections the tunnel shaft and temporary working compounds will be outside of the road right-of-way and will not require lane reductions. The main impact to traffic will be the increase in construction traffic for delivery of material and equipment and haulage of tunnel spoils. Construction signage will be posted on Erin Mills Parkway and Argentia Road to make motorists aware of the construction entrances. The location of the compound entrances will be selected to ensure the least disruption to traffic. Where compounds

are located in close proximity to intersections, entrances are generally located off the 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. Traffic management plans will be developed with the Region of Peel in conjunction with the City of Mississauga Transportation Departments.

6.1.2 Noise, Dust and Vibration

There is an amount of noise, dust and vibration associated with projects that is unavoidable during construction. Tunnelling in general greatly reduces the amount of noise and dust as above grade construction is limited to the controlled environment of the working compounds. As this tunnel is very deep below the surface throughout the majority of the alignment, it is not anticipated that there will be noticeable vibration associated with the tunnelling.

There will be construction traffic into and out of the working compound. If necessary, at muddy or dusty sites, wash stations will be maintained to ensure that the exiting trucks do not track mud onto the roadway.

6.1.3 Public Notification

Public notification will be facilitated through newspaper ads, construction signage and flyers to local residents and businesses. All emergency services (Police, Fire, EMS) will be contacted and notified of the project and specifically where construction is to impact access to public roads.

6.1.4 Archaeological and Heritage Features

As detailed in the Archaeological Investigation Report there are no designated archaeological or heritage sites identified along the Preferred Alternative. In the event of a potential archaeological or heritage find during construction all works will be suspended and the authorities contacted to investigate the site.

6.2 Natural Environmental Impacts

6.2.1 Vegetation and Vegetation Communities

Impacts to vegetation will for the most part be limited to trees located within the working compound locations. Where possible, mature trees will be protected with temporary construction fence around the drip-line to ensure that they are not damaged. There are two sites in particular that will require clearing and grubbing to facilitate the working compound: Shaft 1 located on City of Mississauga park lands; and the connection to the exiting Credit Valley Trunk Sewer located in the hydro right-of-way within the floodplain of Loyalist Creek. It is expected that restoration of these two areas will be coordinated with the City of Mississauga Parks Department and the Credit Valley Conservation Authority.

6.2.2 Wildlife and Wildlife Habitats

There may be some impact to wildlife inhabiting the working areas that will be displaced for the duration of construction. Once construction and subsequent restoration is complete, wildlife will

reintroduce itself into the disturbed areas. Hoarding and construction fence will prevent wildlife from entering the working areas and compounds.

6.2.3 Aquatic Habitats and Communities

The primary risk to aquatic habitats and communities will be during the work within the Loyalist Creek floodplain. This creek is considered a warm-water creek for fish habitat and is limited to the section downstream of the stormwater control structure. During the detailed design phase, the viability of completing the crossing in tunnel will be assessed. In addition, erosion control measures will be implemented during construction to ensure that the creek is protected from siltation from the work areas.

6.2.4 Dewatering Requirements and Associated Impacts

Localized dewatering may be required in some locations during sewer tunnel construction. Based on the preliminary geotechnical investigation that has been undertaken, the shale bedrock is relatively close to surface resulting in the tunnel construction being completed entirely in the rock. It is expected that minimal water will be encountered along the tunnel horizon unless water bearing vertical fractures are encountered. There is no feasible method for identifying these fractures or implementing methods to control prior to encountering them. Typically if these are encountered, the water will drain into the tunnel and if warranted will be sealed by injection grouting. Any water entering into the tunnel will flow back to the mining shaft and be pumped to the surface into a sedimentation structure prior to release into the storm drainage systems.

There may be the need to install temporary dewatering systems at the individual shaft locations. These may be necessary for the excavation of the soil overburden on top of the shale bedrock. During the design phase a detailed hydrogeological assessment will be undertaken to assess the groundwater conditions at each shaft location and if required a dewatering plan will be prepared to assess and reduce the potential impacts of dewatering in the study area. The dewatering plan will be carried out in consultation with the CVCA and MNR and will address impacts that may occur during construction as a result of dewatering on private wells and/or flow in adjacent watercourses. If the removal of more than 50,000 litres of water per day is necessary, from either a surface or groundwater source, a “Permit to Take Water” must be obtained from the MOE.

6.3 Utility Impacts

There are existing utilities within the road allowance that may be impacted during construction. This includes existing watermains, sewers, gas mains, buried cable and telephone lines, and hydro poles and overhead wires. During the design phase, preliminary drawings will be circulated to the utility companies to confirm the location of existing utilities. By locating the majority of the construction shafts outside of the existing road allowances, it is expected that impacts on utilities will be minimized. Also, with the depth of the tunnel ranging from 10 to 60m, no impacts are expected along the tunnel alignment within the road allowances.

6.4 General Mitigating Measures

Table 6.1 provides a summary of typical potential effects and mitigating measures that will be considered.

Table 6.1 – Typical Mitigating Measures for Potential Adverse Environmental Effects

Effect	Mitigating Measures	Application Where/When
Surface Drainage System		
Sedimentation and Turbidity of adjacent water bodies	▪ erosion control measures ▪ buffers and setbacks ▪ sediment traps ▪ staging work ▪ bio-engineering techniques	After site grading and during construction on slopes and channels Collect sediment before entering drainage channel During biologically critical periods
Ponding effects on adjacent properties due to natural drainage disruption	▪ appropriate use of culverts, porous backfill and tile drains ▪ apply natural channel design principles	In new construction projects and expansion
Streambank erosion from diversion, construction or channelization of watercourse	▪ erosion control measures ▪ bio-engineering techniques	River crossings, drainage outlets
Contamination of surface waters through runoff, spills, leaks and disinfection activities	▪ provision for spill control ▪ fast accurate reporting of spill ▪ spill containment ▪ stockpile materials or devices for spill control ▪ avoid adverse soil conditions ▪ monitor facility for leaks ▪ implement disinfection techniques in concert with fisheries requirements ▪ pollution prevention and source control by best management land use practices and best management stormwater practices ▪ buffers and setbacks ▪ install check dams on drainage swales	As a general practice and particularly in vincity of waterbodies, wetlands
Changes in volume of surface runoff	▪ use design measures to minimize increase in surface runoff	New impervious surfaces
Flood storage capacity / obstructions to flow	▪ avoid or minimize fill placement/structures in Regional Storm Floodplains ▪ obtain “Fill, Construction, Alteration to Waterways” permits from from local Conservation Authority prior to any works	Construction within river valleys. Disposal of excess fill

Effect	Mitigating Measures	Application Where/When
Groundwater		
Interference of shallow aquifers and springs	▪ hydrogeologic investigation identifying such areas in advance ▪ develop alternatives to avoid impacts	Excavation
Reduce groundwater quantity through construction dewatering	▪ locate construction activities away from groundwater users and water bearing formations (soils) where possible ▪ proper dewatering techniques ▪ seasonal constraints on construction	Depletion or lowering of shallow aquifers and springs by groundwater utilization
Spills or leaks resulting in contamination of groundwater supply	▪ construction refuelling precautions ▪ land filling precautions ▪ operation and storage precautions	Near watercourses and on site generally Areas of high infiltration capability
Drainage of wetland areas resulting in reduced groundwater contribution to surface waterbodies	▪ avoid wetland areas ▪ utilize appropriate backfill material, i.e. highly permeable backfill is unsuitable	Trenching, excavation, placing fill, dewatering
Reduced surface water recharge to groundwater particularly in soils with high infiltration characteristics	▪ restrict extent of impervious surfaces in zones of high infiltration	Subsurface barriers, e.g., foundations, areas of impervious surfaces, e.g. parking lots, roads, compaction of soils
Interference with groundwater movement	▪ maintenance of the existing groundwater regime through engineering design	Excavations, drainage, construction, dewatering, e.g. in roadbeds, foundations and trenches
Contamination of adjacent wells through runoff from construction	▪ erosion and sedment control ▪ locate projects appropriately ▪ setbacks	Construction adjacent to well sites and exposed aquifers
Fish, Aquatic Wildlife and Vegetation		
Introduction of warmer water from ponds into colder surface watercourse	▪ appropriate selection of ponding site ▪ pond design ▪ infiltrate into groundwater system ▪ planting to provide shade	Dewatering of trench and excavations. Sediment traps. Extend detention ponds
Modification or removal of aquatic habitat; displacement of plants and animals	▪ stage work to non-critical times ▪ restore stream substrate ▪ choose suitable site for stream diversions ▪ seasonal constraints	During construction, e.g. river crossings, dewatering of excavations
Reduced water quality of nearby surface water having value as wildlife habitat	▪ provisions for spill control ▪ fast and accurate reporting of spill ▪ spill containment ▪ stockpile materials or devices for spill control ▪ avoid adverse soil conditions ▪ minimize tree removal	Storm sewers, ditches, diversions and by-passing

Effect	Mitigating Measures	Application Where/When
	▪ buffers and setbacks	
Timing effects of construction on spawning, nesting and breeding periods	▪ staging of work to avoid spawning and breeding periods ▪ seasonal constraints for cold and warmwater systems	For stream crossings and diversions
Lowering of water table resulting in reduced contribution to streams and stress of riparian vegetation	▪ design to maintain existing groundwater flows ▪ restrict extent of impervious surfaces in zones of high filtration	Dewatering of trenches, excavations and aquifers. Areas of newly created impervious surfaces
Increased nutrient loading of existing habitats	▪ buffers and setbacks ▪ provisions for spill control ▪ land filling precautions	Near watercourses and on site generally
Drainage of wetland areas causing mortality or stress to animals and possible changes in species composition	▪ maintain existing groundwater regime ▪ avoid wetland area ▪ utilize appropriate backfill material	Trenching or excavating
Stress on biological communities	▪ consider the carrying capacity of the local natural environment ▪ avoid sensitive periods such as breeding seasons	Municipal infrastructure is necessary to service projected population growth. This increases stress on recreational and natural resources
Tree removal will affect the amount of sunlight reaching waters and affect plant productivity and increase watercourse temperatures	▪ avoid tree removal near surface waterbodies ▪ restoration planting	Stream crossings
Terrestrial Vegetation and Wildlife		
Introduction of exotic plant species through erosion control restoration	▪ restoration planting ▪ use annuals which later die out ▪ use indigenous (native) species only	On slopes and other areas to control erosion In any distribution area requiring restoration work
Changes in vegetative compostion as a result of loss of topsoil and subsoil mixing	▪ restore site by replacing soils in preconstruction horizons	Trenching or excavating
Removal or disturbance of significant trees and/or ground flora	▪ review status of species ▪ avoid these areas ▪ employ tree protection measures	During site grading and cosntruction phase of any project
Heritage Resources		
Deterioration of sites, structures or landscapes having archaeological, historical or architectural values, as a result of environmental changes	▪ avoid where possible ▪ employ necessary steps to decrease harmful environmental impacts such as vibration, alteration of water table, etc.	Where appropriate with respect to archaeological, historical or architectural resources
Unwanted increase in public access and potential vandalism	▪ fence off area of concern ▪ prevent public access	Where appropriate with respect to archaeological heritage resource
Threatened viability of, or opportunity for, retention of sites having heritage value	▪ avoid these areas ▪ record or salvage information on features to be lost	Where appropriate with respect to significance of the heritage resource
Unavoidable alteration to, or destruction of, heritage structures or archaeological sites	▪ record or salvage information on features to be lost	Where appropriate with respect to significance of the heritage resource

Effect	Mitigating Measures	Application Where/When
Disruption of quiet enjoyment	▪ staging of construction to cause least disruption ▪ employ noise and dust control measures	As general practice
Residential, Institutional, Commercial and Industrial		
Disruption of pedestrian movements between adjacent uses	▪ maintan continuity of pedestrian walkway system as much as possible ▪ provide walkway strips to adjacent residential areas	As general practice Where possible
Facilities inconsistent with or which disrupt character of areas	▪ preserve existing amenities as much as possible ▪ design and site structures to blend with adjacent building forms and materials ▪ site grading; utilize berms or other screening devices	As general practice Where suitable
Temporary disruption during construction and/or inconvenience to users of adjacent properties and building	▪ notify public agencies and adjacent owners of construction scheduling ▪ prepare emergency program to ensure quick resolution of servicing problems ▪ consult with public agency and/or adjacent landowners regarding temporary access routes ▪ schedule construction so as to minimize period of disruption in proximity of adjacent uses and structures ▪ ensure access for emergency response vehicles/personnel ▪ apply noise and vibration control measures	Where substantial inconvenience or disruption to adjacent uses would be experienced and where measures would substantially reduce effects As general practice
Outdoor Recreation		
Temporary disruption of open space activities during construction	▪ employ noise and dust control measures ▪ staging of construction to cause least disruption	In areas within or adjacent to public open space
Public Health		
Exhaust emissions from construction equipment and vehicles	▪ minimize operation on site, control location on site	Where adjacent uses or natural vegetation could be adversely affected
Effects on groundwater elevation of existing subsurface sewage disposal systems (e.g. septic systems)	▪ monitor groundwater levels and, if necessary, take appropriate action	Where appropriate
Groundwater contamination	▪ construction refuelling precautions ▪ fill design and operation precautions ▪ precautions in operation and	On site generally

Effect	Mitigating Measures	Application Where/When
	storage facilities ■ containment of leachate maintenance facilities	
Effects of emergency by-passing of sewage	■ contact potentially affected government agencies and public downstream within 24 hours of by-pass event	In all cases

7. 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 Class Environmental Assessment process. To meet the Class EA consultation requirements for this Schedule C project, the Region of Peel 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 Sewer alignment and the alternative designs. Copies of specific documentation (notices, information bulletins, etc.) from the public and agency consultation program are provided in Appendix A. 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.

7.1 Public Notices

7.1.1 Notice of Study Commencement

The Notice of Study Commencement was published in Mississauga's local newspaper on February 7 and 11, 2007, targeting the general public and the study's main stakeholders, including the relevant ministries, organizations, agencies and special interest groups. The Region of Peel sent letters to known stakeholders along with copies of the Notice of Study Commencement and a Response Form for each recipient to complete and return to GENIVAR, indicating their interest in being included in this study.

The notice briefly outlined the purpose of the study and provided some background information on the proposed project. It also indicates a proposed date for the first Public Information Centre (PIC 1), and informed the public that PIC 2 and PIC 3 would follow.

The Notice of Study Commencement, as well as the letter to stakeholders can be found in Appendix A.

7.1.2 Public Information Centre (PIC) Notifications

The purpose of each Public Information Centre (PIC) is 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 EA process. Notices for each PIC were published in the Local newspaper and all private and public stakeholders that requested to be included in the EA process by their response to the Notice of Study Commencement were mailed, faxed or e-mailed a copy of the Notice of Public Information Centre. 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.

For the West Trunk Sewer Class EA, PIC # 1 was held on May 2, 2007 at Mississauga's City Hall, presenting the Study Area along with the five (5) alignment alternatives and the screening criteria that were used to identify them. The purpose of this PIC was to generally familiarize the public with the project and provide the opportunity to receive comments on the alignment

alternatives. A total of 13 attendees recorded their names on the sign in sheet with 10 requesting to be added to the mailing list. There was a strong sentiment from individuals and special interest groups that Alignment 5 (Credit Valley) was the least preferred and should not be considered a viable alternative.

PIC 2, held on March 26, 2007, presented Alignment 1 (Erin Mills Parkway) as the Preferred Alternative as well as providing a description of the steps taken in the evaluation and selection of the Preferred Alternative. All attendees were pleased that Alternative 5 was not selected as the Preferred Alternative and were in agreement with the selection of Alternative 1.

The information presented in PIC 3, held on July 9, 2008, focused on the preliminary design concepts of the West Trunk Sewer to give the attendees an understanding of the installation process, particularly in the area of tunnelling methodology. The preliminary plan and profile drawing, and blow-ups of the proposed shafts were displayed indicating the horizontal and vertical alignment and the locations of the shafts/compounds. Comments at the PIC were positive as people expressed interest in the construction process and were pleased with the level of detail and knowledge presented in the material.

7.1.3 Notice of 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 conditions of the study, and it informs the general public of the outcome of the study and the nature of the resulting project.

7.2 Information Bulletins

Information Bulletins were distributed at each PIC held for the West Trunk Sewer Class EA. These contained information on the study as it progressed, including an overview and background on the project, and the stage of the project displayed at the corresponding PIC. These bulletins are intended to bring new attendees unfamiliar with the project up to speed on the on the study and provides those returning with an outline of what has been completed since the last PIC.

7.3 Agency and Municipal Consultation

A table providing a summary of external agency consultation activities is included in Appendix A. The table provides the contact names, type of information sent and date sent, comments received and responses provided during the project.

A meeting was held with the Credit Valley Conservation Authority (CVCA) in January 2009 to review the crossing of Loyalist Creek and the connection to the existing Credit Valley Trunk Sewer. The presence of cattails in the west flood plain of the creek identified it as a wetland that will require additional measures to mitigate the impacts. It was conveyed to the CVCA that tunneling is the preferred construction method for the creek crossing; however a detailed soil investigation, and confirmation of the proposed sewer and creek bed elevations are required to determine its feasibility. It is acknowledged that CVCA approval is required prior to commencement of the installation in which the environmental impacts and mitigation will be addressed in detail.

A meeting was also held with the Ministry of Transportation related to the Highway 401 and 403 crossings at Erin Mills Parkway. An information package was left with the MTO including the preliminary plan and profile drawing and the proposed alignment. There were no objections in-principal to the crossings as they are both by tunnel method within the bedrock. MTO approval is required and their regulations are to be followed in the design of the sewer/tunnel.

The City of Mississauga has participated throughout the study, most notably involving discussions with regards to the acquisition of permanent and temporary working easements in two specific sites located on City property as discussed in Section 5. The City actively participated in the selection of the proposed sites and a meeting was held in December 2008 to ensure there were no objections to further property negotiations with the Region in the latter stages of the project.

7.4 Public and Agency Comments and Responses

A table providing a summary of external agency and public consultation activities is included in Appendix A. The table provides the contact names, type of information sent and date sent, comments received and responses provided during the project.

Tables 7-3 and 7-4 provide a summary of the comments received from Agencies and the Public. Copies of the actual correspondence are provided in Appendix A.

7.4.1 Public Information Centre (PIC) #1

The first Public Information Centre (PIC #1) was held on May 2, 2007 at Mississauga's City Hall. The following comments were those raised by public and agency participants at the PIC.

Table 7.1 Summary of Verbal Discussion at Public Information Centre #1

General Comments
▪ Interest in timelines for EA project and construction
▪ General interest in the EA process, evaluation process to analyze the alternative alignments and the future opportunities for public consultation
▪ Most participants were not opposed to the need for additional capacity and thus agreed with the project
Comments on Alignment Alternatives
▪ Screening process seems to have identified potential alternative alignments, with the exception of the Credit River alignment
▪ All participants were concerned with the potential alignment following the Credit River (actual twinning of the existing pipe)
▪ All participants were opposed to the Credit River option due to environmental impacts and direct impacts to many of their properties during construction
▪ Many participants did not favor Alternative Alignment #5 (Credit River) due to: – Some having witnessed the damage done in constructing existing West Trunk Sewer, stating that it is still evident, and do not want to see it happen again – Some having witnessed the existing pipe "floating" after construction; they are concerned that this will happen again with this alternative – The route weaving back and forth across the river; it is not straight and involves several crossings of the river, making it seem difficult to construct – Participants concerned about effect on certain species of deer and recreational activities in the area (e.g. kayaking, canoeing)

Table 7.1 Summary of Verbal Discussion at Public Information Centre #1

▪ Participants indicated a preference for Alternative Alignment #1 (Erin Mills Parkway) due to: – Wider road and boulevard so traffic lanes could be maintained during construction to help traffic flow in congested areas – Avoids crossing or impacting Credit River – Avoids impacting the Community of Streetsville – Fewer impacts on the environment – Tree-removal can be minimized – Straighter, more direct route which could be easier to construct and possibly less costly
▪ Concern that Credit Valley Conservation Authority was not present but interested to hear that discussions have been held with them, along with other key stakeholders
▪ Some participants indicated that Alternative Alignment 4 (Mavis Road) was too lengthy and likely expensive
Comments on Proposed Evaluation Process
▪ Most participants indicated agreement on the proposed evaluation criteria and the process that will be followed to evaluate the alternative alignments
▪ Due to the sensitivity of the environment present along the Credit River, most participants felt that the natural environment should have more weighting than the other components
▪ Most participants were interested in the connection points and where the southern connection point would be developed, but they did not have suggestions for this part of the alignment

7.4.2 Public Information Centre (PIC) #2

Table 7.2 Summary of Verbal Discussion at Public Information Centre #2

General Comments
▪ Interest in timelines for EA project and construction
▪ General interest in the EA process, evaluation process to select the Preferred Alternative and the future opportunities for public consultation
▪ Most participants were not opposed to the need for additional capacity and thus agreed with the project
▪ Concerned with the lack of public interest in the process, however did not fault the notification process
Comments on Proposed Evaluation Process
▪ All participants indicated agreement on the proposed evaluation criteria and the process that was followed to evaluate the alternative alignments
▪ Due to the sensitivity of the environment present along the Credit River, most participants were in agreement with the weighting the natural environment had with respect to the other components
▪ Most participants were interested in the connection points and where the southern connection point would be developed, but they did not have suggestions for this part of the alignment
Comments on Preferred Alternative
▪ All participants were in agreement with the selection of the Preferred Alternative
▪ All participants were opposed to the Credit River option due to environmental impacts and direct impacts to many of their properties during construction and were pleased with how it was reflected in the evaluation
▪ There was concern that Credit Valley Conservation Authority was not present but interested to hear that discussions have been held with them, along with other key stakeholders

7.4.3 Public Information Centre (PIC) #3

Table 7.3 Summary of Verbal Discussion at Public Information Centre #3

General Comments
▪ Interest in timelines for EA project and construction

Table 7.3 Summary of Verbal Discussion at Public Information Centre #3

▪ Most participants were interested in the tunnel process and were pleased with the level of information provided in the material
Comments on Design and Construction
▪ Owners of the property identified as the potential compound at Shaft 8 has current plans for development and would not allow for the temporary working compound

7.4.4 Agency Comments

Table 7.4 Summary of Comments Received from Agencies

Agency	Comments Received	Responses to Concerns	ESR References
PIC #1	**May 02, 2007**		
Urbantech (NW Brampton & Mt. Pleasant Landowner's Group) J. David Leighton, President	Jun 27, 2007 (Interest Group) ▪ Urbantech advised that they are representing NW Brampton and Mt. Peasant Landowners. ▪ Fully support the West Trunk Sewer Class Environmental Assessment and completion to increase conveyance capacity. ▪ Understand that there is extensive evaluation of the alternatives and that criteria may vary with specific stakeholders interest. ▪ With focus on the Region's criteria to "minimize capital and operating costs", Urbantech believes Alternative 5 (Credit River) will meet the requirements with lowest cost. ▪ Alternatives 1-4 shown within municipal right-of-ways, based on Urbantech's current projects with the Region suggest the cost of deep services within such right-of-ways can be 5 times shallow open cut. ▪ Additional cost benefits to Alternative 5 include, use of existing easement, use of	▪ Added to mailing list. Regarded comments on capital and operational costs of alternatives 1-4. ▪ Region acknowledges Urbantech's preference of Credit River Valley route, Alternative 5. ▪ Region emphasized that all alternatives have to be evaluated, using all environmental criteria, to meet requirements of Municipal Class EA Process. ▪ Next steps: evaluation of the alternatives considering public and agency comments and environmental, social, economic and technical criteria, to select the recommended alternative. ▪ Informed of PIC #2, advised that they will be updated on study and that all feedback will be in the ESR.	▪ PIC #1 Comment Sheets (Appendix A)

Table 7.4 Summary of Comments Received from Agencies

Agency	Comments Received	Responses to Concerns	ESR References
	current maintenance protocols and access routes, known soil and groundwater conditions, ease of existing sewer rehabilitation, no new flow monitoring stations needed.		
Credit River Anglers Association (CRAA) John Kendell, President	Jun 20, 2007 (Interest Group) ■ Credit River rehabilitation costs incurred, over $1M within Study Area. River valley is a major migratory corridor for trout and salmon; home to several endangered species. ■ Financial costs should include full restoration costs. Existing technology available to replace mature woods of equal tree size/age and density, with similar soil conditions. Restoration of River Valley trails system for residents. ■ In support of alternatives outside of the River Valley complying with soil erosion and construction guidelines. Alternatives trenching the river valley will not be supported; 2 river crossings within 3 route alternatives, acceptable if pre-construction environmental status is restored. ■ CRAA supports the alternative that entirely avoids river valley. ■ Region's recent contractor record shows 2004/5 crossing violated Ontario's Federal Fisheries Act and Lakes & Rivers Improvement Act. Precipitation released	■ Added to mailing list. Regarded comments on existing condition of, and CRAA's investment in Credit River Valley and its natural environment. ■ Region emphasized that all alternatives have to be evaluated to meet requirements of Municipal Class EA Process. Financial and environmental costs will be included in this evaluation. ■ Concerns and technological suggestions on the other alternatives are also acknowledged. ■ Region acknowledges CRAA's preference of Erin Mills Parkway, which entirely avoids Credit River. ■ Next steps: (same for all PIC #1 comment responses). ■ Informed of PIC #2, advised that they will be updated on study and that all feedback will be in the ESR.	■ PIC #1 Comment Sheets (Appendix A)

Table 7.4 Summary of Comments Received from Agencies

Agency	Comments Received	Responses to Concerns	ESR References
	silt from erosion and poor silt fences. Mature trees removed from the riparian zone were not replaced (1,000 of those planted by CRAA and City of Mississauga). Highway 401 project better managed erosion and restoration.		
Sierra Club of Canada, Peel Region Group Peter Orphanos, Chairman	Jun 12, 2007 (Interest Group) ■ Damage done to Credit River Valley by development should be considered in selecting route options. ■ Not in support of Credit River alternative as option. Should not be further damaged. ■ Strongly advise Region that this option would be "fought by our club with all the resources available." ■ Believe that we would reasonably select a route other than Credit River Valley. ■ Could not attend PIC #1 ■ Want to be informed about all meetings, PIC and stages; want to be directly involved.	■ Added to mailing list. Regarded strong concerns about existing condition of Credit River Valley and its natural environment. ■ Region emphasized that all alternatives have to be evaluated to meet requirements of Municipal Class EA Process ■ Region acknowledges CRAA's preference of Erin Mills Parkway, which entirely avoids Credit River. ■ Next steps (same for all PIC #1 comment responses). ■ Informed of PIC #2, advised that they will be updated on study and that all feedback will be in the ESR.	■ PIC #1 Comment Sheets (Appendix A)
Mississauga Garden Council B. Martin	May 28, 2007 (Interest Group) ■ With the extensive development, all green space in the valley must be kept. River and trails actively used by residents. Natural environment cannot be disturbed again. ■ Process seems repetitive, but seems normal; public should be more interested. Would roadside	■ Added to mailing list. Regarded comments on existing condition of Credit River Valley and its natural and recreational value. ■ Concerns about twinning on identified wetlands and tributaries will also be considered. Region acknowledged preference of Creditview Road route. ■ Region emphasized	■ PIC #1 Comment Sheets (Appendix A)

Table 7.4 Summary of Comments Received from Agencies

Agency	Comments Received	Responses to Concerns	ESR References
	information signs assist newspaper notification? ■ Strongly object to "twinning" on wetland areas, Credit River, or any tributaries; Creditview Road route favoured: local traffic allowed, other traffic sent to major roads as needed. ■ Roadway restoration much easier than river; river never returns to natural state. ■ Found PIC #1 Useful (2) ■ Help received: representatives were very patient and ready to explain and answer questions. ■ Suggested considering a solution using a new sewer line that abandons use of existing sewer. Existing sewer old, and will rupture eventually.	that all alternatives have to be evaluated to meet requirements of Municipal Class EA Process. ■ Abandoning existing sewer could only be achieved if a larger sewer is constructed where the existing sewer is. Considering connecting new sewer to existing sub-trunk sewers to reduce load on existing sewer, allowing for repairs to existing sewer. ■ Next steps: evaluation of the alternatives considering public and agency comments and environmental, social, economic and technical criteria, to select the recommended alternative. ■ Informed of PIC #2, advised that they will be updated on study and that all feedback will be in the ESR.	

7.4.5 Public Participant Comments

Table 7.5 Summary of Comments Received from the Public

Agency	Comments Received	Responses to Concerns	ESR References
PIC #1	**May 02, 2007**		
D. M. Adams, Erindale Woodlands Resident	May 14, 2007 ■ Updated on PIC #1, but did not attend. Supports Mr. Robert Fulton's May 13, 2007 letter. Would like study updates. ■ Do not disturb Credit River Valley; observed natural environment damage caused by construction of existing sewer. Sewer repairs 2 summers ago caused further damage – still	■ Added to mailing list. Comments will be a part of the evaluation process for the study. ■ Comments regarding the Credit River route are acknowledged. ■ We acknowledged preference of the Erin Mills Parkway route ■ Region emphasized	■ PIC #1 Comment Sheets (Appendix A)

Table 7.5 Summary of Comments Received from the Public

Agency	Comments Received	Responses to Concerns	ESR References
	recovering. ▪ Several alternatives avoid valley disruption, but a few connect with or cross the river; river damage is foreseeable. ▪ Firmly believes Credit Valley route should be discarded, due to potential impact to natural environment. Future impacts would occur with repairs. ▪ Erin Mills Parkway is the obvious solution.	that all alternatives have to be evaluated to meet requirements of Municipal Class EA Process. ▪ Next steps (same for all PIC #1 comment responses) ▪ Informed of PIC #2, advised that they will be updated on study and that all feedback will be in the ESR.	
Robert Fulton, Resident	May 13, 2007 ▪ Letter expressed concern about including Credit River Valley in location of West Trunk Sewer and future expansion. ▪ Recognition of environmental importance of watershed management by Ontario, and its Conservation Authorities, would not allow for consideration of Credit River route. Earth-boring technology allows less disruptive, more cost-effective route options. ▪ Alternative #1, Erin Mills Parkway, is most reasonable. It allows a 45m right-of-way, allowing access for earth-boring equipment. ▪ Alternatives #3 & 5 would involve more cut & fill excavation. Alternatives #2-5 disrupt the river, causing a “moonscape wasteland” as in 1965. ▪ Alternatives 3,5 should be eliminated; Alternatives 2,4 should be last resorts.	▪ Added to mailing list. Comments will be a part of the evaluation process for the study. ▪ Concerns regarding the Credit River route are acknowledged. ▪ Region emphasized that all alternatives have to be evaluated to meet requirements of Municipal Class EA Process. ▪ We acknowledged preference of the Erin Mills Parkway route ▪ Next steps (same for all PIC #1 comment responses) ▪ Informed of PIC #2, advised that they will be updated on study and that all feedback will be in the ESR.	▪ PIC #1 Comment Sheets (Appendix A)

Table 7.5 Summary of Comments Received from the Public

Agency	Comments Received	Responses to Concerns	ESR References
Anonymous, Resident	May 03, 2007 ■ Blue alternative (Credit River) unacceptable, environmental impacts. Green (Mavis Rd) too long, too far east, expensive? Red/Orange (Mississauga Rd and Creditview Rd) too disruptive to residences, schools, businesses. ■ Yellow alternative (Erin Mills Parkway) least disruptive, most direct route; should be chosen. ■ Questions: 1.Is the existing trunk sewer from the end point to Clarkson WWTP to be expanded? 2.Can the WWTP cope with and process increased waste in an environmentally sound manner? ■ Found PIC #1 Very Useful (1) ■ Questions answered satisfactorily. ■ Concerns regarding WWTP ability to effectively treat increasing waste should be addressed and publicized before implementation.	■ Anonymous Comment; response not sent. ■ No mailing address provided for inclusion in "decision process".	■ PIC #1 Comment Sheets (Appendix A)
Anonymous, Resident(s)	May 02, 2007 (at PIC #1) ■ Twinning option has huge environmental impact on Credit River and organisms there. Other options affect roadways and sidewalks. ■ Consider all alternatives; but 300-year-old trees are difficult to replace. If twinning, a 'safer' route	■ Anonymous Comment; response not sent. ■ No mailing address provided for inclusion in "decision process".	■ PIC #1 Comment Sheets (Appendix A)

Table 7.5 Summary of Comments Received from the Public

Agency	Comments Received	Responses to Concerns	ESR References
	could be on Mississauga Rd, south of Dundas. ▪ Prefers no twinning at all, but would like to be included in the decision process. If not twinning, they will 'repurchase' their "twinning easement land " from the Region. ▪ Alternatively, use the Hydro corridor south of Mississauga Rd to minimize environmental impacts along Credit River. Other 4 alternatives are preferred. ▪ Found PIC #1 Very Useful (1) ▪ Informative Display.		

8. First Nations' Consultation

8.1 First Nations' Consultation

8.1.1 First Nations' Consultation

First nations refer to the first known populations of Canada, the Aboriginal Peoples. The Ontario Ministry of the Environment (MOE) is holding discussions to determine the formal requirements of First Nations Consultations. The MOE, in conjunction with the Municipal Engineers Association (MEA), have posted the Interim Directives for Consultation with Aboriginal Peoples, to guide First Nations Consultations until a decision is made on the formal process.

Our First Nations Consultation found no bands or organizations affected by the alternatives for the proposed sewer that would arise out of the West Trunk Sewer Class EA.

The consultation process included an initial search for bands or organizations affected by the project and a letter informing the First Nations of the West Trunk Sewer Class EA. The letter of notification included the Study Area with a copy of the information provided at our first PIC. A request for information on any known land claims or other matters that may be affected by the study was also requested in this letter, and a response form was also attached.

The concerns of the First Nations bands and organizations are now heard separate from ministries, agencies and the general public.

First Nations Consultation has become a mandatory part of the Municipal Class EA process, but the details of the process are currently being determined at the government level. The Municipal Engineers Association (MEA) in conjunction with the Ontario Ministry of the Environment (MOE) have prepared an interim process for First Nations' / Aboriginal Peoples' Consultation.

The Region has generated a First Nations Consultation Plan on the basis of these interim documents, as well as a guide and a list of mandatory contacts from the MOE. These documents serve to provide guidance in the interim, until a definite procedure is developed.

The interim documents specifically advise that First Nations representatives will not be likely to attend a standard Public Information Centre (PIC). It is thus advised that a separate consultation process be followed in determining First Nations interests in the study.

The First Nations Consultation plan was therefore as follows:

- Contact the MEA First Nations' Contacts to Request a List, with relevant Contact Information, of First Nations' organizations affected by the Study or existing within the Study Area.
- Advise that the next steps include the Stage 1 Archaeological Study, which will be released for their review. (A First Nations Archaeologist was recommended in their correspondence with the Region; should he be consulted?) MEA Directives advise that we determine potential impacts.
- Send them each a package: Letter, and PIC #1 Display Boards & Response Form.
- Contact First Nations' organizations to verify contact information provided.

- Write all relevant First Nations' organizations, addressing any concerns raised, and send them Comment Sheets. This way, the new contacts can give their comments; previously contacted organizations should be copied on this correspondence.
- Respond to all feedback received, addressing new concerns, if any. Enclose the results of the Stage 1 Archaeological Study conducted. Respond to any feedback, addressing additional concerns.
- Document all correspondence: add contacts to Correspondence Summary Table and create a separate mailing list for Aboriginal Peoples' / First Nations'.

The Stage 1 Archaeological Study has been conducted, and will be presented to all known First Nations organizations affected by the study. As discussed in section 2.3.3 on the Archaeological and Heritage Impacts of the study, while the report does not show any problems with the preferred alternative, it reveals forty-three (43) sites exist near of alternatives 2, 3 and 4, and several more sites are likely to be found along alternative 5, Credit River Valley.

All correspondence with First Nations organizations has been included in Appendix A.

9. Conclusions and Recommendations

The following conclusions and recommendations provide a summary of the key findings presented in the report:

- Based on the projected population growth data in the Peel Water and Wastewater Master Plan a new trunk sewer is required to expand the capacity of the existing Credit Valley Trunk Sewer from Highway 401 and approximately 300m north of the QEW. The estimated size of the trunk sewer is 1800mm diameter, however the size is to be confirmed during the detailed design.
- The preferred alignment for the West Trunk Sewer is Alternative 1 (Erin Mills Parkway) as described in this report. It was evaluated as preferred in the following criteria:
    - Impacts to the Natural Environment,
    - Socio-cultural Impacts,
    - Technical and Operational Impacts, and
    - Constructability

    Although not the most cost effective Alternative, it is competitive in terms of overall cost and the impacts to natural, socio-cultural and technical considerations outweighed the cost difference.
- The existing elevations of the Credit Valley Trunk Sewer and the ground profile of the proposed alignment make open cut construction not feasible due to the excessive depth, and therefore tunnel method must be employed for the majority of the alignment.
- Tunnel shafts and working compounds are to be kept off the traveled roadway and located on private property and will require permanent and temporary easements for all but one location. Initial contact has be made to property owners of the proposed shaft/compound locations, as identified in Section 5, and verbal and written agreements are in place to further property negotiation moving forward.
- Preliminary Geotechnical and Hydrogeological information indicate favourable conditions for tunnel installation along the preferred alignment. Extensive Geotechnical and Hydrogeological investigations are suggested during the detailed design stage.

Moving into the detailed design further coordination is required with MTO, CP Rail and CVCA for the obtainment of the relevant approvals detailed in Section 5. MOE approval is required for the Certificate of Approval and depending on the findings of the Geotechnical and Hydrogeological investigations a Permit to Take Water may also be required. Regulations and application forms for the various approvals are posted on the agency websites and in most cases require design drawings and/or design reports to be included in the submission.