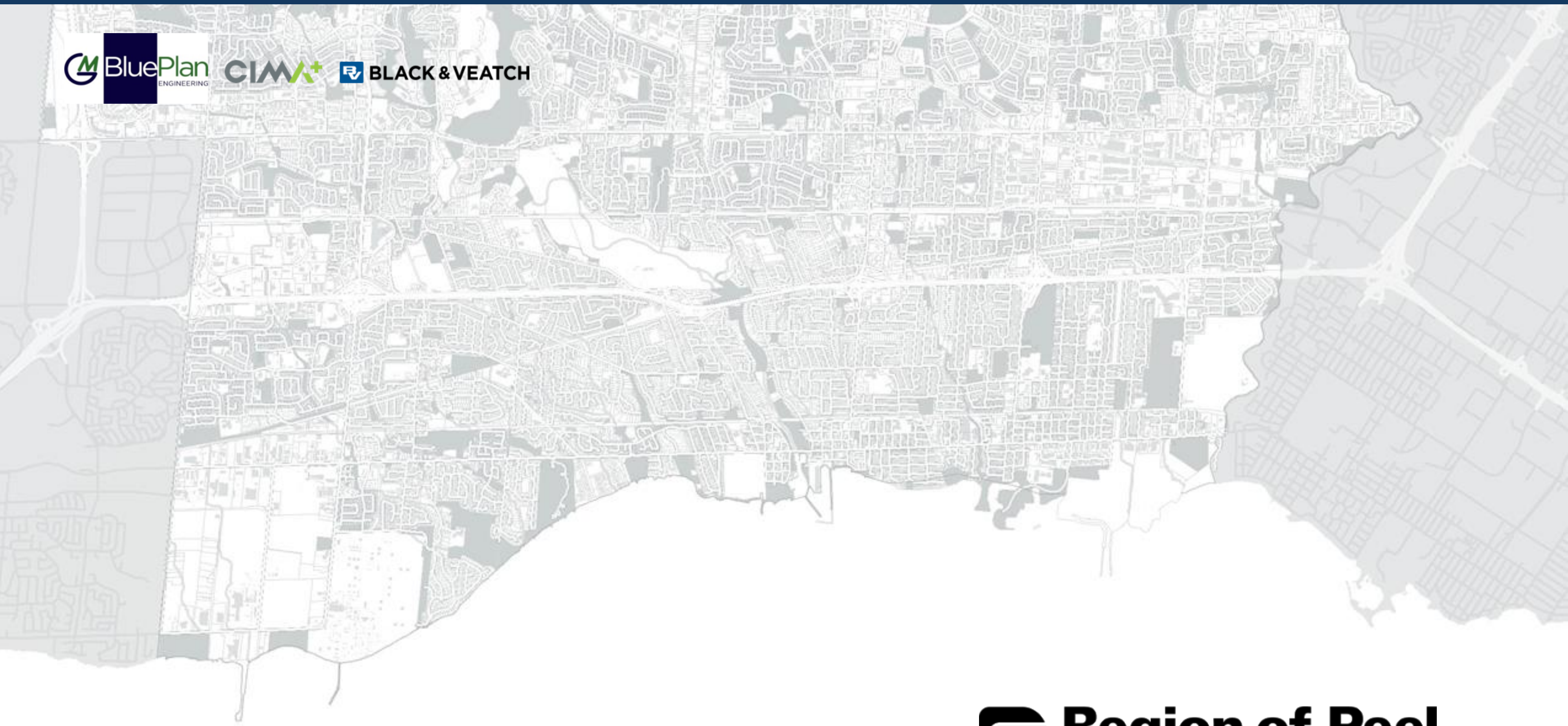

Schedule C Municipal Class Environmental Assessment

G.E. Booth Water Resource Recovery Facility

Volume 1: Environmental Study Report

For Public Review

March 2024

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List of Abbreviations

Term of Acronym	Definition
%	Percent
AA	Archaeological Assessment
AAR	Acoustic Assessment Report
ABAC	Implementation of Ammonia-Based Aeration Control
ADF	Average Daily Flows
ANSI	Areas of Natural and Scientific Interest
APEC	Areas of Potential Environmental Concern
AQA	Air Quality Assessment
AQIA	Air Quality Impact Assessment
BBO	Open Beach/Bar
BTF	Bio-Trickling Filter
BNQ	Bureau de normalization du Quebec
BOD	Biochemical Oxygen Demand
BOD5	Five-Day Biological Oxygen Demand
CAS	Conventional Activated Sludge
CCME	Canadian Council of Ministers of the Environment
CCMP	Climate Change Master Plan
CEPA	Canadian Environmental Protection Act
CEPT	Chemically Enhanced Primary Treatment
CFIA	Canadian Food Inspection Agency
cfu	Colony Forming Units
Class EA	Municipal Class Environmental Assessments
CLOCA	Central Lake Ontario Conservation Authority
CMP	Construction Management Plan
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
COSSARO	Committee on the Status of Species at Risk in Ontario
CTC	Credit Valley, Toronto and Region, & Central Lake Ontario
CUH	Hedgerows
CUM	Cultural Meadows
CVC	Credit Valley Conservation
CVSPA	Credit Valley Source Protection Area
dBA	Decibel
DEC	District Energy Centre
DES	District Energy System
DFO	Fisheries and Oceans Canada
dT/d	Dry Tonnes per Day
EAA	Environmental Assessment Act
EASR	Environmental Activity and Sector Registry
ECA	Environmental Compliance Approval
EMP	Environmental Management Plan
EPA	Environmental Protection Act

Term of Acronym	Definition
ESA	Endangered Species Act
ESR	Environmental Study Report
FOD	Deciduous Forests
FzA	Fertilizers Act
FzR	Fertilizers Regulations
GAC	Granular Activate Carbon
GHG	Greenhouse Gas
GLWQA	Great Lakes Water Quality Agreement
GPR	ground penetrating radar
ha	Hectare
IGLD	International Great Lakes Datum
IJC	International Joint Commission
IPCC	Intergovernmental Panel on Climate Change
IPZ	Intake Protection Zone
JTLCA	Jim Tovey Lakeview Conservation Area
kg/d	Kilogram per Day
km	Kilometers
KtCO2e	Kilotonnes of Carbon Dioxide Equivalent
L/cap/d	Litres per Capita per Day
L/day	Liters per Day
L/s	Liters per Second
LSRCA	Lake Simcoe Region Conservation Authority
m	Metre
m^3	Cubic Metre
m^3/day	Cubic Metres per Day
MAM	Meadow Marshes
MAM2	Mineral Meadow Marsh
MBCA	Migratory Birds Convention Act
MCFN	Mississaugas of the Credit First Nation
MEA	Municipal Engineers Association
MECP	Ministry of the Environment, Conservation, and Parks
Mg/L	Milligrams Per Litre
MHSTCI	Ministry of Heritage, Sports, Tourism and Cultural Industries (now the Ministry of Tourism, Culture and Sport – MTCS)
MLD	Megalitres per Day
mm	Millimetre
MCM	Ministry of Citizenship and Multiculturism
MNRF	Ministry of Natural Resources and Forestry
MOC	Commercial/Industrial Open Space
N_2O	Nitrous Oxide
NASM	Non-Agricultural Source Material
NEP	Niagara Escarpment Plan
NEPDA	Niagara Escarpment Plan Development Act
NMA	Nutrient Management Act

Term of Acronym	Definition
NPRI	National Pollutant Release Inventory
NASM	Non-agricultural source material
NVCA	Nottawasaga Valley Conservation Authority
O.Reg.	Ontario Regulation
OAO	Open Aquatic
OGS	Ontario Geological Survey
OHA	Ontario Heritage Act
OLT	Ontario Land Tribunal
OMAFRA	Ontario Ministry of Agriculture, Food and Rural Affairs
OP	Official Plan
OPG	Ontario Power Generation
ORMP	Oak Ridges Moraine Plan
OWES	Ontario Wetland Evaluation System
OWRA	Ontario Water Resources Act
PAH(s)	polycyclic aromatic hydrocarbon(s)
PCBs	Polychlorinated Biphenyls
PHC(s)	petroleum hydrocarbon(s)
POR(s)	Points of Reception(s)
PPS	Provincial Policy Statement
PSW	Provincially Significant Wetlands
PTTW	Permit-to-Take-Water
PWQO	Provincial Water Quality Objectives
QEW	Queen Elizabeth Way
RAS	Return Activated Sludge
RCP	Representative Concentration Pathway
RNG	Renewable Natural Gas
RTC	Real Time Control
RWIA	Receiving Water Impact Assessment
SAR	Species at Risk
SARA	Species at Risk Act
SLR(s)	Solids Loading Rate(s)
SOP	Standard Operating Procedures
SPR	Source Protection Region
SUE	Subsurface Utility Engineering
SWD	Deciduous Swamp
SWH	Significant Wildlife Habitat
SWM	Stormwater Management
TAN	Total Ammonia Nitrogen
TBM	Tunnel Boring Machine
TMP	Traffic Management Plan
TP	Total Phosphorus
TRCA	Toronto and Region Conservation Authority
TSS	Total Suspended Solids
TWAS	Thickened Waste Activated Sludge

Term of Acronym	Definition
UIA	Un-Ionized Ammonia
UV	Ultraviolet
WAS	Waste Activated Sludge
WEP	Water Efficiency Plan
WRRF	Water Resource Recovery Facility
WSER	Wastewater System Effluent Regulations
WSER	Wastewater System Effluent Regulations
WTP(s)	Water Treatment Plant(s)

1.0 Introduction and Background

1.1 Study Purpose and Objectives

The Regional Municipality of Peel ("Region of Peel" or "The Region") lake-based wastewater system consists of two (2) Water Resource Recovery Facilities (WRRFs) (formerly referred to as Wastewater Treatment Plants [WWTPs]): the Clarkson WRRF and the G.E. Booth WRRF, and two (2) major interconnected trunk sewer systems (East and West) which convey flows through sewage pumping stations, force mains, trunk sewers, and local gravity sanitary sewers, to the treatment plants for final treatment and discharge to Lake Ontario.

Both the Clarkson and G.E. Booth WRRFs are conventional activated sludge facilities, with rated capacities of 350 megalitres per day (MLD) and 518 MLD, respectively. The G.E. Booth WRRF is currently approaching its capacity limits, as the five (5) -year average daily flow (ADF) to the G.E. Booth WRRF is approximately 450 MLD. Currently, the ADF to the Clarkson WRRF is approximately 220 MLD.

The East and West trunk sewer systems are approximately divided by the watershed boundary between the Etobicoke Creek and the Credit River. The two (2) systems are currently connected via the West-to-East Sanitary Trunk Sewer, which can be used to divert some wastewater flows by gravity from the west trunk system to the east trunk system at Highway 407. In addition, an East-to-West Sanitary Trunk Sewer Diversion is currently being constructed, to help alleviate capacity challenges at the G.E. Booth WRRF, and allow the Region to better optimize wastewater flows and loadings in their systems. The diversion is a deep gravity tunneled trunk sewer of 2400 millimeter (mm) diameter that extends 11 kilometers (km) between Spring Creek and the Credit River, aligned primarily along Derry Road. Construction of the gravity trunk sewer diversion is expected to be completed by 2026.

The Region's Growth Management process and 2020 Water and Wastewater Master Plan identified that there will be significant population and employment growth across the Region of Peel. With this approved growth to year 2041 and vision for growth beyond 2041, the WRRFs together will not have the capacity to meet the needs of the Region's citizens and to continue to protect the environment, even with the East-to-West Trunk Sewer Diversion in place. Additional wastewater treatment capacity is therefore required at the G.E. Booth and Clarkson WRRFs.

Wastewater consists of liquid and solids components. Through the treatment process the liquids and solids components are separated and treated. The treated liquid component, known as effluent, is discharged to Lake Ontario through outfall pipes at both WRRFs. The effluent meets Ontario Ministry of the Environment, Conservation, and Parks (MECP) quality criteria for protecting human health and the environment. The separated solids are treated to produce sludge. If the sludge has been treated in a manner such that it can be safely used on land, it is referred to as biosolids. Currently, digested sludge generated at Clarkson WRRF is dewatered and hauled by truck approximately 18 km to the G.E. Booth WRRF for incineration. The residual ash slurry from the incineration process is transferred to two (2) on-site settling lagoons which are dredged regularly and stored on-site in the ash ponds and berms. The existing incineration program has challenges related to its capacity, long-term sustainability, cost effectiveness, and reliability. Therefore, improving the current program is required.

Increases in wastewater treatment capacity and management of biosolids require the completion of a Schedule C Municipal Class Environmental Assessments (Class EA) in accordance with the Municipal Engineers Association (MEA) Municipal Class EA (October 2000, as amended in 2007, 2011, 2015 and 2023), to meet Ontario EA Act requirements. The following phases of the Class EA process must be completed for both the Clarkson WRRF and the G.E. Booth WRRF:

Phase 1: Problem or Opportunity Definition.

Phase 2: Identification and Evaluation of Alternative Solutions on a regional service area basis.

Phase 3: Examination of Alternative Methods of Implementation of the Preferred Solution, including assessment of treatment technologies and conceptual designs on a WRRF specific basis.

Phase 4: Documentation of the Class EA process for both WRRFs in separate Environmental Study Reports (ESRs).

The purpose this G.E. Booth WRRF Class EA is to document the process undertaken to identify a strategy for addressing immediate and long-term wastewater servicing needs in the Region, and to develop a preferred design concept for meeting these needs at the G.E. Booth WRRF. The interrelated nature of the Region's wastewater collection and conveyance systems means that the solution established for the G.E. Booth WRRF is dependent on the solution selected for the Clarkson WRRF. Consequently, this Class EA has been completed in conjunction with the Clarkson WRRF Class EA through to the end of Phase 2. The following three (3) components of the Peel's system were considered in the Phase 2:

1. Wastewater collection and treatment system,
2. Biosolids management system, and
3. Outfall and wet weather flow management needs.

At the end of Phase 2, a strategy for meeting future servicing needs, considering each of the above factors was developed, which identified expansion requirements at both the Clarkson WRRF and the G.E. Booth WRRF. Phase 3 was then completed separately for each WRRF to identify the preferred conceptual designs for the expansions.

Details on the Clarkson WRRF EA are documented in the Clarkson WRRF Environmental Study Report (ESR) which was completed and filed in May 2023. The preferred alternative long-term plan is to expand the Clarkson WRRF from 350 MLD to 500 MLD, and to treat the sludge produced on-site, instead of trucking it to the G.E. Booth WRRF for incineration. Sludge produced at the Clarkson WRRF will be treated and managed at the Clarkson WRRF in the long-term.

This ESR provides details on the G.E. Booth WRRF Schedule C Class EA, including establishing:

- Flow diversion requirements through the East-to-West Diversion Trunk Sewer;
- A long-term sustainable program for managing biosolids in the Region;
- Expansion needs at the G.E. Booth WRRF, including wastewater and biosolids treatment technologies, associated process requirements, and new outfall requirements;

- Measures to avoid and mitigate impacts to the natural, social, cultural, and technical environments;
- An enhanced conceptual design; and
- A plan and schedule for implementing infrastructure works.

The Region's goal is to provide reliable wastewater collection, treatment and management now and for the future. The G.E. Booth WRRF Class EA meets this goal by developing a preferred solution and design concept which meets the key objectives presented in **Table 1-1**.

Table 1-1. Class EA Objectives.

Key Objective	Description
Long-term sustainability	• Region-wide wastewater and biosolids management with operational flexibility • Multiple biosolids product marketing opportunities • Resource recovery through beneficial use
Resiliency	• Manage wet weather flows • Adapt to changing conditions • Built in redundancy in treatment processes
Environmental Protection	• Mitigate risks to natural environments • Meet air and effluent quality requirements
Community Acceptability	• Manage odour and noise • Limit truck traffic • Visually appealing designs and landscaping
Ease of Operations	• Operator acceptability • Proven processes
Energy Efficiency and Reduce Greenhouse Gas (GHG) Emissions	• Support Peel's GHG reduction goals • Energy reduction and reuse opportunities
Fiscally Responsible	• Balance lifecycle costs, while protecting the environment and communities

1.2 Study Areas

Two (2) study areas have been defined for this Class EA: the regional study area and the local study area. The regional study area is the entire service area for both the Clarkson WRRF and the G.E. Booth WRRF, which includes the west trunk system that conveys flows to the Clarkson WRRF and the east trunk system that conveys flows to the G.E. Booth WRRF. It also includes the Clarkson WRRF and the planned diversion of flows through the East-to-West Diversion trunk sewer, currently under construction. The regional study area is considered in the Phase 2 evaluation of alternative solutions. The local study area is the G.E. Booth WRRF and surrounding area. The local study area is considered in the Phase 3 evaluation of alternative design concepts.

The Region and Local study areas are shown in Error! Reference source not found..

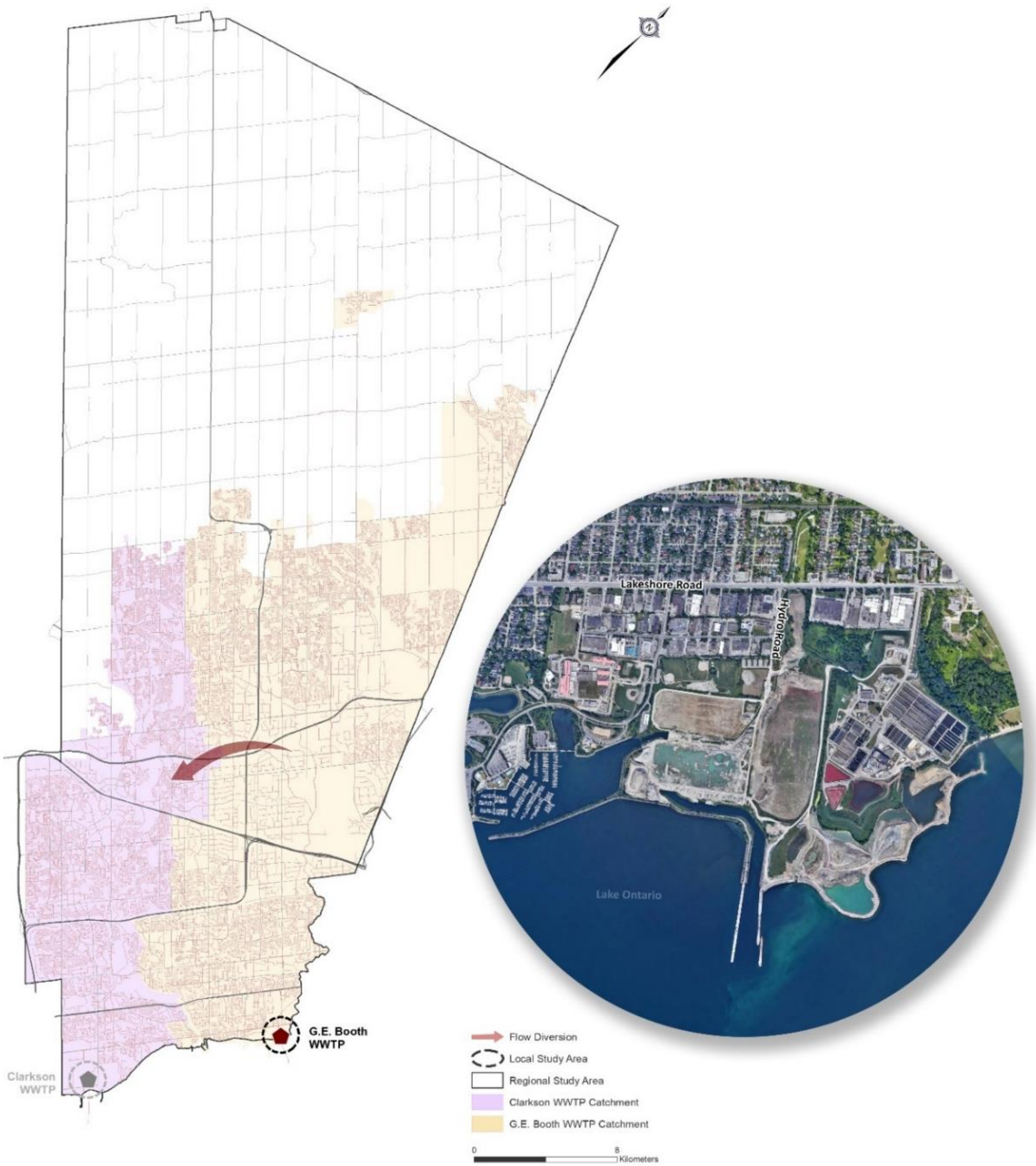


Figure 1-1. Regional and Local Study Areas.

2.0 Ontario's Environmental Assessment Process

To meet the requirements of Ontario's EA Act, this Class EA study was completed as a Schedule C undertaking in accordance with the requirements of the MEA Class EA process (October 2000, as amended in 2007, 2011, 2015 and 2023). The Class EA process includes public, review agency and indigenous consultation, identification, and evaluation of wastewater servicing and biosolids management strategies identification and evaluation of design alternatives, and a comprehensive identification of measures to mitigate potential adverse effects. Ontario's EA Act and the Class EA process are described in the sections below.

2.1 Ontario's Environmental Assessment Act

Ontario's Environmental Assessment Act (EAA) was passed in 1975 and was proclaimed in 1976. The EAA requires proponents to examine and document the environmental effects that could result from major projects or activities and their alternatives. Municipal undertakings became subject to the EAA in 1981.

The EAA's comprehensive definition of the environment is:

- Air, land, or water;
- Plant and animal life, including human life;
- The social, economic, and cultural conditions that influence the life of humans or a community;
- Any building, structure, machine, or other device or thing made by humans;
- Any solid, liquid, gas, odour, heat, sound, vibration, or radiation resulting directly or indirectly from human activities; or,
- Any part of combination of the foregoing and the interrelationships between any two or more of them, in or of Ontario.

The EAA establishes the overruling requirements for EAs, including regulation of Class EAs (as described in Section 2.3). The purpose of the EAA is the betterment of the people of the whole or any part of Ontario by providing for the protection, conservation, and wise management of the environment in Ontario.

2.2 Principles of Environmental Planning

The EAA sets a framework for a rational, objective, transparent, replicable, and impartial planning process based on the following five (5) key principles:

1. **Consultation with affected parties.** Consultation with the public, government review agencies, Indigenous Communities, and other interested stakeholders is an integral part of the planning process. Consultation allows the proponent to identify and address concerns cooperatively before final decisions are made. Consultation should begin as early as possible in the planning process.

2. **Consideration of a reasonable range of alternatives.** Alternatives include different solutions, (I.e., "alternatives to" the proposed undertaking) and "alternative methods" of implementing the preferred solution. The "Do Nothing" alternative must also be considered.

3. **Identification and consideration of the effects of each alternative on all aspects of the environment.** This includes the natural, social, cultural, technical, and economic environments.

4. **Systematic evaluation of alternatives in terms of their advantages and disadvantages, to determine their net environmental effects.** The evaluation shall increase in the level of detail as the study moves from the evaluation of "alternatives to" to the evaluation of "alternative methods".

5. **Provision of clean and complete documentation of the planning process followed to allow "traceability" of decision-making with respect to the project.** The planning process must be documented in such a way that it may be repeated with similar results.

2.3 Municipal Class Environmental Assessment Process

Class EAs were approved by the Minister of the Environment in 1987 for municipal projects having predictable and mitigable impacts. The Class EA approach streamlines the planning and approvals process for municipal projects that are:

- Recurring;
- Similar in nature;
- Usually limited in scale;
- Predictable in the range of environmental impacts; and
- Responsive to mitigation.

The Municipal Class EA, prepared by the MEA (October 2000, as amended in 2007, 2011, 2015, and 2023) outlines the procedures to be followed to satisfy Class EA requirements for water, wastewater, stormwater management, and road projects. The process includes five (5) phases:

- **Phase 1:** Problem or Opportunity Definition;
- **Phase 2:** Identification and Evaluation of Alternative Solutions to Determine a Preferred Solution while taking input from the public and other stakeholders into consideration;

- **Phase 3:** Examination of Alternative Methods of Implementation of the Preferred Solution while taking input from the public and other stakeholders into consideration;
- **Phase 4:** Documentation of the Class EA process in the form of an Environmental Study Report (ESR) for public review; and
- **Phase 5:** Implementation and Monitoring.

Public and agency consultation are integral to the Class EA planning process. Projects subject to the Class EA process are classified into the following four (4) “schedules” depending on the extent of the expected impacts. **Figure 2-1** illustrates the Municipal Class EA planning and design process as approved March 1, 2023.

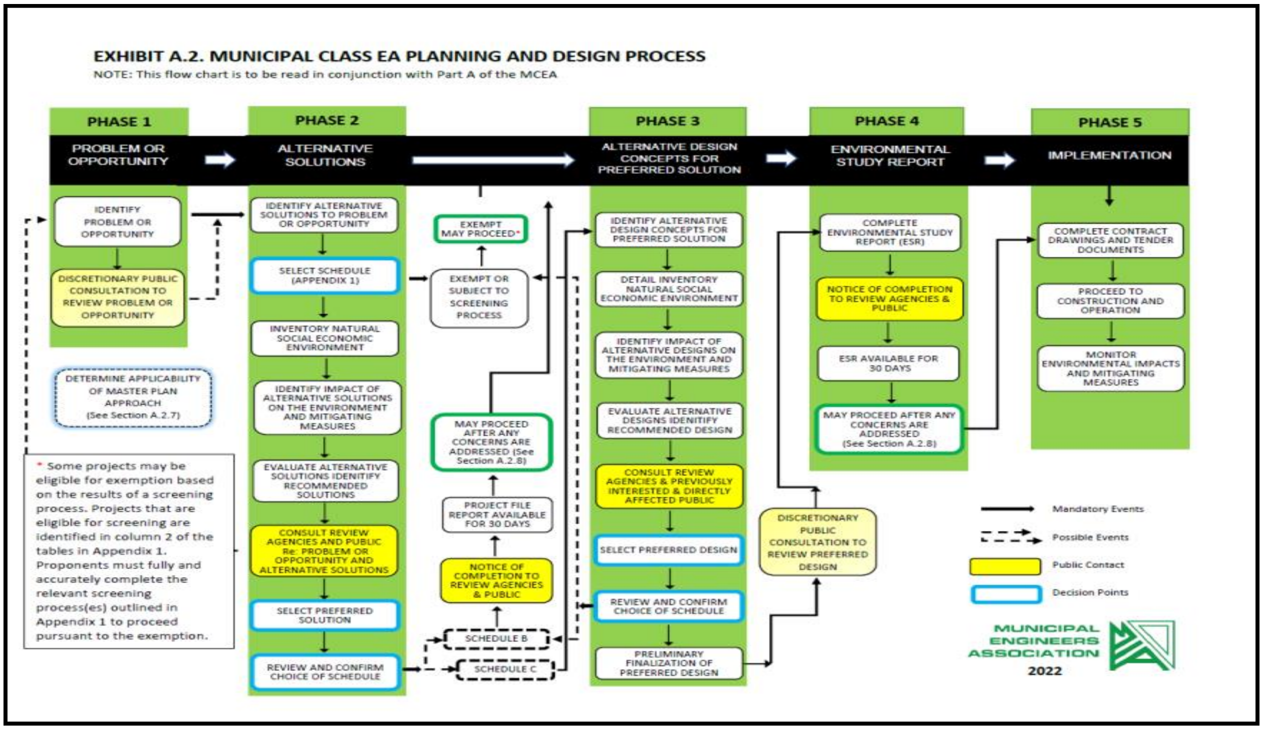


Figure 2-1 Class Environmental Assessment Process, Approved March 1, 2023

Exempt Projects (Formerly known as Schedule A and A+ Projects) These projects are minor or emergency operational and maintenance activities. These projects are typically smaller in scale and do not have a significant environmental effect. These projects are exempt from Ontario’s EA Act and are pre-approved; however, the public is to be advised prior to the project implementation for those projects formerly categorized as Schedule A+.

Projects Eligible to be Screened to Exemption: These projects are eligible for exemption based on the results of a screening process. There are two (2) screening processes identified in the Municipal Class EA process:

- Collector Road Screening Process (CRSP)
- Archaeological Screening Process (ASP)

If the screening process determines that the project is not exempt, the applicable Schedule B or C assessment process must be completed. Proponents can also choose at the outset of the project to not follow a screening process and just complete the applicable Schedule B or C process.

Schedule B projects require a screening of alternatives for their environmental impacts and Phases 1 and 2 of the planning process must be completed. The proponent is required to consult with the affected public, relevant review agencies, Indigenous Communities, and other stakeholders. If there are still outstanding issues after the public review period, requests may be made to the Minister of the Environment for a Section 16 Order (formerly known as a Part II Order). A Section 16 Order is also known as bumping-up the project to a Schedule C Class EA or an Individual EA. Provided that no significant impacts are identified and no requests for a Section 16 Order are received, once a Schedule B project is approved, work may proceed directly to implementation.

Schedule C projects must satisfy all five (5) phases of the Class EA process. These projects have the potential for greater environmental impacts. Phase 3 involves the assessment of alternative methods of carrying out the project, as well as public consultation on the preferred conceptual design. Phase 4 normally includes the preparation of an ESR that is filed for public review. Provided no significant impacts are identified, and no requests for Section 16 Orders are received, once a Schedule C project is approved, work can proceed directly to implementation.

2.4 Selection of Project Schedule

Given the nature of this project, the Municipal Class EA for the G.E. Booth WRRF expansion is classified as a Schedule C undertaking. Therefore, the G.E. Booth WRRF Class EA has been prepared to satisfy Phases 1 to 4 of the Class EA process with the completion of the ESR, and the first stage in Implementation (Phase 5) – Enhanced Conceptual Design Report.

Based on the anticipated complexity of this project, the interconnectivity of the strategies and facilities to the community, and the stakeholder sensitivity for this project, the Region has also provided additional opportunities for public consultation, beyond the minimum required for Schedule C undertakings.

2.5 Public and Stakeholder Consultation / Engagement

Public and stakeholder consultation and engagement was an important component to the success of this study and is mandated as part of the Class EA Process. The primary goals and objectives of the public consultation/engagement process were to:

- Present clear and concise information at key stages of the study process;
- Solicit input from all potential stakeholders, including the community, general public, regulatory agencies, interest groups and other interested parties;
- Identify and address concerns that might arise through the study process;
- Undertake a comprehensive Indigenous Communities' consultation and engagement program;
- Consider stakeholder comments when developing the preferred solution; and

- Meet and exceed Municipal Class EA Consultation requirements for Schedule C projects.

The Consultation and Engagement program for this Class EA was driven by five (5) key principles:

- **Respect:** for all parties engaged in the process;
- **Clear, consistent communication:** to allow for reliable messaging and common understanding;
- **Demonstrated organizational and community values:** all communications reflect the values of the Region as an organization and as a community;
- **Transparency:** to communicate the EA process and its results openly and honestly; and
- **Flexibility:** changeable to adapt to different stakeholders, concerns and opportunities that may arise throughout the EA process.

A broad a range of methods were used through the Class EA process to advise the public and stakeholders of the Class EA and solicit input. Methods include notices, newsletters, a project website, comment forms, public consultation events, as well as online engagement tools such as video, social media platforms (e.g., YouTube, Facebook), StoryMaps, narrated slides, and interactive presentation platforms.

Section 12.0 of this ESR details the public and stakeholder consultation/engagement program and its results.

3.0 Policy Overview

This section presents a summary of the federal, provincial, and local legislation and policies relating to the treatment of wastewater, the management of biosolids, and the protection of the environment, that are relevant to the G.E. Booth WRRF Schedule C Class EA. Relevant capital works programs and studies being undertaken by the Region of Peel that are directly related to this Class EA are also described in this section.

3.1 Federal Legislation and Policy

3.1.1 Canada – U.S Great Lakes Water Quality Agreement

The Great Lakes Water Quality Agreement (GLWQA) first signed in 1972 commits the governments of Canada and the United States to restoring and protecting the Great Lakes. Objectives include protecting and maintaining the lakes for safe drinking water supply, swimming and recreational use, and safe fish and wildlife for human consumption. Issues and potential threats that are addressed in the GLWQA are derived from nutrients, chemicals, vessel discharges, invasive species, and climate change. The GLWQA helps set the policies for protection of the Great Lakes in Canada and Ontario. The GLWQA was first signed in 1972 and has been amended several times.

The International Joint Commission (IJC) plays a key role in the GLWQA, by evaluating efforts to restore the Great Lakes ecosystem, engaging the public, completing research, and assessing the effectiveness of the USA and Canadian programs in meeting the agreement's goals and objectives. Progress reports prepared by the USA and Canadian governments are reviewed and evaluated by the IJC every three years, after which the IJC will complete extensive research and consult with the public to prepare their assessment report on a triennial basis. The first Progress Report was issued in 2016, and the second in 2019.

Key recommendations in the GLWQA include:

- Developing bi-national approaches to climate change adaptation and resiliency, including recognizing the impacts on water infrastructure and improving capacity to respond to extreme events.
- Updating phosphorus reduction targets in vulnerable areas of the Great Lakes to reduce the threats such as harmful algae.

Relevance to this Project: The GLWQA indirectly affects this Class EA project by helping to define the policies governing the quality of effluent discharged to Lake Ontario.

3.1.2 Canadian Environmental Protection Act

The Canadian Environmental Protection Act (CEPA) was enacted in September of 1999 and provides the Canadian government the power to protect the environment and human health while contributing to sustainable development. The CEPA does not directly apply to municipal wastewater treatment and biosolids products but helps advice and direct provincial policies. For example, it has supported stricter wastewater effluent ammonia limits for some municipal wastewater treatment facilities through its

"Guideline for the Release of Ammonia Dissolved in Water Found in Wastewater Effluents", released in 2004. It may also address new substances found in biosolids through the National Pollutant Release Inventory (NPRI). The NPRI is a program that requires the reporting of the release of 323 substances listed on the inventory based on an annual threshold. From a regulatory perspective, Environment Canada currently considers biosolids to be a waste product. As a result, biosolids may be impacted in the future if the substances on the inventory or the threshold quantities change.

Relevance to this Project: The CEPA does not directly apply to municipal wastewater treatment and biosolids products but helps advise and direct provincial policies.

3.1.3 Canadian Council of Ministers of the Environment Guidelines

The Canadian Council of Ministers of the Environment (CCME) was established in 1964, and is composed of environmental ministers from the federal, provincial, and territorial governments. The CCME supports evidenced-based environmental policy making by researching, reporting, and developing guidelines and standards. Key guidelines relevant to this Class EA are reviewed in the following subsections.

3.1.3.1 Canada-wide Strategy for the Management of Municipal Wastewater Effluent

The Canada-wide Strategy for the Management of Municipal Wastewater Effluent was developed in 2019 by the CCME. The strategy sets out a framework that addresses issues related to governance, wastewater facility performance, effluent quality and quantity and its associated risk and economic considerations in a way that provides consistency and clarity to the wastewater sector across Canada.

The Strategy requires that all facilities achieve minimum National Performance Standards and develop and manage site-specific Effluent Discharge Objectives. The Strategy also outlines risk management activities to be implemented to reduce the risks associated with combined and sanitary sewer overflows. The Strategy requires, among other elements, that overflow frequencies for sanitary sewers not increase due to development or redevelopment. The same applies for combined sewers, unless occurring as part of an approved combined sewer overflow management plan. Neither should occur during dry weather, except during spring thaw and emergencies. Source control of pollutants is recommended and monitoring and reporting on effluent quality is required.

3.1.3.2 Wastewater Systems Effluent Regulations

The Wastewater System Effluent Regulations (WSER), issued in 2012 and amended in 2015, is the primary instrument that Environment Canada uses to implement the CCME. The WSER governs both federal and provincial wastewater standards for compliance and are applicable to any wastewater system that treats an average daily volume of at least 100 cubic metres per day (m^3/day).

3.1.3.3 Guidance Document for the Beneficial Use of Municipal Biosolids, Municipal Sludge and Treated Septage

Beneficial use of biosolids is an alternative management strategy considered in this Class EA. The Guidance Document for the Beneficial Use of Municipal Biosolids, Municipal Sludge and Treated Septage was developed by the CCME Biosolids Task Group and published in 2012. It was developed in support of a Canada-wide approach to the management of biosolids. The guidance supports the beneficial use of biosolids and the sound management of biosolids, wastewater treatment sludge and treated septage.

3.1.3.4 CCME Guidelines for Compost Quality

Although the Region currently does not utilize their biosolids as a compost product, composting is an alternative management strategy considered in this Class EA. In the early 1990s the CCME, to support the composting industry in Canada, established a committee to develop quality guidelines for compost products. The CCME, the Bureau de normalization du Quebec (BNQ) and the Canadian Food Inspection Agency (CFIA) agreed to coordinate and develop compost standards to provide consistency. This effort resulted in the first edition of the CCME Compost Quality Guidelines which were published in 1996. The growth in the composting industry since 1996 and the advances in science and technologies resulted in the need to update the guidelines. The revised guidelines published in 2005 are based on four (4) criteria to ensure product safety and quality: Foreign matter; Maturity; Pathogens and Trace Elements. The Guidelines established two (2) grades of material:

- **Category A** – Unrestricted use and
- **Category B** – Restricted use

The Guidelines for Compost Quality are referenced in the CCME Guidance Document for the Beneficial Use of Municipal Biosolids, Municipal Sludge and Treated Septage.

Relevance to this Project: The CCME supports evidenced-based environmental policy making by researching, reporting, and developing Ontario provincial guidelines and standards with respect to wastewater treatment and biosolids management that this project must be designed to meet.

3.1.4 Fisheries Act

The Fisheries Act is a federal legislation for the protection of fish habitat from biological, physical, or chemical alterations that are harmful and/or destructive. Fisheries and Oceans Canada (DFO), in conjunction with various other agencies (Environment Canada, Ontario Ministry of Natural Resources and Forestry, MECP) are responsible for the enforcement and management of fisheries resources.

The following sections of the Act are relevant to this Class EA regarding fish and fish habitat protection and pollution prevention:

- **Section 35(1):** No person shall carry on any work, undertaking or activity that results in serious harm to fish that are part of a commercial, recreational, or Aboriginal fishery, or to fish that support such a fishery.
- **Section 36(3):** No person shall deposit or permit the deposit of a deleterious substance of any type in water frequented by fish or in any place under any conditions where the deleterious substance or any other deleterious substance that results from the deposit of the deleterious substance may enter any such water.

Relevance to this Project: There are watercourses within the Local study area with the potential for fish and fish habitat. In addition, construction of a new outfall has the potential to impact fish and fish habitats. Consequently, the Fisheries Act applies.

3.1.5 Migratory Bird Convention Act

The Migratory Birds Convention Act (MBCA) was established in 1917 and amended in 1994 and 2005, to protect migratory birds, their eggs, and their nests. The MBCA was created to implement the Migratory Birds Convention between Canada and the United States. The Act, administered by Environment Canada, lists protected families and subfamilies of migratory birds and lays out legislation surrounding activities that may impact migratory birds or nests, including when and where activities may occur.

Relevance to this Project: The local study area has the potential to support migratory and nesting birds.

3.1.6 Species at Risk Act

The Species at Risk Act (SARA), administered by Environment Canada, focuses on restoring and maintaining populations of species that are at risk of extinction or extirpation due to human activity such as habitat destruction, hunting, introduction of competing species, or other anthropogenic causes. Species are designated at risk by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) by using biological information on a species deemed to be in danger. The COSEWIC reviews research information on population and habitat status, trends and threats and applies assessment criteria based on international standards. Once a species is added to Schedule 1 – List of Wildlife Species at Risk, it benefits from legal protection afforded and the mandatory recovery planning required under the Act.

Relevance to this Project: While SARA applies to species on federal land, it also applies to species at risk migratory birds under the MBCA and fish anywhere they occur. Therefore, SARA applies to any fish species that are deemed a federal species at risk in the Study Area.

3.1.7 The Canadian Food Inspection Agency – Fertilizers Act and Fertilizers Regulations

The CFIA administers several Acts and Regulations including the Fertilizers Act (FzA) and Fertilizers Regulations (FzR). These have been designed to protect the food supply along with animals and plants. As a result, they enhance Canada's environment, economy and the well-being of its citizens. The FzA and FzR require that regulated fertilizers and soils supplements are safe for humans, animals, plants and the environment, including biosolids products.

While CFIA regulates the fertilizers and supplements that are sold and imported into Canada, the manufacturer of the product, their use and disposal are controlled by provincial and municipal regulations. The CFIA performs pre-market assessments and label verification on fertilizer products. For supplements such as biosolids products and compost they provide marketplace monitoring to verify their compliance with prescribed standards which include pathogens, metals, and pesticide residue along with dioxins and furans.

Relevance to this Project: Sludge is currently incinerated at the G.E. Booth WRRF and as such the FzA and FzR do not apply. However, as part of this Class EA alternative technologies for sludge treatment and alternatives for managing the biosolids produced are identified and assessed. The ability of biosolids products to meet the FzA and FzR were considered in this assessment.

3.2 Provincial Legislation and Policy

All municipalities in Ontario must operate within the administrative, legislative, and financial framework established by senior levels of government. The following sections summarize key provincial initiatives relevant to this Class EA.

3.2.1 Planning Act and Provincial Policy Statement

3.2.1.1 Planning Act

The Planning Act establishes the rules for land use planning in Ontario and describes how land uses may be controlled in communities. It also defines the respective roles and responsibilities of the province and municipalities, as listed below:

Provincial Responsibility

- Issuance of Provincial Policy Statement
- Promotion of provincial interests
- Preparation of provincial plans, such as the Greenbelt Plan and Growth Plan for the Greater Golden Horseshoe
- Provision of advice to municipalities and the public on land use planning issues
- Administration of local planning controls and approvals where required

Municipal Responsibility

- Decision-making for future community planning
- Preparation of planning documents such as Official Plan and Zoning By-Laws
- Ensuring that planning decisions and documents are consistent with Provincial plans
- For upper-tier municipalities (such as Peel Region), approval authority for lower-tier municipalities' Official Plans

3.2.1.2 Provincial Policy Statement

Under the Planning Act, the Province has issued the Provincial Policy Statement which sets the policy foundation for regulating the development and use of land. The Provincial Policy Statement provides guidance and support for appropriate land use planning and development while protecting resources of provincial interest, public health and safety, and the quality of the natural and built environment. The Provincial Policy Statement contains policies relevant to wastewater infrastructure planning including, but not limited to:

- Requirement that infrastructure be provided in a coordinated, efficient, and cost-effective manner with considerations to climate change;
- Planning for infrastructure should be financially viable over their lifecycle and available to meet current and projected needs; and
- Optimization of the use of existing infrastructure and public service facilities before developing new infrastructure.

More specifically, the Provincial Policy Statement recommends that wastewater services should:

- Direct and accommodate expected growth in a manner that promotes the efficient use and optimization of existing municipal water and wastewater services;
- Ensure that these systems are provided in a manner that:
  - Can be sustained by the water resources upon which such services rely;
  - Is feasible, financially viable, and complies with all regulatory requirements; and
  - Protects human health and the natural environment.
- Promote water conservation and water use efficiency; and
- Integrate servicing and land use considerations at all stages of the planning process.

Relevance to this Project: By setting the stage for growth and development in Ontario, the Planning Act and Provincial Policy Statement supports the need for this project, as well as defines the parameters under which it should be implemented (i.e., solutions must be consistent with the overall goals of the Provincial Policy Statement, including protect human health and the environment, be financially viable and comply with all regulatory requirements).

3.2.2 Growth Plan for the Greater Golden Horseshoe and Related Land Use Plans

The Growth Plan for the Greater Golden Horseshoe, which falls under the Places to Grow Act (2005), was first introduced in July 2017, and later amended as of August 28, 2020. The Growth Plan sets out a vision and policies to manage rapid growth. It integrates land use planning, infrastructure planning and investment as well as demographic, economic growth, and health considerations to support the achievement of complete communities, a thriving economy, a clean and healthy environment, and social equity. Like other provincial plans, the Growth Plan builds upon the policy foundation provided by the Provincial Policy Statement and provides additional and more specific land use planning policies to address issues facing the Greater Golden Horseshoe area of Ontario.

The Growth Plan describes permissible population and employment growth areas for upper and single tier municipalities. It also identifies concentrated growth in Urban Growth Centres, including Downtown Mississauga and Downtown Brampton in the Peel Region.

The following land use plans work together with the Growth Plan for the Greater Golden Horseshoe to protect the natural environment and determine where and how growth should be accommodated in the Region:

- **Greenbelt Plan:** The Greenbelt Act, 2005 provides the authority for the creation of the Greenbelt Plan (2017). The Greenbelt Plan is aimed at protecting farmland, communities, forests, wetlands, watersheds, and cultural heritage resources, as well as supporting recreation and tourism in Ontario's Greater Golden Horseshoe. The Greenbelt Area also includes the Niagara Escarpment Plan and the Oak Ridges Moraine Conservation Plan areas.
- **Niagara Escarpment Plan (NEP):** The NEP (2017) was established under the Niagara Escarpment Plan Development Act (NEPDA; 1990) and serves as a framework of objectives and policies to balance development, protection, and the enjoyment of the Niagara Escarpment. The Plan is administered by the Niagara Escarpment Commission.
- **The Oak Ridges Moraine Plan (ORMP):** The ORMP was established in 2002 by the Ontario Government under the Oak Ridges Moraine Conservation Act, 2001, which aimed to protect the ecological and hydrological integrity of the Moraine. The Clarkson and G.E. Booth WRRFs, as well as their service areas, namely the Cities of Mississauga and Brampton, and the community of Bolton, are located outside of the protected Greenbelt Area.

Relevance to this Project: Like the Provincial Policy Statement, the Growth Plan for the Greater Golden Horseshoe and its' related land use plans framework set out where and how future population and employment growth should be accommodated and support the need for this project.

3.2.3 Ontario Heritage Act

The province and municipalities are enabled to conserve significant individual properties and areas through the Ontario Heritage Act (OHA). The OHA, administrated by the Ministry of Citizenship and Multiculturalism (MCM), requires that cultural heritage resources, including buildings, sites and archaeological (land and marine) resources be protected. Impacts to these features must be avoided or mitigated.

Relevance to this Project: As part of the Class EA, investigations to identify the potential for unknown cultural heritage resources have been completed to ensure that the preferred alternative will not impact these resources.

3.2.4 Endangered Species Act

The Endangered Species Act (ESA) was originally written in 1971 and amended in 2008. Similar to the Federal SARA, the ESA aims to provide protection to plant and animal species that are at risk of extinction or extirpation from Ontario. Species thought to be at risk in Ontario are initially determined by the Committee on the Status of Species at Risk in Ontario (COSSARO), and if approved by the provincial Ministry of Natural Resources and Forestry (MNRF), species will be added to the provincial list of endangered and threatened species in compliance with the ESA. The ESA immediately provides habitat protection to all species listed as threatened, endangered or extirpated.

The ESA provides guidance on determining whether anthropogenic activities, such as construction, could impact regulated species and considers biology and behaviour of the species, details of the activity, and how the activity may affect the species' ability to carry out its life processes.

Relevance to this Project: Given the characteristics of the Local study area, there is potential for terrestrial and aquatic provincial species at risk (SAR) species. Impacts to this species must be mitigated in accordance with the ESA. The Project may be subject to a permit under the ESA and/or its regulatory exemptions under the Act.

3.2.5 Water Opportunities Act

The Ontario Government passed the Water Opportunities Act in 2010. The purposes of the Act are as follows:

- To foster innovative water, wastewater and storm water technologies, services, and practices;
- To create opportunities for economic development and clean-technology jobs in Ontario; and
- To conserve and sustain water resources for present and future generations.

To further the purposes of the Act, the MECP may establish aspirational targets in respect of the conservation of water and other matters.

This Act requires regulated parties to prepare and approve municipal water sustainability plans for municipal water, wastewater, and stormwater services under their jurisdiction and submit these plans to the Minister. The Minister may establish performance indicators and targets for these services. This Act also authorizes the making of regulations requiring public agencies to prepare water conservation plans, achieve water conservation targets, and consider technologies, services and practices that promote the efficient use of water and reduce negative impacts on Ontario’s water resources.

Relevance to this Project: Given the characteristics of the Local study area, there is potential for terrestrial and aquatic provincial SAR species. Impacts to these species must be mitigated in accordance with the ESA. The Project may be subject to a permit under the ESA and/or its regulatory exemptions under the Act.

3.2.6 Safe Drinking Water Act and Clean Water Act

Several changes were made to Ontario’s legislation and management of drinking water following Justice O’Conner’s inquiry into the Walkerton E.coli outbreak in 2000, including introduction of the Safe Drinking Water Act and Clean Water Act. The Safe Drinking Water Act was adopted in 2002. The Act provides for the protection of human health and the prevention of drinking water hazards through the control and regulation of drinking water systems and drinking water testing.

The Clean Water Act was adopted in 2006 with the objective being to protect existing and future sources of drinking water including rivers, lakes, and underground aquifers. Under this Act, Source Water Protection Plans were mandated to identify and assess risk of threats, such as agricultural runoff and sewage, to drinking water sources. Source Water Protection Plans also document Intake Protection Zones (IPZs), which delineate high risk areas that must be protected from potential contamination.

The Clarkson and G.E. Booth WRRFs are located within the Credit Valley Source Protection Area (CVSPA), which is grouped within the larger Credit Valley, Toronto, and Region & Central Lake Ontario (CTC) Source Protection Region (SPR). Water intakes in the vicinity of the G.E. Booth WRRF include the Region of Peel

Lorne Park and Lakeview (now A.P. Kennedy) Water Treatment Plants (WTPs) and the City of Toronto R.L. Clark WTP.

Relevance to this Project: The project must include a source protection plan which identifies measures and risks to vulnerable source water protection areas, including intake protection zones (IPZs).

3.2.7 Environmental Protection Act and Ontario Water Resources Act

The Environmental Protection Act (EPA) is the primary pollution control legislation in Ontario and is used with the Ontario Water Resources Act (OWRA) to protect air and water quality in Ontario. The EPA prohibits the discharge of contaminants into the environment that are likely to cause adverse effects, by establishing limits for air emissions and wastewater effluent that must not be exceeded. Environmental Compliance Approvals (ECAs) are issued under the Act. In addition, the Act controls the removal, transport, and disposal of excess soils, if they are deemed to be contaminated. Management of excavated soils must be in accordance with O. Reg. 406/19: On-site and Excess Soil Management.

The OWRA focuses on the protection of groundwater and surface water in Ontario. The Act regulates the approval, construction, and operation of wastewater treatment facilities, including ensuring that effluent discharges to receiving waters meet Provincial Water Quality Objectives (PWQOs). Permits-to-Take-Water (PTTW) from the ground or surface water sources are also regulated under the Water Resources Act.

3.2.7.1 Water Management – Policies, Guidelines, Provincial Water Quality Objectives

To support municipalities in meeting the EPA and OWRA, the MECP has developed water management guidelines. The two (2) most relevant guidelines to this Class EA are described below:

MECP Procedure F-5-1

Procedure F-5-1 outlines treatment requirements for municipal and private sewage treatment works discharging to surface waters. Effluent requirements are established on a case-by-case basis considering the characteristics of the receiving water body. All sewage treatment works shall provide secondary treatment or equivalent as the “normal” level of treatment unless individual receiving water assessment studies indicate the need for higher levels of treatment. Existing works not complying with the guideline are required to upgrade as soon as possible.

The Procedure stipulates effluent design objectives for Biochemical Oxygen Demand (BOD), suspended solids, total phosphorus and ammonia, and provides guidelines for BOD and suspended solids. Sewage treatment works designed according to the guidelines should be able to meet the objectives on an average annual basis and not exceed the guidelines.

Procedure F-5-1, Section 3.3 states that bypassing of raw sewage and primary effluent from nominally separated sewerage systems will not be allowed except in emergency conditions. However, Section 3.5 allows the use of “excess primary treatment” to handle extraneous wet weather peak flows where secondary treatment for these flows is “impractical or uneconomical”. Effluent criteria and compliance assessment programs are not necessary for excess primary treatment. This policy supports the development of appropriate levels of primary and secondary treatment capacity, particularly with respect to subjecting peak flows to a minimum of primary treatment and the determination of secondary treatment peak capacity.

MECP Procedure B-1-5

Procedure B-1-5 describes the procedures to establish receiving-water based effluent requirements for point source discharges, such as wastewater treatment plant outfalls. The Procedures aims to ensure that point-discharges to surface water bodies do not negatively impact receiving water quality relative to PWQO. Procedure B-1-5 states that effluent limits are the legally enforceable effluent requirements, and that these limits are based on either achievable treatment technology or scientifically sound data on receiving water quality requirements. Further it states that effluent objectives are used where the available data on the parameters to be controlled are insufficient to form the basis for a legally enforceable limit. Violations of an effluent objective can require the discharger to report on the causes and impacts of the violations as per their ECA and MECP policy.

Surface waters in Ontario are subject to requirements of the five (5) Policies, as applicable to an undertaking:

- **Policy 1** applies to water bodies with quality that is better than PWQO and specifies that water quality must be maintained at or above the Objective.
- **Policy 2** applies to water bodies with quality that does not currently meet PWQO and shall not be further degraded. Policy 2 reinforces the fact that measures should be taken to improve water quality to meet Objectives.
- **Policies 3 and 4** prohibit the release of banned hazardous substances and to minimize the release of no-hazardous substances, respectively.
- **Policy 5** addresses mixing zone effects; the mixing zone is defined as an area where the receiving water quality is degraded at the point of discharge and may hinder beneficial use of the water body. Policy 5 prescribes that mixing zones should be as small as possible to limit effects on beneficial use and shall not be used in lieu of reasonable and practical treatment.

For this Class EA, Policies 1 and 5 apply. The Procedure also stipulates methods for developing effluent criteria and assessing receiving waters. In compliance with this procedure, a receiving water assessment and assimilative capacity study was completed for this Class EA.

3.2.7.2 Permits-to-Take-Water

PTTW are required if temporary or permanent dewatering is required. For temporary dewatering on land, the volume of water entering the excavation will be based on both groundwater infiltration and precipitation events. Based on Ontario Regulation (O. Reg.) 63/16, the following dewatering limits and requirements are as follows:

- Construction Dewatering less than 50,000 liters per day (L/day): The takings of both groundwater and stormwater do not require a hydrogeological report and does not require a PTTW from the MECP.

- Construction Dewatering greater than 50,000 L/day and less than 400,000 L/day: The taking of groundwater and/or stormwater requires a hydrogeological report and registration on the Environmental Activity and Sector Registry (EASR) but does not require a PTTW from the MECP.
- Construction Dewatering greater than 400,000 L/day: The taking of groundwater and/or stormwater requires a hydrogeological report and a PTTW from the MECP.

For permanent dewatering, based on Section 34 of O.Reg. 387/04, the dewatering limits and requirements are as follows:

- Water Taking less than 50,000 L/day: A PTTW is not required from the MECP.
- Water Taking greater than 50,000 L/day: A PTTW is required from the MECP (likely Category 3).

Relevance to this Project: The EPA and OWRA are key legislation applicable to this project. Preferred solutions and design concepts identified through the Class EA process must incorporate mitigation measures to reduce risks to the community and the environment to receive subsequent approvals under these Acts.

3.2.8 Nutrient Management Act

As part of Ontario's Clean Water Strategy, the Nutrient Management Act (NMA), 2002 was developed to reduce the potential for water and environmental impacts from agricultural activities. The NMA regulates biosolids as of non-agricultural source material (NASM) intended for application to agricultural land as nutrients. NASM categories include yard waste, fruit and vegetable peels, food processing waste, pulp and paper biosolids and municipal sewage biosolids. NMA prohibits application of these materials to land that is unsuitably close to adjacent surface waters and sensitive areas; sets out criteria regarding heavy metal concentrations and suitable soil types and topography; and outlines the amount, method and timing of application. Before being approved for application on farmland, biosolids must be tested for pH, available nitrogen, potassium and phosphorus, pathogens, 11 regulated heavy metals, and meet sampling requirements set out in the regulation.

The NMA was developed by the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA), and the MECP and sets the framework for best practices regarding application of nutrients to agricultural fields, including fertilizers, manure, and wastewater biosolids. OMAFRA is responsible for the approvals, training, certification, and education activities required for the safe application of NASM. They will also notify the local municipality (lower or single tier) when any NASM Plan within its jurisdiction is approved. MECP is responsible for enforcing compliance with the NMA. They will also carry out proactive inspections and respond to complaints of NASM land application activities to ensure compliance with the regulatory standards and protection of the environment.

3.2.8.1 Quality Standards and Guidelines for the Production of Compost (2012)

In 2012, Ontario updated its quality standards and guidelines for the production of compost, to encourage the composting of more materials, while protecting the environment and human health. These standards include three categories of compost (AA, A, and B), which provide additional options for the management of biosolids. These standards set quality criteria for metals, pathogens, maturity, and foreign matter for each category of finished compost.

Category AA is unrestricted use that allows compost to be given away and used by the public freely. Under the Ontario compost regulation, a compost that contains biosolids cannot be classified as AA Category. Categories A and B allow municipal wastewater biosolids to be used as feedstocks up to 25%, allowing for the beneficial use of these resources. Category A compost is exempt from the need for approvals provided that it meets the new standards, including labelling, while Category B, falls under the same requirements as a NASM, will continue to require government approval for use and transportation, including an ECA or EASR registration for transport and ECA for use off-farm or approved NASM Plan for on-farm use.

Relevance to this Project: The Act does not currently apply to the G.E. Booth WRRF as sludge is incinerated and not applied on agricultural lands. However, as part of this Class EA alternative technologies for sludge treatment and alternatives for managing the biosolids produced are identified and assessed. The ability of alternative biosolids products to meet the NMA were considered in this assessment. The NMA will apply if biosolids management practices are changed in the future.

3.2.9 Conservation Authority Regulation and Policy

The legislative mandate of a Conservation Authority, as set out in Section 20 of the Conservation Authorities Act, is to establish and undertake programs designed to further the conservation, restoration, development, and management of natural resources. Conservation Authorities are local agencies that protect and manage water and other natural resources at the watershed level. Five Conservation Authorities have jurisdiction in the Region of Peel. Approximately 98 percent (%) of the total area of the Region is managed by either Toronto and Region Conservation Authority (TRCA) or Credit Valley Conservation (CVC). The three (3) other authorities, Conservation Halton (CH), Nottawasaga Valley Conservation Authority (NVCA), and Lake Simcoe Region Conservation Authority (LSRCA), collectively comprise less than 2% of the total area of the Region. The G.E. Booth WRRF site is within the CVC Regulation Limit Area. Currently, the CVC is working jointly with the TRCA and Region of Peel to construct the Jim Tovey Lakeview Conservation Area (JTLCA) located immediately southeast of the G.E. Booth WRRF ash lagoons on the Lake Ontario shoreline.

The key responsibility of the Conservation Authorities is to help ensure that the requirements of the Lakes and Rivers Improvement Act administered by the MNR are met. The Act was introduced in 1990 to protect the province’s surface water resources. This Act regulates the public and private use of Ontario’s lakes and rivers, including governing any works that interfere with wetlands or the alternation to shorelines and watercourses.

Relevance to this Project: Given that the G.E. Booth WRRF is within the CVC Regulation Limit, the Lakes and Rivers Improvement Act applies. Consultation with the CVC and TRCA, as well as the City of Mississauga through the project was undertaken to ensure that measures to mitigate impacts on the watershed were identified and incorporated into the overall preferred design concept.

3.2.10 More Homes Built Faster Act (2022)

On April 14, 2022, the More Homes Built Faster Act received Royal Assent. The aim of the Act is to advance the province's goal to increase housing supply in Ontario; The goal is to have 1.5 million new homes built over the next ten (10) years. It builds on the province's early More Homes, More Choice Plan and the More Homes for Everyone Plan, and sets framework for growth by:

- Reducing the bureaucratic costs and red tape that are delaying construction and pushing home prices even higher;
- Promoting building up near transit and reforming zoning to create more "gentle density"; and
- Protecting homebuyers and utilizing provincial lands to build more attainable homes.

The Act amends various statutes to achieve the goal of increasing housing supply in Ontario, including the following:

Planning Act

The Planning Act and Provincial Policy Statement are described in Section 3.2.1.. Key amendments to the Planning Act Planning Act include changes to existing zoning by-laws, third part appeal processes to the Ontario Land Tribunal, site plan controls and parkland requirements.

Growth Plan for the Greater Golden Horseshoe and Related Land Use Plans

To accommodate the expected growth and support the building of more homes, The Growth Plan for the Greater Golden Horseshoe was amended in 2020 to reflect changes in population and employment forecasts, the horizon for planning and other policies to increase housing supply, great jobs, attract business investments and better align with infrastructure. In addition, the Greenbelt Plan and Oak Ridges Moraine Conservation Plan have been amended to increase the suitable land available for residential development.

Conservation Authority Act

Regulatory and policy changes under the Conservation Authorities Act were made in 2022 to improve conservation authority governance, oversight, transparency, and accountability. The amendments do not remove the mandate of Conservation Authorities over watershed management but change their roles with respect to approvals and appeal rights. Individual municipalities have regulatory responsibility under the Planning Act, and the Minister of Natural Resources know has the authority to determine permit applications in place of the Conservation Authorities.

Relevance to this Project: The More Homes Built Faster Act was enacted near the completion of this Class EA process. This Class EA is based on approved population growth forecasts as presented in the Region of Peel's 2020 Water and Wastewater Master Plan (see Section 3.5.1) and does not change the assessment process or recommendations presented herein.

3.3 Regional and Municipal Legislation and Policy

3.3.1 Region of Peel Official Plan

The Official Plan (OP) is a long-term plan used to assist the Region in managing future growth and development while meeting the needs of existing residents and businesses in the Region. It sets out a policy framework that guides economic, environmental and community planning decisions and sets the basis for providing regional services in an efficient and effective manner. As required under the Planning Act, the OP is updated every five (5) years. Region Council adopted the latest updated OP on April 28, 2022.

The OP provides policy framework and integrates provincial legislation into Region-specific planning, it also documents approved population and employment growth, providing a growth basis for Peel's 2020 Water and Wastewater Master Plan used in this Class EA to identify future wastewater treatment needs.

Relevance to this Project: Like the Planning Act, the Region of Peel's OP sets out how growth should be accommodated and support the need for this project.

3.3.2 City of Mississauga Official Plan

The Mississauga OP provides direction for the next stage of the city's growth and planning policies to guide development to year 2031, as required by the Ontario Planning Act. The most current office consolidation of the Mississauga OP is updated to March 3, 2023, which includes Ontario Land Tribunal (OLT) decisions and City Council approved OP Amendments up to this date.

The Mississauga OP outlines general policies as well as specific policies. Key policies relevant to the water and wastewater networks were considered in the development of the 2020 Water and Wastewater Master Plan including ensuring co-operation with other levels of government, appropriate agencies, and the private sector, such that adequate water and sanitary sewer services are provided.

Relevance to this Project: In conjunction with the Region OP, the City of Mississauga OP sets policies to support the need and implementation of this project.

3.3.3 Region of Peel Climate Change Master Plan

The Region of Peel Climate Change Master Plan (CCMP) was recently issued (2020) and is in effect until 2030. The CCMP outlines strategies to manage the Region's assets, infrastructure, and services in a changing climate. Two (2) primary outcomes of the CCMP are:

- Reduce corporate emissions by 45% by 2030 relative to 2010 levels; and
- Be prepared for changing climates and extreme weather events by ensuring Region services and assets are resilient.

Supporting outcomes will enable success by providing direction to "Build Capacity," "Invest," and "Monitor and Report". The pursuit of these outcomes is guided by four (4) principles: balance, transparency, collaboration, and innovation. Progress on these outcomes will be measured by the

Region's Climate Change Resiliency scorecard which assesses key factors of a climate resilient community.

These principles and objectives are integrated into the G.E. Booth WRRF Expansion Class EA through opportunities to address Climate Change.

Sections below discuss the CCMP's approach to energy management and GHG reduction.

3.3.3.1 Energy Management

The CCMP recommends undertaking deep retrofits for existing buildings to reduce inefficient energy use related to heat transfer through walls, windows, and roofs. Improved efficiency in these areas would minimize energy loss associated with heating and cooling.

In conjunction with deep retrofits, the CCMP prescribes leveraging the Reduce, Improve, Switch and Generate framework:

- Reduce the amount of energy needed to maintain comfort and deliver services
- Improve efficiencies of energy consuming equipment
- Switch from GHG intensive to low-carbon fuels (natural gas to electricity)
- Generate energy through renewable resources (e.g., solar photovoltaic cells and renewable natural gas from wastewater)

Further to the above, the CCMP also recommends ensuring that new buildings have high energy performance and aiming for net-zero emissions.

This Class EA will integrate the above recommendations where appropriate, including consideration of opportunities to generate renewable natural gas.

3.3.3.2 Greenhouse Gas Reduction

A primary outcome of the Region of Peel CCMP is to reduce corporate GHG emissions by 45% by 2031 relative to 2010 levels. The Region achieved a 29% reduction in 2016 and will need to reduce emissions by a further 16% to meet the 2031 goal, bringing emissions down to 75 kilotonnes of carbon dioxide equivalent (KtCO2e) per year. The CCMP describes a "Low-Carbon Pathway", which considers seven (7) Region sectors, including Water and Wastewater. In order to meet the Region's 2031 goals, Water and Wastewater-related GHG emissions must be reduced by approximately 20 KtCO2e per year.

Relevance to this Project: Energy efficiency and GHG reduction is a key objective of this Class EA. The preferred design concept has been selected and developed to support the Region of Peel's CCMP Goals.

3.3.4 Region of Peel Water Efficiency Strategy

The Region of Peel first developed a Water Efficiency Plan (WEP) in 2004 in response to the growing demands on the water supply and wastewater treatment system at the time. In 2011 the WEP underwent a review to account for technological and marketplace changes since the WEP was originally developed to align the Region's strategy with the current Strategic Plan and Term of Council Priorities.

The new strategy, the 2013-2025 Water Efficiency Strategy, accounts for marketplace changes, Region direction and is in line with current legislation including the 2010 Ontario Water Opportunities Act and the OWRA.

The goal of the WEP is to identify and implement appropriate and cost-effective water efficiency measures to reduce peak day water demands, meet legislative requirements, manage system loss, and help citizens manage their water demands more effectively. The WEP has served to reduce water demands and wastewater generation rates in the Region over the years and is part of Peel's strategy for meeting future water supply and wastewater treatment needs. Through their Water Smart Peel program, the Region continues to increase the awareness and understanding about water efficiency and its benefits. Water demands within the Region are monitored and measured to assess projected savings and verify that targets are met.

Relevance to this Project: Water efficiency is a key objective of the Region. Water efficiency is part of the overall solution to meet capacity requirements in the Region of Peels' system and at its WRRFs.

3.4 Inter-Regional Servicing Agreements

Servicing agreements between the Region of Peel and the City of Toronto and York Region are described below. These agreements are current and no additional inter-regional servicing is expected as part of the 2020 Master Plan update.

3.4.1 Peel-Toronto Inter-Regional Wastewater Servicing Agreement

The Toronto-Peel Wastewater Servicing Agreement allows for the provision of treatment services to parts of the City of Toronto's and the Region of Peel's respective sanitary sewersheds that would otherwise require significant additional infrastructure to intercept and convey sewage flows back to the municipalities' respective WRRFs. The agreement effectively eliminates the need for both municipalities to construct and maintain additional pumping stations and forcemains.

The agreement states that there are three (3) locations where sewage flows cross the municipal boundary line between the Region of Peel and the City of Toronto, as listed in **Table 3-1**.

Table 3-1 Peel and Toronto Inter-Regional Servicing Interconnection Points

Direction of Flow	Interconnection Point	Receiving System	Receiving Facility
Toronto to Peel	Rakely Court and Eglinton Avenue East	Peel East Sanitary Trunk Sewer	G.E. Booth WRRF
Toronto to Peel	41st Street and Lakeshore Road East	Peel East Sanitary Trunk Sewer	G.E. Booth WRRF
Peel to Toronto	Disco Road and Highway 427	North Mimico Sanitary Trunk Sewer	Humber WRRF

Recent analysis of historic flows shows that flows from Toronto to Peel exceed the flows from the Region of Peel to Toronto, meaning that there is a net flow from Toronto to the Region of Peel.

3.4.2 York-Peel Inter-Regional Water and Wastewater Agreement

The Region of York and The Region of Peel currently participate cooperatively to manage many aspects of the infrastructure program within the Peel boundaries required to treat and supply water to York and collect and treat wastewater from York.

The York-Peel Water and Wastewater Agreements set out the committed servicing requirements to York Region from the Region of Peel. Committed wastewater treatment capacity to an average day wastewater flow of 53.2 MLD in 2031 and beyond was factored into the 2020 Master Plan. This flow is pumped from the Humber Sewage Pumping Station in York Region to the east trunk system in Peel and is treated at the G.E. Booth WRRF.

3.5 Relevant Capital Works Projects and Planning Studies in the Region

In order to effectively undertake this project, it is important to consider current projects being undertaken by the Region of Peel that are related to this Class EA. The following is a list of related projects.

3.5.1 2020 Water and Wastewater Master Plan

The 2020 Water and Wastewater Master Plan sets the stage for these Class EAs by establishing future population growth and wastewater treatment needs to the year 2041 and establishes the Region of Peel's overall strategy for wastewater servicing. A summary of relevant results of the Master Plan is presented in this ESR.

3.5.2 2025 Water and Wastewater Master Plan for the Lake-Based System

The Region of Peel is initiating the 2025 Water and Wastewater Master Plan for the Lake-Based System to account for new population growth and other changes resulting from the provincial plan goal to increase housing supply in Ontario as per the More Homes Built Faster Act, 2022. Water and wastewater infrastructure needs to meet growth forecasts to the year 2051, including schedule for implementation, will be identified through this 2025 Master Plan. The preferred solution and recommendation presented in this Class EA will be incorporated into the 2025 Master Plan.

3.5.3 Clarkson WRRF Schedule C Class EA Environmental Study Report (ESR) (May 2023)

The Clarkson WRRF Schedule C Class EA ESR was completed and filed on May 24, 2023, for public review. The Class EAs for the Clarkson WRRF and G.E. Booth WRRF were undertaken simultaneously to the end of Phase 2 of the Class EA process due to interconnectivity between the plants. At the end of Phase 2, a strategy for meeting future servicing needs, which identified expansion requirements at both the Clarkson WRRF and the G.E. Booth WRRF. Phase 3 was then completed separately for each WRRF to identify the preferred conceptual designs for the expansions. Section 7.0 of this Class EA presents Phase 2 process and results (which is similar to that presented in the Clarkson WRRF ESR), while Section 8.0 presents Phase 3 process and results for the G.E. Booth WRRF.

3.5.4 East-to-West Diversion Trunk Sewer

As indicated, the East-to-West Diversion Trunk Sewer is a key component of the Region of Peel's long-term plan to provide wastewater services. The sewer is currently under construction and scheduled to be complete in 2026. The Diversion Trunk Sewer will allow the Region to optimize the use and timing of infrastructure upgrades to the Clarkson and G.E. Booth WRRFs. While the preliminary diversion requirements were identified in the 2020 Master Plan, a more detailed analysis has been completed as part of this Class EA to confirm expansion and diversion requirements and timing.

3.5.5 Lakeshore Road Trunk Sewer

The Region of Peel is currently undertaking the design of a deep gravity sewer on Lakeshore Road from Front Street sewage pumping station to Richards Memorial sewage pumping station. This trunk sewer could potentially extend to the Clarkson WRRF in the future; thus, eliminating various pumping stations along the route and allowing the Region more flexibility in the future to divert flows from the east to the west service area.

3.5.6 Real Time Control Feasibility Study

The Region is currently undertaking a study to identify the feasibility of implementing Real Time Control (RTC) within its collection system to manage peak wet weather flows. RTC within the collection system will help manage peak flows to the WRRFs. If feasible, RTC will be implemented as part of the Region's overall strategy for managing wet weather flows.

3.5.7 District Energy Centre

The District Energy Centre (DEC) is a partnership between the Region of Peel, Enwave, and the Lakeview Development. The DEC is a thermal energy centre which pumps treated effluent from the G.E. Booth WRRF through heat exchangers to provide heating and cooling to homes in the Lakeview Development. The DEC is planned to be constructed on the eastern boundary of the Lakeview Development site with conduits connecting the DEC to the G.E. Booth WRRF outfall conduits. It is planned for construction in 2027. The preferred design concept for the G.E. Booth WRRF has been developed to coordinate with the DEC project.

3.6 Capital Works Projects at the G.E. Booth WRRF

There are numerous capital works projects underway at the G.E. Booth WRRF, as described in the sections below.

3.6.1 New Plant 1

Construction of New Plant 1 is currently underway and expected to be completed in the spring of 2026. The work includes replacement of the existing aging Plant 1 to restore its rated capacity of 40 MLD. Work includes a new inlet conduit, a new odour control facility, new primary clarifiers, and a new bypass conduit to replace Plant 1 and to support future facility expansions.

3.6.2 Odour Control Upgrades

Odour control upgrades are planned for construction in 2024 with completion near the end of 2028. Odour control measures include:

- Replacing old Plant 1 and enclosing the new Plant 1 primary clarifiers with flat covers, a building, and an odour control facility;
- Covering the existing Plant 2 & Plant 3 primary clarifiers with flat covers, a building, and odour control facilities;
- Increasing the stack height of the odour control facility at the existing headworks facility; and
- Adding a polishing stage of odour control to the existing headworks odour control facility.

3.6.3 Plant 2 and 3 Upgrades

Upgrades to Plant 2 and 3 are ongoing and include:

- Replacement of the diffusers in the Plant 2 aeration tanks;
- Expansion of the Plant 3 clarifiers to restore hydraulic capacity to 518 MLD, including two (2) new primary clarifiers, a new secondary bypass conduit, and removal of the existing secondary bypass; and
- Replacement of the existing Plant 3 effluent pumping system.

These works are expected to be completed in 2027.

3.6.4 Sludge Management Facility Upgrades

Two (2) projects are underway:

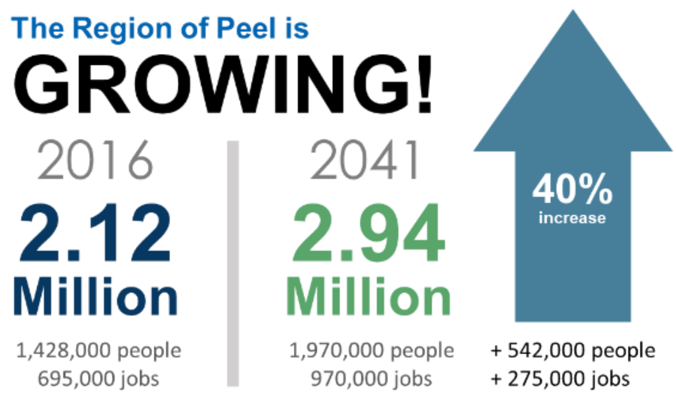
- Design and construction of a truck loading facility to haul dewater sludge for alterative disposal on a contingency basis; and
- Refurbishment of the three incinerator units (i.e., Thermal Oxidation (TOX) units) to improve operating efficiency.

4.0 Project Need

This section summarizes the projected population and employment growth in Peel Region to the 2041 planning horizon, and the implications this growth will have on the wastewater (liquids and solids) system. This is used to establish the project need and to identify the study's Opportunity Statement. While this Class EA focuses on needs specific to the G.E. Booth WRRF, it is important to understand the growth and wastewater servicing needs of both the Clarkson WRRF and G.E. Booth WRRF catchment areas together as they operate as a system. The holistic system-wide review is necessary to understand the effects of flow diversion via the East-to-West Trunk sewer on each respective treatment plant and critical to better assess needs for future biosolids management since, currently, all system-generated biosolids are managed at the G.E. Booth WRRF.

4.1 Population and Employment Projections

The Region's Growth Management Process and 2020 Water and Wastewater Master Plan identified that there will be significant growth across the Region of Peel, with the need to provide additional wastewater treatment capacity to meet these needs.



Population and employment projections were established to assess future wastewater treatment hydraulic and loading capacity requirements. The 2020 Master Plan summarized population and employment projections serviced by the Clarkson and G.E. Booth WRRFs to 2041 and beyond, as presented in **Table 4-1** below.

Table 4-1 Region-Wide Population and Employment Growth

Year	G.E. Booth WRRF Catchment Area		Clarkson WRRF Catchment Area		Total	
	Population	Employment	Population	Employment	Population	Employment
2020	831,233	498,028	623,595	184,510	1,454,828	682,538
2021	842,755	507,010	634,651	188,983	1,477,406	695,993
2026	900,761	539,h876	682,320	205,428	1,583,081	745,304
2031	957,564	565,606	733,933	220,669	1,691,497	786,275
2036	1,035,005	603,318	770,466	235,609	1,805,471	838,927
2041	1,089,517	633,928	804,604	254,710	1,894,121	888,638
Buildout*	*1,730,671*	*1,101,012*	*1,012,742*	*387,909*	*2,743,413*	*1,488,920*

* Population Forecasts to the year 2041 are approved under the Official Plan. The buildout populations, however, do not have status under Provincial or Municipal legislation. They are used strictly for planning purposes in this Class EA to develop a long-term vision

4.2 Wastewater (Liquid) Hydraulic Capacity Requirements

4.2.1 Existing Wastewater Treatment Capacity

The average rated flow capacity of the G.E. Booth WRRF is currently 518 MLD as specified in the facility's Amended ECA (NUMBER 9375-C4RKKZ), dated October 2021. From 2017 to 2019, average daily flows to the G.E. Booth WRRF were approximately 480 MLD. Generally, when 90% of a WRRF's rated capacity is reached and additional growth is forecasted, alternatives for providing additional capacity must be assessed through a Class EA process. The G.E. Booth WRRF is currently at about 92% of its rated capacity.

The rated average daily flow capacity of the Clarkson WRRF is currently 350 MLD as specified in the facility's Amended ECA (NUMBER 0729-9KBNNY), dated June 2014. For the Clarkson WRRF, 90% of its rated capacity is 315 MLD. The average daily flows to the Clarkson WRRF from 2017 to 2019 were approximately 220 MLD. The Clarkson WRRF, therefore, has excess capacity to treat additional flows.

4.2.2 Historical Wastewater Flows

The historical wastewater flows to the G.E. Booth and the Clarkson WRRFs from 2015 to 2019, inclusive, are listed in **Table 4-2** and **Table 4-3**, respectively, along with the estimated per capita average day use (L/cap/d) based on the total equivalent service population. The G.E. Booth WRRF also receives flows from the City of Toronto and the Regional Municipality of York. The flows received from these jurisdictions vary slightly; however, from 2015 to 2019, flows from Toronto averaged 26 MLD and flows from York averaged 35 MLD.

Table 4-2 Historical Average Day Flows to G.E. Booth WRRF from 2015 to 2019

Year	Average Daily Flow at the WRRF (MLD)	Average Daily Flow (MLD) – Excl. Contributions from York and Toronto	Residential Population	Employment Population	Total Equivalent Population	Equivalent Per Capita Flow (L/cap/d)
2015	412	351	784,279	461,042	1,245,321	282
2016	434	380	785,149	462,100	1,247,249	305
2017	445	382	796,670	471,082	1,267,752	301
2018	474	412	808,191	480,064	1,288,255	320
2019	469	401	819,712	489,046	1,308,758	306
5-year avg	447[i]	--	--	--	--	303

i The rated capacity of the G.E. Booth WRRF is 518 MLD; 90 % of this rated capacity is 446 MLD.

Table 4-3 Historical Average Day Flows to Clarkson WRRF from 2015 to 2019

Year	Average Daily Flow (MLD)	Residential Population	Employment Population	Total Equivalent Population	Equivalent Per Capita Flow (L/cap/d)
2015	189	579,926	170,935	750,861	252
2016	201	579,372	166,614	745,986	269
2017	188	590,428	171,088	761,516	247
2018	191	601,484	175,562	777,046	246
2019	228	612,540	180,036	792,576	288
5-year avg	*200*[i]	--	--	--	*260*

i: The rated capacity of the Clarkson WRRF is 350 MLD; 90% of this rated capacity is 315 MLD.

The five-year average per capita generation in the G.E. Booth WRRF catchment area is estimated at 303 L/cap/d, while per capita wastewater generation in the Clarkson WRRF catchment area is somewhat less at 260 L/cap/d, with an overall system average of 287 L/cap/d. However, when estimating future wastewater flows, a 10 percent safety factor was applied to reflect an increasing flow trend and an element of inflow and infiltration, which equates to a 315 L/cap/d wastewater flow rate (2020 Master Plan).

4.2.3 Hydraulic Capacity Projections and Assessment

The starting year used in estimating future flows was 2019, as identified in the 2020 Master Plan. Future flow projections were then established by multiplying the forecasted equivalent population growth estimates with the 315 L/cap/d wastewater flow rate and adding with the 2019 flows. The contributions from York Region and the City of Toronto were also added for G.E. Booth WRRF up to the maximum agreement contributions from York Region and the City of Toronto, 53 MLD and 29 MLD, respectively.

G.E. Booth WRRF

Future Year Flows = 2019 Starting Point + (Growth x Design Criteria) + (York + Toronto)

Clarkson WRRF

Future Year Flows = 2019 Starting Point + (Growth x Design Criteria)

Future average flow estimates to the G.E. Booth WRRF and Clarkson WRRF without flow diversion through the East-to-West Diversion Trunk are shown in **Table 4-4** and **Table 4-5**, respectively. These are also illustrated graphically in **Figure 4-1** for G.E. Booth WRRF and **Figure 4-2** for Clarkson WRRF.

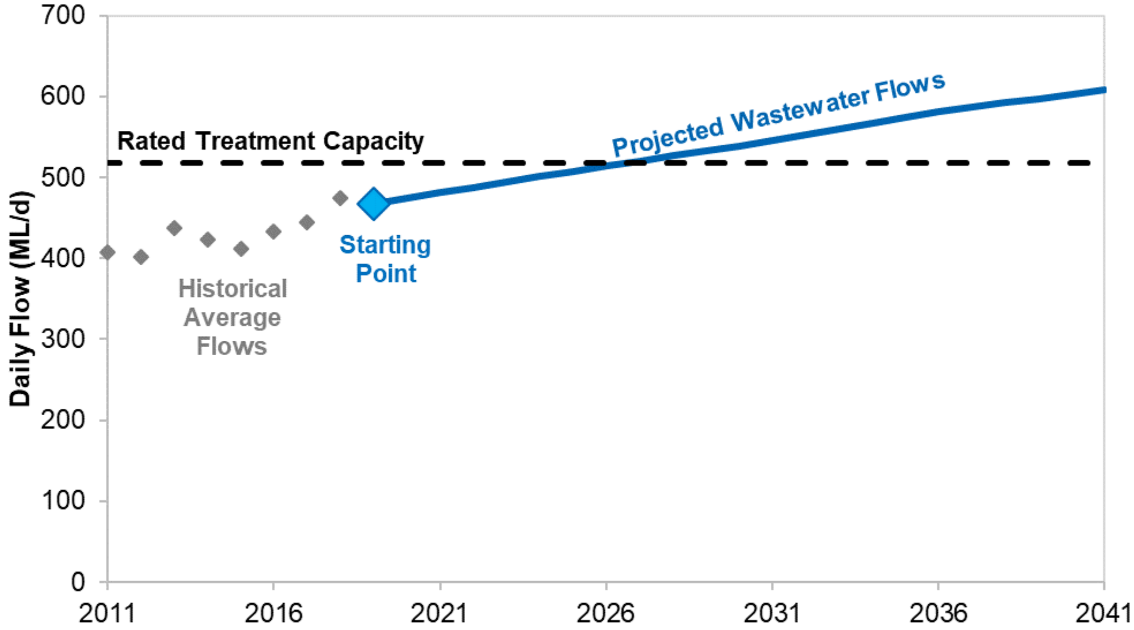


Figure 4-1 G.E. Booth WRRF Flow Projections

Table 4-4 Future Average Day Flows to G.E. Booth WRRF

Year	Population	Employment	Population Growth	Employment Growth	York Avg. (MLD)	Toronto Avg. (MLD)	Avg Flow (MLD)
2019	819,712	489,046	--	--	43	29	467
2021	842,755	507,010	23,043	17,964	44	29	481
2026	900,761	539,876	58,006	32,866	49	29	514
2031	957,564	565,606	56,803	25,730	53	29	545
2036	1,035,005	603,318	77,441	37,712	53	29	581
2041	1,089,517	633,928	54,512	30,610	53	29	608

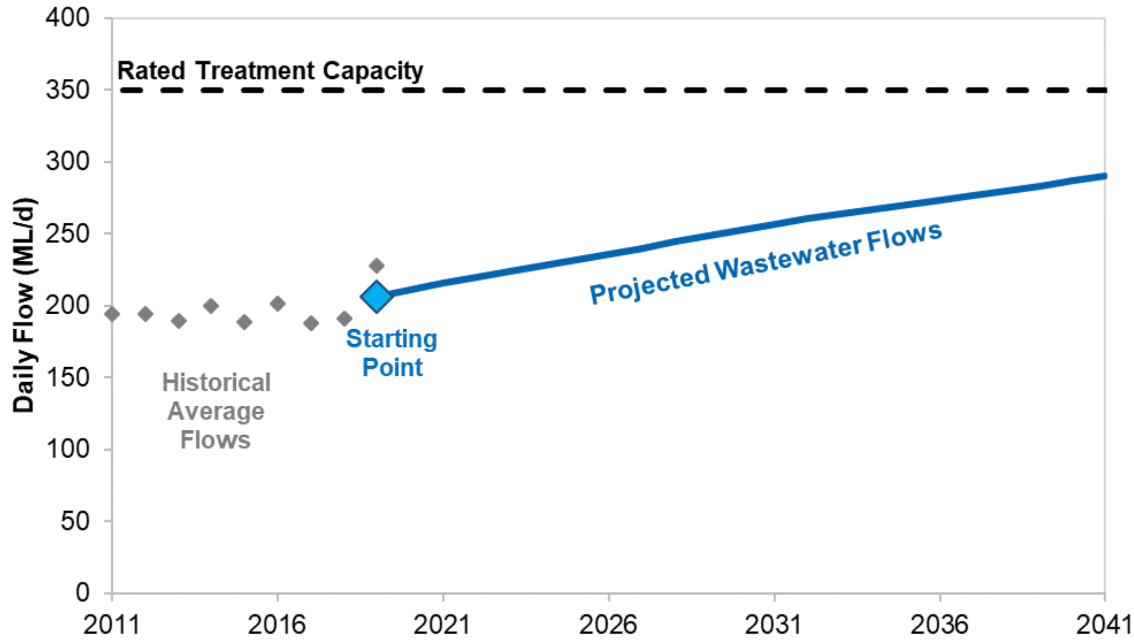


Figure 4-2 Clarkson WRRF Flow Projections

Table 4-5 Future Average Day Flows to Clarkson WRRF

Year	Population	Employment	Population Growth	Employment Growth	Avg Flow (MLD)
2019	612,540	180,036	--	--	206
2021	634,651	188,983	11,056	4,473	216
2026	682,320	205,428	58,725	20,918	236
2031	733,933	220,669	51,613	15,241	247
2036	770,466	235,609	36,533	14,940	273
2041	804,604	254,710	34,138	19,101	290

4.2.4 Future Hydraulic Capacity Needs

The total existing approved total wastewater treatment capacity in Peel is 868 MLD; corresponding to the total of 518 MLD at the G.E. Booth WRRF and + 350 MLD at the Clarkson WRRF. Based on approved population and employee growth projections, the estimated 2041 average day flow projections in Peel are 898 MLD, as indicated in **Table 4-6**.

As such, additional capacity is required to meet future needs. Growth will continue beyond 2041 in Peel Region, so it is also important to consider the vision for the future beyond 2041 when planning for capacity expansions. Therefore, for the purposes of this Class EA, population forecasts for ultimate build-out in Peel Region have also been established as shown in **Table 4-6**. As indicated, the required capacity within the system could be approximately 1,354 MLD at build-out, which would exceed the combined treatment capacity of the G.E. Booth and Clarkson WRRFs.

Table 4-6 Future Average Day Flows in the Region of Peel

Year	G.E. Booth WRRF Avg Flow (MLD)	Clarkson WRRF Avg Flow (MLD)	Avg Flow in System (MLD)
2019	467	206	673
2021	481	216	697
2026	514	236	750
2031	545	247	792
2036	581	273	854
2041	608	290	898
Buildout	827	519	1,354

It is common industry practice to plan for capacities of at least 10% above those required to allow sufficient time to plan for future capacity expansions, if required, as well as provide greater operational flexibility under abnormal or emergency situations. Consequently, Peel is planning for provide a total of 1000 MLD total capacity be available by 2041, as illustrated on Error! Reference source not found..

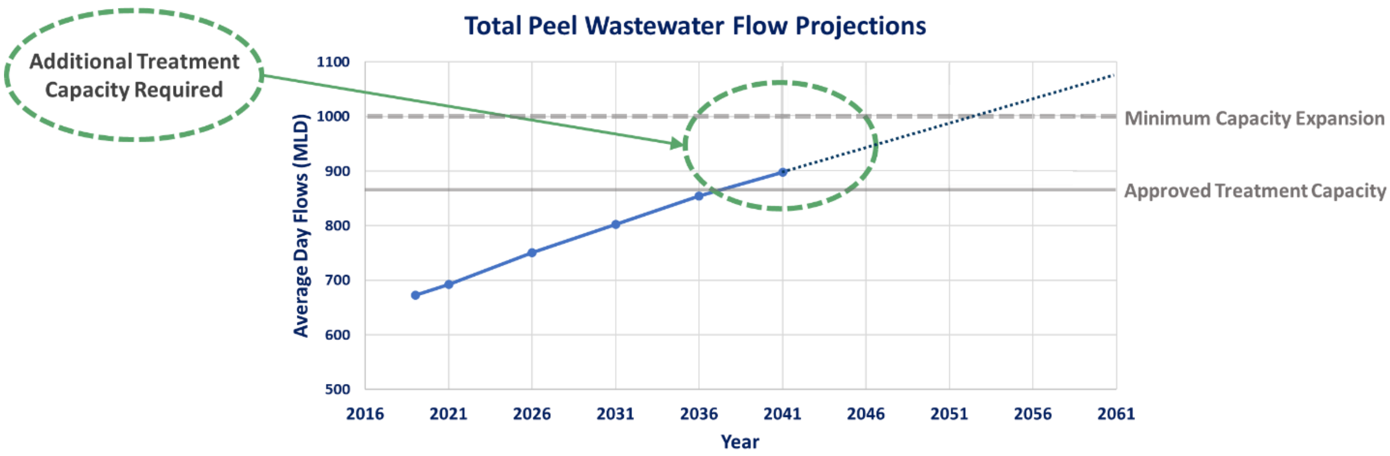


Figure 4-3 Total Peel Wastewater Flow Projections

4.3 Solids Capacity Requirements

4.3.1 Existing Solids Capacity

The G.E. Booth WRRF must also have adequate capacity to treat the solids removed from the wastewater. Solids management in the Region of Peel is limited by the capacity of the incinerators at the G.E. Booth WRRF, which handle solids from both Clarkson and G.E. Booth WRRFs. There are four fluidized bed incinerators at the G.E. Booth WRRF, each operating capacity of about 70 dT/. With a maximum of three units in operation at the same time, the maximum operating capacity of the incinerators is 210 dT/d.

In 2019, the average daily sludge feed to the incinerators in the peak month was 155 dT/d, which did not exceed capacity. However, the incinerator use is approaching the lower end of the incinerator operating capacity, and additional capacity will be needed to meet future demands. In addition, there are long-term risks associated with depending on incineration alone to manage all biosolids produced at both the Clarkson and G.E. Booth WRRFs in the future.

4.3.2 Historical Annual Solids Loading

Solid loading in the sludge is directly proportional to the influent wastewater load. While solids requirements are generally based on both 5-day biological oxygen demand (BOD5) and Total Suspended Solids (TSS) in the effluent, BOD_5 was determined to be a reasonable surrogate parameter to estimate solids generation for capacity planning purposes.

Historical annual average BOD_5 influent concentrations and loads are presented in **Table 4-7.**

Table 4-7 Historical Influent BOD_5 Concentrations and Loadings to G.E. Booth and Clarkson WRRFs

Year	G.E. Booth WRRF BOD_5 Concentration (mg/L)	Clarkson WRRF BOD_5 Concentration (mg/L)	G.E. Booth WRRF BOD_5 Loads (kg/d)	Clarkson WRRF BOD_5 Loads (kg/d)
2015	333	218	101,297	41,376
2016	267	212	101,659	42,708
2017	294	190	101,847	34,987
2018	289	200	121,878	38,322
2019	273	227	122,430	45,124

Future BOD_5 loadings were established based on average historical data from 2015 to 2019, inclusive, and the loading rates for residential and employment growth identified in **Table 4-8**. As noted in **Table 4-8,** an annual increase of 500 kilogram per day (kg/d) was also applied to account for possible additional high strength wastewater discharges in the catchment areas in 2041. These factors were established in the 2020 Master Plan and have been adopted for use in this Class EA.

Table 4-8 Factors Established for Estimating Future Solids Loading

Parameter	BOD_5 Value	Notes
Residential Growth BOD_5 Loading	75 g/cap/d	Applied for population growth from 2019 to 2041 or Buildout
Employment Growth BOD_5 Loading	37.5 g/emp/d	Applied for employment growth from 2019 to 2041 or Buildout
High Strength User Annual Increase	500 kg/d	Overall system-wide annual increase to account for possibility of additional high strength users

4.3.3 BOD_5 Loading Projections

Future loading projections to 2041 were estimated in terms of BOD5 on a system-wide basis using the following formula:

Future Loading = 2019 Starting Point + (Future Growth x Design Criteria) + Allowance for High Strength Users

Table 4-9 System-Wide Influent BOD_5 Loading Projections

Year	Population	Employment	Population Growth	Employment Growth	Loading (dt/d)
2019	1,432,252	669,082	N/A	N/A	168
2021	1,466,350	691,520	34,098	22,438	173
2026	1,583,081	745,304	116,731	53,784	188
2031	1,691,497	786,275	108,416	40,971	200
2036	1,805,471	838,927	113,974	52,652	213
2041	1,894,121	888,638	88,650	49,711	224

4.3.4 Future Solids Treatment Requirements

The existing maximum firm operating capacity of the incinerators is assumed to be 210 dT/d with three (3) incinerators in operation. As indicated in **Table 4-9**, by 2041 total BOD_5 loading in the system is estimated to be approximately 224 dT/d. For the purposes of visioning and approximating future solids management needs in the system, loading was projected to Buildout using ultimate population forecasts. Based on this approach, the system would need capacity to manage at least 300 dT/d.

4.4 Outfall Capacity

4.4.1 Configuration of Existing Outfalls

The two (2) plants each have an outfall discharging to Lake Ontario. Each outfall includes a tunnel shaft that connects to an outfall tunnel. Risers are installed toward the end of the outfall tunnel extending just above the lakebed. Diffusers are installed at the end of each riser to improve effluent mixing with the lake water. In some cases, risers may be capped for future use, allowing outfall capacity increases. Similarly, diffuser ports can come in different design styles that affect the amount of flow that can travel through; in cases where a diffuser port tapers or reduces toward its open end, it may be possible to retrofit new diffuser ports with larger openings, permitting greater flow discharge. A schematic of the outfall components is shown in **Figure 4-4**Error! Reference source not found..

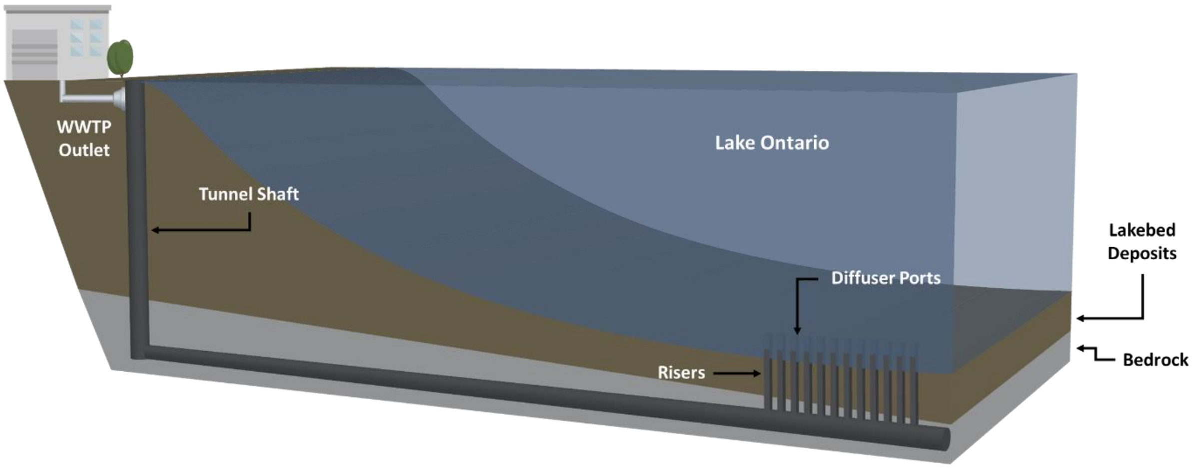


Figure 4-4 Schematic of Outfall Components

The final effluent from the G.E. Booth WRRF is discharged to Lake Ontario through a 3.65 m diameter and 1,400 m long outfall with discharge port diffusers in the last 200-metre section. The current configuration includes 35 diffusers, all of which are in use, and no additional spare risers or diffuser ports. Each diffuser has a 600 mm outlet pipe and a discharge nozzle of the same diameter. Therefore, there is no opportunity to increase outfall capacity by adding diffusers or increasing diffuser nozzle diameter. The G.E. Booth WRRF outfall has a peak approved capacity of 1,523 MLD (17,627 L/s) per the ECA.

The final effluent from the Clarkson WRRF is discharged to Lake Ontario through a 3-metre (3,000 mm) diameter and 2,200 m long outfall with eighteen 508 mm diameter dispersion shafts with 450 mm diameter diffuser nozzles. The outfall has a rated capacity of 1,400 MLD (16,203 L/s) as indicated in the current ECA. It currently has 18 diffusers in use, each of which consists of a 508 mm diameter pipe that is fitted with a tapered 450 mm diameter discharge nozzle, presenting a potential opportunity to retrofit with larger diameter discharge nozzles to match the riser pipe.

There are no outfall capacity challenges at the Clarkson WRRF. However, the G.E. Booth WRRF outfall is approaching its capacity. To avoid the risk of plant flooding, the G.E. Booth WRRF is operated to allow a maximum of 100 mm of flooding of the secondary clarifier weir, during emergency situations. Flooding of the weir at the G.E. Booth WRRF has occurred occasionally during high wet-weather flow events due to the combination of higher lake levels and high influent flows. Based on the hydraulic analysis of the existing outfall at current lake levels, flooding of the weir occurs at flows approximately exceeding 1,482 MLD.

4.4.2 Outfall Hydraulic Analysis

Hydraulic capacity analyses were undertaken to confirm the existing capacities of the outfalls at the Clarkson WRRF and the G.E. Booth WRRF. Lake levels are projected to increase in the future due to potential impacts related to climate change, and this was considered in the hydraulic capacity analyses. A summary of historical lake levels as well as lake level projections relative to the International Great Lakes Datum (IGLD) 1985 is presented in **Table 4-10.**

Table 4-10 Historical and Projected Lake Levels for Lake Ontario

Climate Condition	Climate Variable	Trend	Historical Baseline (1981-2010)	Mid-Century (2050s) Climate Model Projections[1]	End of Century (2080s) Climate Model Projections[1]
Water Level	Lake Ontario Water Level – high scenario (90th percentile), m IGLD	Increasing	74.77 m	75.55 m	76.02 m

[1] The study used state-of-the-science climate modelling recommended by the Intergovernmental Panel on Climate Change (IPCC) to obtain future climate conditions for the period of 2011-2100, resulting in three future time horizons: the 2020s, 2050s and 2080s.

The hydraulic capacity assessment was completed at lake levels of 75.65 m and 76.00 m, assuming two (2) plant operation scenarios at Clarkson and G.E. Booth WRRFs:

1. No flooding of the secondary clarifier weirs.
2. Maximum of 100 mm of flooding to the secondary clarifier weirs (i.e., G.E. Booth WRRF current operating condition).

4.4.3 Outfall Capacity Requirements

Results of the hydraulic analysis under each scenario are presented in Error! Reference source not found. for each WRRF outfall, and indicate that:

- The actual G.E. Booth WRRF outfall capacity is lower than the approved rated capacity of the outfall as identified in the ECA, even when allowing for up to 100 mm of secondary clarifier weir flooding.
- The Clarkson WRRF outfall capacity is higher than the approved rated capacity of the outfall as identified in the ECA, without flooding the secondary weirs.

Table 4-11 Outfall Capacity WRRFs

Secondary Clarifier Weir Flooding Scenario	High Lake Level (m)	G.E. Booth WRRF Total Peak Flow to Outfall Sewer (MLD)	Clarkson WRRF Total Peak Flow to Outfall Sewer (MLD)
No flooding	75.65	1,200	1,500
No flooding	76.00	1,200	1,500
100 mm flooding	75.65	1,482	1,680
100 mm flooding	76.00	1,482	1,641
Capacity per Existing ECA	N/A	1,523	1,400

4.5 Opportunity Statement

As described above, the Region's Growth Management Process and 2020 Water and Wastewater Master Plan identified significant growth across the Region of Peel. With this approved growth to year 2041 and vision for growth beyond 2041, additional wastewater treatment capacity is needed at the G.E. Booth WRRF to meet the needs of Peel's citizens and to continue to protect the environment. In addition, there are long-term risks associated with depending on incineration alone to manage all biosolids produced at both the Clarkson WRRF and the G.E. Booth WRRF.

Study Opportunity Statement

In conjunction with the Clarkson WRRF Class EA, the G.E. Booth WRRF Class EA will develop a solution for treating wastewater in the lake-based Peel system that will:

- **Meet future needs associated with population growth, new regulations, climate change, energy efficiency, and wet weather flow management.**
- **Address community expectations regarding level of service, odour, air emissions, noise, water quality, protection of the environment, and aesthetics.**
- **Provide greater flexibility and reliability in wastewater and biosolids management.**

A preferred design concept to address the above will be developed for the G.E. Booth WRRF.

5.0 Existing Wastewater System and Servicing Conditions

This section describes the existing servicing conditions of the Region of Peel wastewater collection and treatment system. The wastewater characteristics, plant capacities and effluent quality requirements are described in detail for the G.E. Booth WRRF. An overview of the Clarkson WRRF is also provided to support the Phase 2 region-wide alternative solutions' assessment.

5.1 Wastewater Collection

Wastewater produced from residential, industrial, commercial, and institutional users enters a municipal sewer system where it is conveyed to a wastewater plant for treatment, prior to discharge to a local water body such as a lake, stream, or river. The Peel lake-based wastewater system consists of 2,644 km of sewers, 36 wastewater pumping stations, and two (2) wastewater treatment facilities – the Clarkson and G.E. Booth WRRFs. These WRRFs service the Cities of Brampton and Mississauga, the urban areas in Caledon, and parts of the Regional Municipality of York and the City of Toronto.

The G.E. Booth WRRF is located in the southeast corner of the City of Mississauga south of Lakeshore Road East, between Dixie Road and Cawthra Road. The site has an area of approximately 36 hectares (90 acres). The Clarkson WRRF is located in southwest Mississauga, south of Lakeshore Road between Southdown Road and Winston Churchill Boulevard. The site has an area of approximately 32 hectares (79 acres The G.E. Booth WRRF was originally constructed in 1961, servicing a community of about 100,000 people. Today, the G.E. Booth and the Clarkson WRRFs together service about 1.4 million customers. Both WRRFs are operated by the Ontario Clean Water Agency (OCWA) under contract to the Region.

The Region of Peel collection system generally consists of two predominant service areas – the East Trunk System, conveying flows to the G.E. Booth WRRF, and the West Trunk System, which convey flows to the Clarkson WRRF. Through proactive planning, Peel has continually optimized, rehabilitated, upgraded, and expanded their wastewater system in an environmentally and cost-efficient manner to meet the needs of its citizens. The 2020 Master Plan builds on these historical investments by further refining Peel's system-wide strategy and identifying key infrastructure projects for managing wastewater to 2041 and beyond. The services areas and areas of planned growth and intensification are illustrated in **Figure 5-1**.

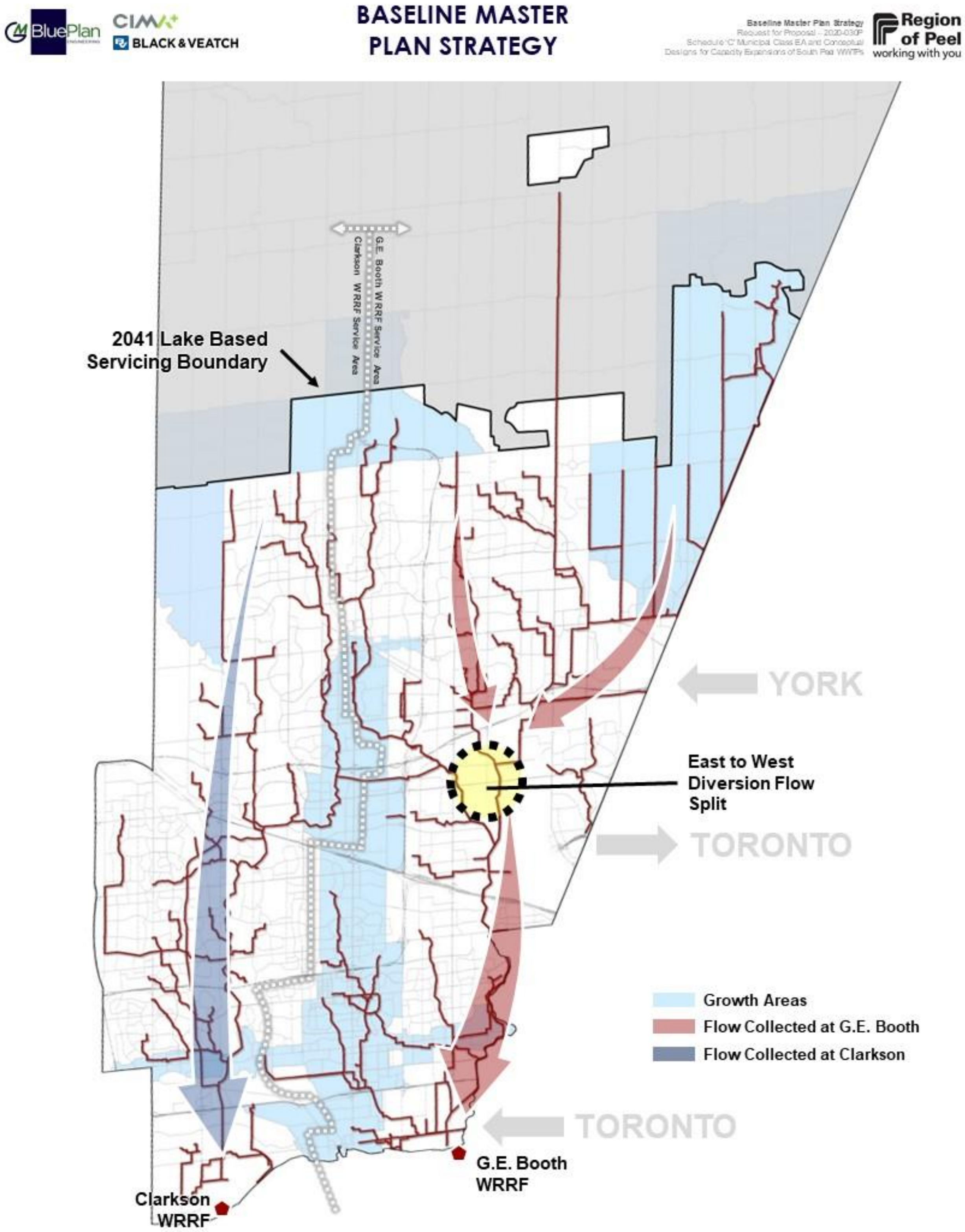


Figure 5-1 Planned Growth and Intensification

5.2 East-to-West Diversion Trunk Sewer

A cornerstone to the Region's system-wide strategy is to make use of available capacity in the West Trunk System by diverting flows from the East Trunk System via the East-to-West Diversion. The East-to-West Diversion is a proactive approach to managing capacity and making optimal use of existing infrastructure, while limiting necessary capacity upgrades. It also provides an opportunity to implement real time controls for managing wet weather flows to each WRRF.

The East-to-West Diversion Trunk Sewer is a 1.5 to 2.4 m diameter trunk sewer that extends west from the East Trunk Sewer along Derry Road, Old Derry Road, old Creditview Road and Creditview Road to the West Trunk System at Highway 401. The sewer is approximately 11 km in length and being constructed using trenchless technologies where possible to reduce (or mitigate) impacts. It is planned to be completed by 2026, which then flows can be diverted from the G.E. Booth WRRF catchment area west to the Clarkson WRRF catchment area. Section 7.0 presents an assessment of alternative wastewater servicing strategies including diversion of through the East-to-West Diversion.

5.3 Wastewater Characteristics

Raw wastewater characteristics are not the same at G.E. Booth and Clarkson WRRFs. Raw sewage data from 2015-2019 indicated that the raw wastewater received at the G.E. Booth WRRF has higher BOD5 and TSS concentrations than the raw wastewater received at the Clarkson WRRF.

The 2020 Master Plan presents an analysis of the users in each catchment, and results indicated that there are significantly more industries or high strength users in the G.E. Booth WRRF catchment area than in the Clarkson WRRF catchment area, that explain the difference in raw wastewater characteristics. The review indicated that the G.E. Booth catchment has 119 high strength industrial users, compared to the Clarkson WRRF catchment with 16 high strength users, and that 98% of high strength users' loadings are generated within the G.E. Booth WRRF catchment. In addition, the review found that approximately 41% of the high strength users are north of the East-to-West Diversion, and 59% south of the Diversion. The distribution of the high strength users in the catchment areas of the G.E. Booth WRRF and the Clarkson WRRF is shown in **Figure 5-2**. The implications of diverting flows on solids loading to the WRRFs were considered as part of the development and assessment of alternative strategies presented in Section 7.0.

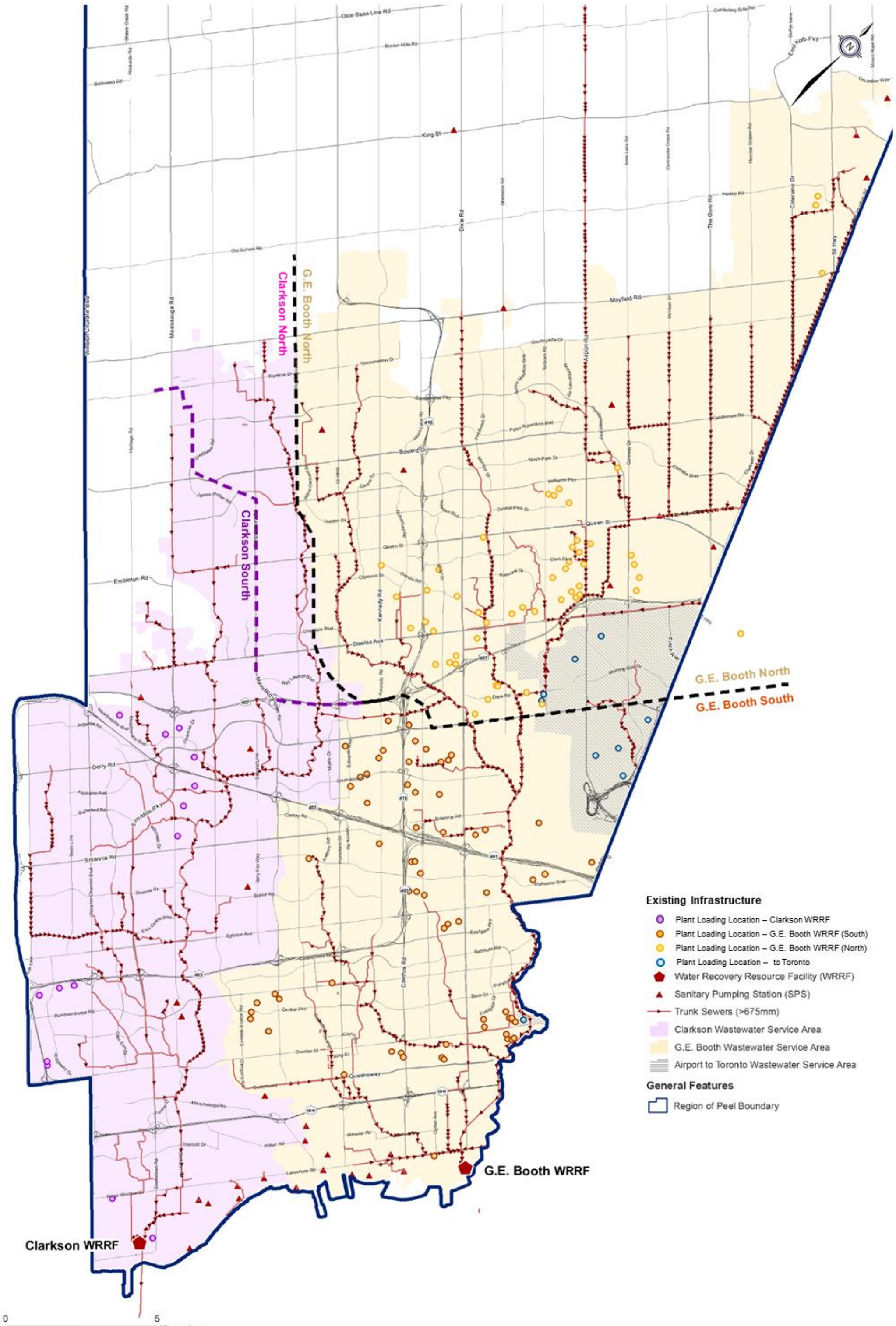


Figure 5-2 Distribution of High Strength Users

5.4 Treatment Processes at the G.E. Booth WRRF

The G.E. Booth WRRF is a conventional activated sludge plant with chemical phosphorus removal; meaning it uses biological, physical, and chemical processes to treat wastewater. Wastewater flows by gravity to the WRRF through a 2,400 mm diameter trunk sewer and two (2) 2,140 mm diameter trunk sewers. The trunk sewers converge at the plant's inlet chamber system then flow through two (2) conduits into the headworks facility. The wastewater is then diverted into three (3) separate treatment trains known as Plants 1, 2 and 3, served by common disinfection and solids handling facilities. The existing treatment processes include screening, grit removal, primary clarification, aeration, secondary clarification and chlorine disinfection and de-chlorination prior to discharge to Lake Ontario through a 3.65 m diameter, 1,400 m long diffused outfall.

Waste activated sludge (WAS) and raw sludge are dewatered and thickened prior to being incinerated in fluidized bed incinerators. The resulting ash is stored in on-site lagoons. The incineration facility also receives digested and dewatered sludge from the Clarkson WRRF. However, this practice will be phased out following the planned expansion of the Clarkson WRRF.

The rated capacity of the G.E. Booth WRRF is currently 518 MLD as specified in the facility's Amended ECA (NUMBER 9375-C4RKKZ), October 2021. The average day flow capacity of each of the three (3) plants is:

- Plant 1: 40 MLD
- Plant 2: 80 MLD
- Plant 3: 398 MLD

Currently, a new Plant 1 is under construction to replace the existing Plant 1 and increase its capacity. Since the last expansion at G.E. Booth WRRF, there were changes in the MECP Design Guidelines requiring more conservative secondary clarifier loading rates. This, in combination with the higher peak flows observed at G.E. Booth WRRF during wet weather events, impact the capacity of existing tankage at peak flows. Therefore, the Region decided to de-rate the existing Plant 3 to 358 MLD and size the new Plant 1 at an 80 MLD average day capacity with peaking factors reflective of recent peak hourly flows. The new Plant 1 secondary clarifiers are designed to reflect MECP Design Guidelines. This will provide for improved treatment performance and reliability during wet weather flow events.

Figure 5-3 shows the site plan for the G.E. Booth WRRF showing existing facilities, **Figure 5-4** illustrates the general flow between key unit processes.

Figure 5-3 G.E Booth WRRF Existing Plant Facilities

Figure 5-4 G.E Booth WRRF Simplified Process Flow Diagram

Further description of the unit processes are described in the subsections below.

5.4.1 Screens and Grit Removal

Housed in the headworks facility are the screening and grit removal systems. Mechanical screens remove material such as rags, paper, and branches and other large debris from the wastewater. Heavier inorganic particles, such as sand and grit, are removed through the vortex grit chambers. Screenings and grit material removed from the wastewater stream are collected and trucked to landfill for disposal. The headworks and inlet sewers are serviced by dedicated odour control facilities.

5.4.2 Primary Treatment

From the headworks, the wastewater then diverges into three (3) separate streams to the primary clarifiers in Plants 1, 2 and 3. The primary clarifiers remove suspended solids in the wastewater. Solids that settle to the bottom of these tanks are scraped to a hopper and pumped to the solids treatment processes as described below. Primary clarifiers also allow for the removal of oil, grease, and scum from the surface via skimming mechanisms. This solids removal process is referred to as primary treatment.

To enhance the effectiveness of the primary treatment, the Region adds chemicals including iron salt (ferrous chloride) and polymers to the wastewater as it flows into and out of the primary clarifiers. These chemicals act as coagulants, binding the solids to improve solids removal and removal of total phosphorus. This process is known as chemically enhanced primary treatment (CEPT). Phosphorus removal is important as too much phosphorous in the effluent can promote algae growth in our lakes and rivers.

5.4.3 Secondary Treatment

The primary treated wastewater flows into the Plant 1, 2, and 3 secondary treatment facilities – the aeration tanks and secondary clarifiers – to remove the dissolved solids which contain organic contaminants.

- **Aeration tanks –** Air is added to the aeration tanks, allowing the naturally occurring bacteria present in the aeration tanks to consume or convert the organic contaminants and harmful ammonia into non-active compounds and settleable solids that can be removed in secondary clarifiers. At this stage nitrification occurs, where the bacteria convert the ammonia in the wastewater to nitrate. Nitrification of wastewater is important, as nitrogen in its un-ionized ammonia form is toxic to aquatic life.
- **Secondary clarifiers –** The mixture of micro-organisms and treated wastewater coming from the aeration tanks flows into the secondary clarifiers, where the solids (known as activated sludge) settle to the bottom and are pumped to the solid treatment facilities for further treatment as described below. A portion of this activated sludge is returned to the aeration influent to support the aeration process.

5.4.4 Disinfection

Secondary effluent, which is substantially free of solids and organic contaminants, passes on to disinfection for further treatment. At this stage the treated wastewater, referred to as secondary effluent, is dosed with chlorine (sodium hypochlorite) to kill bacteria and inactivate viruses. The chlorinated effluent is conveyed through the outfall to allow time for disinfection. Prior to the outfall diffusers, the effluent is de-chlorinated, using sodium bisulphate, to remove the residual chlorine prior to discharge to the lake.

5.4.5 Outfall

The final effluent from the G.E. Booth WRRF is discharged to Lake Ontario through a 3.65 m diameter, 1,400 m long outfall with discharge port diffusers in the last 200 m section. The diffusers improve mixing of the effluent with the receiving water. The outfall has a rated peak capacity of 1,523 MLD (17,627 L/s). However, as noted in Section 4, the actual capacity of the outfall is limited to 1,482 MLD (17,153 L/s).

5.4.6 Solids Treatment

The WAS from the secondary clarifiers from all three (3) plants is pumped to one (1) Solids Handling Facility where it is thickened using centrifuges. The thickened WAS (TWAS) is conveyed to blending tanks where it is blended with the primary clarifier solids (also known as raw sludge), prior to dewatering in centrifuges. The removed liquid from the thickening and dewatering processes is conveyed upstream of the primary clarifiers for additional treatment.

Dewatering using high speed centrifuges, reduces the water content of the blended solids to produce a cake material which is of moist soil like consistency. The dewatered cake is distributed to storage silos from where it is pumped into one (1) of four (4) fluidized bed incinerator reactors housed in the Thermal

Oxidization Building. Dewatered sludge is also trucked from the Clarkson WRRF for incineration together with G.E. Booth WRRF dewatered solids.

5.4.7 Incineration (Thermal Oxidation)

The G.E. Booth WRRF has four (4) fluidized bed reactors or incinerators. One (1) incinerator is reserved for standby use, allowing for up to three (3) operating units at any time. Each incinerator has a capacity of 60 to 80 dT/d. This amount varies depending on operating settings such as sludge feed rate and temperature, but the incinerators must be operated such that the ECA air quality emissions requirements are met. For purposes of this EA, it was assumed that the maximum operating capacity of each incinerator unit is 70 dT/d, for a total capacity of 210 dT/d (with three (3) operating units and one (1) on standby).

The ash slurry from the incinerators is conveyed to ash tanks and then pumped to any of the two (2) on-site lagoons for settling. Supernatant is pumped from the lagoons back to the beginning of the liquid train for treatment. Periodically, the settled ash is relocated to the adjacent holding pond for long-term, on-site disposal.

5.4.8 Odour Control

Odourous air generated in the headworks building is collected and treated with two (2) air scrubbers to remove odour components before discharging the treated air to the atmosphere. Three (3) biofiltration units are used to treat odourous air collected from the outlet side of the primary clarifiers and untreated air collected from the primary clarifier inlets. The treated air is discharged to the atmosphere through an exhaust stack.

The Region has been proactive over the years in implementing odour control at the WRRF to not only meet MECP requirements, but to address the changing needs of the community around the G.E. Booth WRRF. Peel's goal is to remain a "good neighbour" such that the WRRF is integrated with the community in which it is located.

There are numerous methods of controlling odour that are currently in place at the G.E. Booth WRRF. These include:

- The headworks has a dedicated odour control system that collects and treats odours from the incoming sewers and also from the screens and grit tanks;
- The influent and effluent channels in Plants 1, 2 and 3 primary clarifiers are aerated and covered, and odorous air from the channel is collected in a common piping system for treatment in local odour control units to each plant source;
- The solids treatment processes at any plant can be a source of odour. At the G.E. Booth WRRF odour emissions from the sludge dewatering and thickening processes are collected and treated; and

- Intermittent odour may also occur when tanks are emptied for maintenance, screening and grit bins are emptied into trucks, and Clarkson WRRF biosolids are received. When undertaking these activities, plant operators use best practices to limit the potential for odour emissions, including routine hosing and debris removal, keeping haulage bay doors closed to contain odours when appropriate.

The ECA for the G.E. Booth WRRF requires that the Region log all odour complaints, investigate and resolve them. The Region staff make every effort to contact the customers that file complaints and satisfactorily address their concerns. Since 2005, the frequency of odour complaints from the plant has been low, averaging approximately seven complaints per year. The majority of the recent odour complaints have been short-term during periods when tanks were out of service for maintenance and mitigated by plant staff.

The Region of Peel recognizes the importance of managing odours from the G.E. Booth WRRF to better meet the needs of surrounding communities, both existing and planned. Towards this end, Peel has developed an Odour Management Strategy for the G.E. Booth WRRF (Jacobs 2020) which identified major sources of odour and measures to mitigate. Most odours are emitted from the Plant 1 uncovered primary clarifier effluent weirs. In 2022, an interim odour mitigation measure was taken with covers installed over these weirs. The covers prevent odorous air from the weirs to escape and allow it to be captured for treatment through odour control units. In addition, the following odour control enhancements are underway or planned:

- Replacing the old Plant 1 and enclosing the new Plant 1 primary clarifiers with flat covers connected to an odour control facility.
- Covering the existing Plant 2 & Plant 3 primary clarifiers with flat covers connected to odour control facilities.
- Increasing the stack height of the odour control facility at the existing headworks facility.
- Adding a polishing stage of odour control to the existing headworks odour control facility.
- Continued odour modelling and community outreach.

5.4.9 Standby Power

Normal power is provided to the site by two independent utility feeders to provide redundancy in case one fails. The G.E. Booth WRRF is also equipped with the following existing emergency power generators to provide standby power to critical plant loads:

- 525-kilowatt (kW), 600 volts (V) diesel generator dedicated to the Headwork Building.
- 900 kW, 600 V diesel generator dedicated to the Thermal Control Facility.
- 200 kW, 600V diesel generator dedicated to the Storage Complex.

Based on the recommendations in the Standby Power Plan (Jacobs, 2019), the Region plans on constructing a new centralized facility with diesel generators sized to support the liquid treatment process at its expanded capacity. This approach would mitigate the potential for odour generation during power outages and would allow for continuous primary treatment to avoid non-compliance. This centralized facility (i.e. the new Energy Centre) is part of the preferred design concept for the G.E. Booth WRRF. The proposed Energy Center would provide normal and emergency power to all buildings and processes on-site.

5.5 GE Booth WRRF Upgrade Projects

As summarized in Section 3.6, there are several upgrade projects ongoing at the G.E. Booth WRRF to enhance operations. **Table 5-1** provides a summary of these capital projects.

Table 5-1 G.E. Booth WRRF Ongoing Projects

Location	Project Description

Facility	• Construction of new storage complex
	• Plant 1 and 2 Primary Inlet Conduit
	• Modernization of staff change rooms
	• Odour Control Enhancements
	  ○ Replacing old Plant 1 and enclosing the new Plant 1 primary clarifiers with flat covers, a building, and an odour control facility.
	  ○ Covering the existing Plant 2 & Plant 3 primary clarifiers with flat covers, a building, and odour control facilities.
	  ○ Increasing the stack height of the odour control facility at the existing headworks facility.
	  ○ Adding a polishing stage of odour control to the existing headworks odour control facility.

Plant 1	• Replacement of existing aging Plant 1 with a new 80 MLD plant
	• Works Include:
	  ○ A new inlet conduit
	  ○ New odour control facility
	  ○ New primary clarifiers complete with covers and a new primary building
	  ○ New aeration tanks
	  ○ New secondary clarifiers designed with updated MECP Design Guidelines and recent peaking factors
	  ○ A new blower building, and
	  ○ A new bypass conduit to replace Plant 1 and to support future facility expansions

Plant 2	• New inlet conduit • New primary clarifier covers and a new primary building • Replacement of blowers with high efficiency turbo blowers and associated upgrades to the aeration system • Implementation of ammonia-based aeration -control (ABAC) • Replacement of existing channel aeration system with duckbill diffusers

Location	Project Description
Plant 3	• Expansion of Plant 3 clarifiers to restore hydraulic capacity to 518 MLD including: ○ two new primary clarifiers (Primary Clarifiers 12 and 13), ○ a secondary bypass conduit, and ○ removal/abandonment of existing secondary bypass • Replacement of diffusers in Aeration Tank No. 9 • New primary clarifier covers and new primary buildings • New odour control system • Replacement of blowers with high efficiency turbo blowers and associated upgrades to the aeration system • Implementation of ABAC • Replacement of existing channel aeration system with duckbill diffusers • Replacement of existing effluent pumping systems with new medium pressure effluent pumping station supplied by the main Plant 3 outfall
Biosolids Facility	• Design and construction of a truck loading facility to haul dewatered sludge for alternative disposal, when necessary (i.e., on a contingency basis) • Refurbishment of three (3) Thermal Oxidation (TOX) Units

5.6 Treatment Capacity and Effluent Quality at the G.E. Booth WRRF

5.6.1 Unit Process Treatment Capacity

The operation of wastewater treatment systems in Ontario is governed by the MECP and subject to Federal legislation, as described in Section 3.1. The MECP issues ECAs under the Environmental Protection Act; an ECA for a WRRF dictates plant capacities, final effluent discharge requirements based on the sensitivity of the receiving waters and monitoring protocols. As indicated, the rated capacity of the G.E. Booth WRRF is currently 518 MLD, as specified in its Amended ECA (NUMBER 9375-C4RKKZ), October 2021. The G.E. Booth WRRF currently receives approximately 480 MLD average day flow (2017 to 2019).

5.6.1.1 Wastewater (Liquid) Treatment

A hydraulic capacity assessment was completed for the major unit processes to evaluate the capacity of the existing facility, and to be used as the basis for establishing capacity expansion alternatives and their requirements. The assessment was based on traditional desktop analytical methods, using historical plant operational data, plant design criteria, approved ECA capacities, and typical design guidelines.

Table 5-2 illustrates the parameters for assessing the capacity of each unit process at the G.E. Booth WRRF. Inlet sewers and screening facilities, as well as the outfall are designed to handle peak instantaneous flows, and the grit chambers and disinfection are sized based on peak hourly flows. During severe wet weather flow conditions, flows exceeding the capacity of the aeration tanks and secondary clarifiers would be by-passed. In this case, the by-pass flows would receive primary treatment and disinfection before being re-combined with the fully treated flow and released to Lake Ontario through the outfall. The solids unit processes, including the thickening and dewatering processes and the incinerators at the G.E. Booth WRRF are designed based on peak monthly solids loading.

Table 5-2 Unit Process Capacity Assessment Basis

Unit Process	Capacity Parameters	Capacity Assumptions
Inlet Sewer	Peak Instantaneous Flow	All sewers online
Screens	Peak Instantaneous Flow	One screen offline
Grit Chambers	Peak Hourly Flow	All grit chambers online
Primary Clarifiers	Peak Day Flow	One primary clarifier offline
Aeration Tanks	Average Day Flow	One aeration tank offline
Oxygenation System	Peak Month Loading	One blower offline per plant
Secondary Clarifiers	Peak Hourly Flow, Peak Daily Solids Loading	One secondary clarifier offline
Disinfection (Contact Time)	Peak Hourly Flow	N/A
Outfall	Peak Instantaneous Flow	N/A
Anaerobic Digesters (Clarkson WRRF only)	Peak Month Loading	All Digesters Online
Thickening	Peak Month Loading	One centrifuge offline
Dewatering	Peak Month Loading	One centrifuge offline
Incineration	Peak Month Loading	One incinerator offline

The capacity of each unit process in relation to its rated flow capacity of 518 MLD can be seen in **Figure 5-5**. The graphs are colour coded based on the capacity limiting condition for each unit process, assuming an average day flow design capacity of 518 MLD and the following peaking factors which are based on historical data from 2017 to 2019:

- Peak Daily Flow (PDF) = 1.7
- Peak Hourly Flow (PHF) = 2.4
- Peak Instantaneous Flow (PIF) = 3.0

The hydraulic peaking factors from the original design were selected to minimize the risk of headworks bypasses, however the hydraulic peaking factors will be reduced based on the use of RTC, as discussed in Section 9.1.

Figure 5-5 indicates capacities available after the upgrades identified in Section 5.5 are in place. As denoted by the vertical lines, even once the upgrades are completed, there would be capacity deficits in screening, in the secondary clarifiers, and the outfall at the current 518 MLD rated design flow.

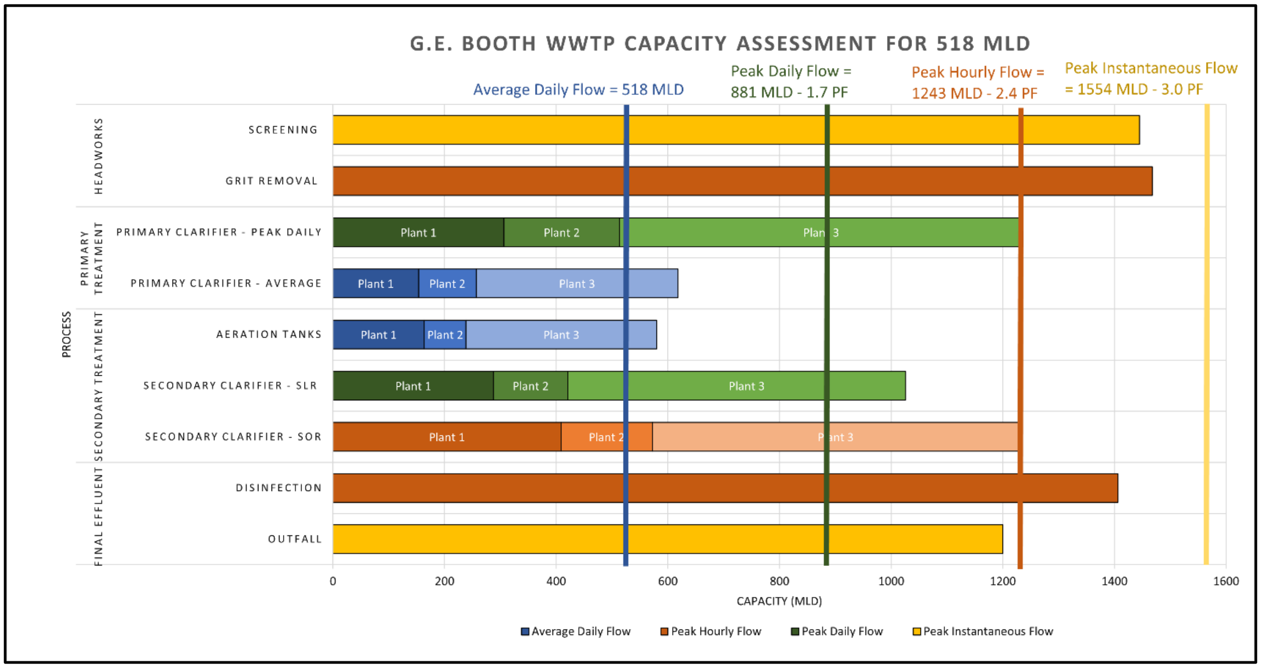


Figure 5-5 G.E. Booth WRRF Hydraulic Capacity at 518 MLD Average Rated Design Flow

5.6.1.2 Solids Capacity

Biosolids production is directly proportional to the influent wastewater load, and therefore, depends on characteristics of the wastewater and the types of wastewater treatment processes. The historical unit production rates based on BOD_5 load and a peak month load peaking factor of 1.3 were used to project biosolids production at the current design capacity of the G.E. Booth WRRF (i.e., 518 MLD), and for the alternative solutions described in Section 7.0.

Table 5-3 illustrates the existing solids treatment capacities of each unit process in comparison to the treatment needs at the rated capacity of 518 MLD based on maximum month load conditions. As indicated, the dewatering and incinerator facilities would have insufficient capacity to meet design peak month loadings. Alternatives for providing the required additional capacity as well as to meet future solids loading requirements are described in Section 8.0.

Table 5-3 G.E. Booth WRRF Sludge Handling Capacity Assessment

Process	Existing Capacity (dT/day)	Capacity Needs at 518 MLD (dT/day)
WAS Thickening	104	105
Sludge Dewatering	240	266
Cake Pumping	360	346
Incineration[1]	210	254

[1] Assumes sludge would no longer be trucked from the Clarkson WRRF for incineration as per the recommendations herein and in the Clarkson WRRF ESR (May 2023).

5.6.1.3 Outfall

The existing outfall has a peak approved capacity of 1,523 MLD (17,627 L/s) per the ECA. However, hydraulic analysis indicates that the G.E. Booth WRRF outfall is near its capacity limits and has insufficient capacity to meet future needs. This is supported by the fact that to avoid overall plant flooding, the G.E. Booth WRRF is operated to allow a maximum of 100 mm of flooding downstream of the secondary clarifier weir, for emergency situations. Flooding of the weir at the G.E. Booth WRRF has occurred occasionally during high wet-weather flow events.

The existing outfall is a 3.65 metre diameter outfall, 1,400 metres in length, with discharge port diffusers in the last 200 metre section. The existing outfall configuration faces challenges meeting mixing zone requirements, as detailed in the Receiving Water Impact Assessment (RWIA) presented in **Volume 2, Appendix B**.

5.6.2 Effluent Design

The effluent existing ECA design objectives and compliance limits for the G.E. Booth WRRF effluent are shown in **Table 5-4**. The operating objectives are what the plant is designed to meet, while the compliance limits are the legal limits that must be met to avoid non-compliance. The G.E. Booth WRRF effluent currently meets its compliance limits.

To confirm the effluent limits for the expansion, a RWIA was undertaken to meet the MECP's PWQO. The RWIA is provided in Volume 2, Appendix B.

Table 5-4 G.E. Booth WRRF Design Objectives and Compliance Limits (Amended ECA NUMBER 9375-C4RKKZ, October 2021)

Parameter	Effluent Design Concentration Objectives	Concentration Compliance Limits	Loading Compliance Limits
Carbonaceous Biological Oxygen Demand ($CBOD_5$)[1]	15 mg/L	25 mg/L	N/A
Total Suspended Solids (TSS)[1]	15 mg/L	25 mg/L	N/A
Total Phosphorous (TP)[2]	0.7 mg/L	0.8 mg/L	394 kg/d[4]
Total Ammonia Nitrogen (TAN)[2] : May 1st to May 31st	6.6 mg/L	13.2 mg/L	N/A
Total Ammonia Nitrogen (TAN)[2] : June 1st to Sept 30th	4.9 mg/L	6.6 mg/L	N/A
Total Ammonia Nitrogen (TAN)[2] : Oct 1st to Oct 31st	6.6 mg/L	13.2 mg/L	N/A
Total Ammonia Nitrogen (TAN)[2] : Nov 1st to Apr 30th	14.0 mg/L	28.0 mg/L	N/A
E. coli[3]	150 organisms per 100 mL	200 organisms per 100 mL	N/A
Total Residual Chlorine (TRC)[2]	0.0 mg/L (non-detectable)	0.02 mg/L	N/A
pH	6.5 to 8.5	6.0 to 9.5	N/A

1 Based on annual average effluent concentration values.
2 Based on monthly average effluent concentration values.
3 Based on the monthly geometric mean density.
4 Based on monthly average daily effluent loading.
Note: The Amended ECA Number 9375-C4RKKZ (issued October 15th, 2021) mistakenly expressed the values in terms of Total Ammonia instead of Total Ammonia Nitrogen (TAN). The table above has been corrected accordingly, and the future amended ECA for the G.E. Booth WRRF will also be corrected.

5.7 Clarkson WRRF

The existing conditions at the Clarkson WRRF are described in detail in the Clarkson WRRF ESR (May 2023) and summarized here to provide background information that was used to support the evaluation of alternative solutions presented in Section 7.0.

5.7.1 Existing Wastewater Treatment Processes

The Clarkson WRRF is a conventional activated sludge system with a current rated average daily flow capacity of 350 MLD, provided by two (2) separate primary and secondary process trains designated as Plant 1 and Plant 2. The major liquid treatment processes include screening and grit removal, primary treatment, secondary treatment, and phosphorus removal. Effluent disinfection is provided by chlorination and dechlorination in the plant outfall. The plant currently practices chemically enhanced primary treatment using ferrous chloride to precipitate phosphorus and improve primary treatment performance.

The solids handling processes at the Clarkson WRRF include WAS thickening, anaerobic digestion, and dewatering. Raw sludge from the primary clarifiers and TWAS are blended and directed to anaerobic digesters for digestion. The digested sludge is dewatered, and the dewatered cake is trucked to the G.E. Booth WRRF for incineration. Approximately three (3) trucks (40 cubic metre (m3) capacity each) per day on average transfer the digested and dewatered sludge. The biogas produced at the digesters is either directed to a 1.4-megawatt cogeneration facility (combined heat and power engine) or used by the boilers for the digestion process. The electricity generated at this facility is used within the treatment plant distribution system, and heat is used for digester process heating.

Figure 5-6 illustrates the facilities and site layout for the Clarkson WRRF for reference purposes.

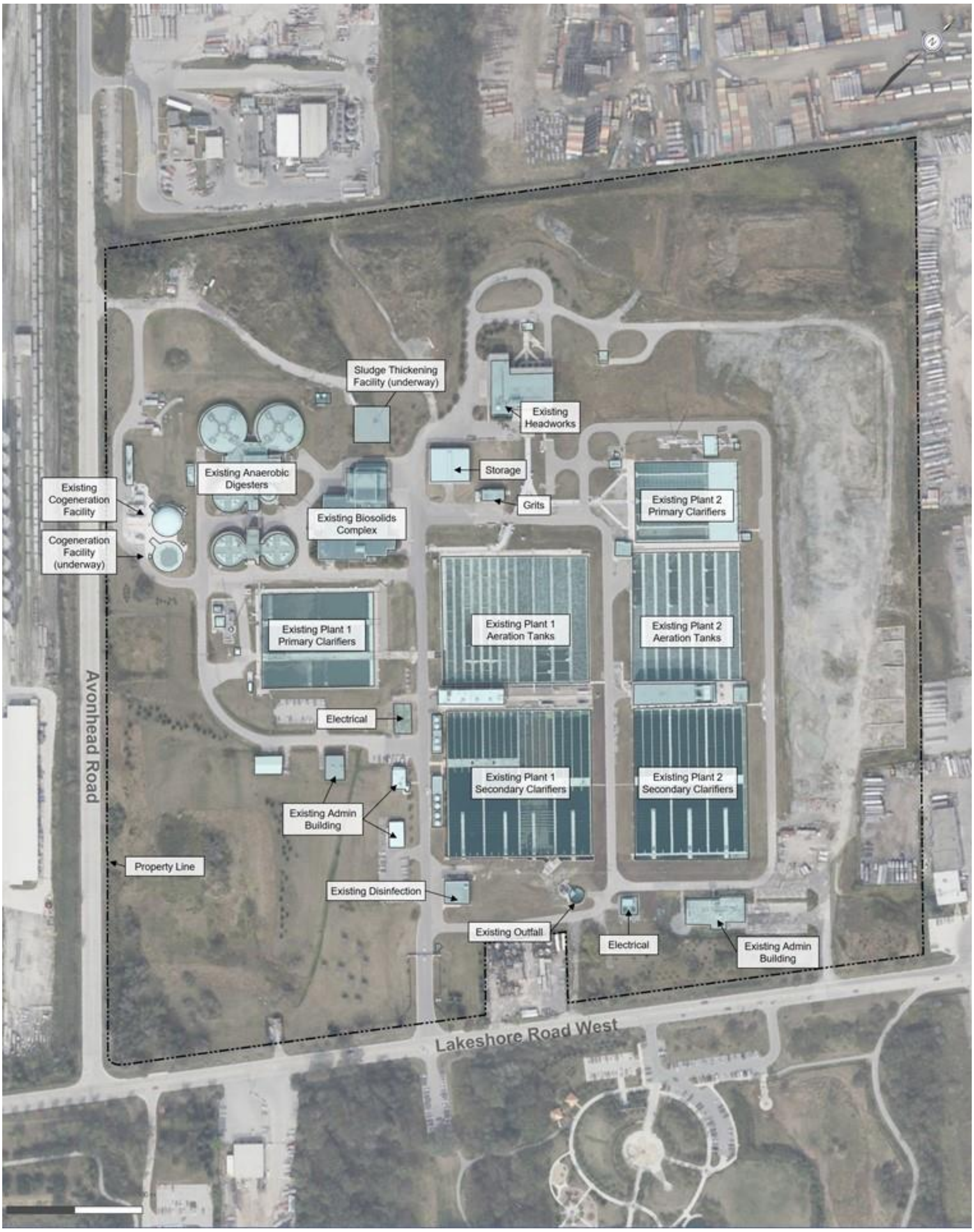


Figure 5-6 Clarkson WRRF Existing Plant Facilities

5.7.2 Treatment Capacity and Effluent Quality at the Clarkson WRRF

The rated capacity of the Clarkson WRRF is currently 350 MLD average day flow split between Plants 1 and 2, as specified in its Amended ECA (NUMBER 0729-9KBNNY), June 2014. The Clarkson WRRF currently receives approximately 220 MLD average day flow (2017 to 2019). A hydraulic capacity analysis indicated that the unit processes at the Clarkson WRRF, including the outfall, have capacity to meet the current rated design flow requirements. The plant continues to meet the effluent quality requirements as set out in its ECA.

When the East-to-West diversion sewer comes online in 2026, flows to the Clarkson WRRF would be increased, and additional capacity would be required to meet future wastewater treatment needs. The Clarkson WRRF ESR (May 2023) concluded that the Clarkson WRRF must be expanded to 500 MLD average flow capacity by 2029 to meet future needs to the year 2041. Additional liquid and solids treatment capacity would be required. The existing outfall has capacity to meet the projected peak flows. A RWIA for the Clarkson WRRF concluded that the expanded plant must be designed to meet stricter effluent limits for Total Phosphorus (TP) to continue to meet PWQOs. The Clarkson WRRF ESR (May 2023) further concluded that the sludge generated at the Clarkson WRRF would be managed at the facility, and no longer be trucked to the G.E. Booth WRRF for incineration on a regular basis.

6.0 Environmental Baseline Review

Section 5.0 provides a review of the servicing conditions in the Study Area, while this section describes the existing environmental baseline conditions. Two (2) levels of review were conducted:

1. Literature and desktop reviews of the existing conditions on and surrounding each WRRF site to support the Phase 2 evaluation of alternative servicing strategies.
2. Site-specific investigations at the G.E. Booth WRRF to support the evaluation of alternative design concepts for expanding the WRRF, and the development of the preferred design concept (i.e., Phase 3).

The major focus of this section is to provide details on the existing conditions on and surrounding the G.E. Booth WRRF based on literature review, desktop studies and site-specific investigations. However, a high-level summary of the existing conditions on and surrounding the Clarkson WRRF is also provided for Phase 2 purposes at the end of this Section.

Further details on the environmental baseline conditions at the G.E. Booth WRRF are documented in supporting study reports available in **Volume 2 – Supporting Technical Studies** of this ESR.

6.1 Natural Environment

The natural environment is comprised of land, air, water, flora, and fauna. The natural environmental features surrounding the G.E. Booth WRRF include Applewood Creek and Marie Curtis Park to the east, Serson Creek along the western property limits, the developing JTLCA immediately to the south, and Lake Ontario at its shoreline. Two small-forested communities are identified within the northwest and southeast portions of the G.E. Booth WRRF site itself. The southeastern forested community is part of a significant woodland complex located within Marie Curtis Park. An objective of this Class EA is to develop solutions which continue to protect and enhance, where possible, these natural environmental aspects.

Two natural heritage reports were prepared as part of the G.E. Booth WRRF Class EA: the Natural Heritage Characterization Report and the Impact Assessment Report, which are provided in **Volume 2**, **Appendix A1** and **Appendix A2**, respectively.

The Natural Heritage Characterization Report provides a review of the presence and extent of the natural heritage features and functions on and surrounding the G.E. Booth WRRF. This information was used to support the evaluation of alternative solutions and alternative design concepts and is summarized below.

The Impact Assessment Report documents the impacts, mitigation, and restoration measures proposed for the preferred design concept, with further details provided in Section 10.0.

6.1.1 Terrestrial Habitats and Features

The local study area is located within the Carolinian or Deciduous Forest Zone (also referred to as the mixed wood plains), an area characterized by a relatively warmer climate that supports plant species typical of more southern areas.

The local study area is surrounded by an urbanized landscape consisting of a mixture of open space and commercial/industrial areas. Lake Ontario and its adjacent terrestrial landscape support a variety of aquatic and terrestrial species, including migratory species (e.g., birds). Serson Creek and Applewood Creek are not prominent wildlife corridors or linkages within the landscape as they appear disturbed and contain limited riparian vegetation to provide coverage to species. Lakeshore Road has been identified as a permanent migratory barrier to upstream movement of aquatic species due to culvert degradation, therefore it prevents Serson Creek and Applewood Creek from providing linkage opportunities. Etobicoke Creek, which is located on the east side of Marie Curtis Park, likely acts as a primary north-south connection for the movement of aquatic and terrestrial species. The G.E. Booth WRRF is an actively managed facility that experiences a moderate amount of traffic therefore it is unlikely that wildlife move east-west across the property.

All vegetation communities, including confirmed and candidate natural heritage features, are illustrated in **Figure 6-1** and described in detail in **Volume 2, Appendix A1**. Vegetative communities include cultural meadows (CUM), deciduous forests (FOD), hedgerows (CUH), commercial/industrial open space (MOC), open beach/bar (BBO) and open aquatics (OAO). The shoreline is identified as cultural meadow community. The open aquatics habitat is associated with the ash lagoons and the stormwater management (SWM) pond. The northwestern forested community within the Study Area was described as containing invasive species such as Garlic Mustard (Alliaria petiolata), European Buckthorn (Rhamnus cathartica), and Tartarian Honeysuckle (Lonicera tatarica) within the Lakeview Waterfront Connection Environmental Assessment (LWC EA) (SENES Consultants 2014).

Targeted fieldwork was completed within the G.E. Booth WRRF property to inform an impact assessment for the property, specifically in areas where potential alteration may occur within or adjacent to potential natural features. The following targeted surveys were undertaken:

1. **Wetland Characterization:** The OAO community could be considered a wetland community, depending on the amount of wetland vegetation present; however, it is recognized that the OAO feature is functioning as a SWM pond and typically SWM ponds do not qualify as wetland communities. Therefore, the fieldwork involved reviewing the OAO community to determine whether it met the criteria to be considered a wetland. In addition, the fieldwork included determining whether the northern woodlot near Season Creek contained any wetland habitat.

   Results: As reflected in **Figure 6-1**, the SWD2-2 feature was reviewed and classified as a Green Ash Mineral Deciduous Swamp, the CUW1 feature was reviewed and classified as a Mineral Cultural Woodland, and the CUM1 feature was reviewed and classified as a Mineral Cultural Meadow. The OAO feature will remain mapped as an OAO community; however, this community is not considered a wetland community given the absence of wetland plants. Refer to Volume 2, Appendix A1 for further details.

2. **Monarch Survey:** The CUM1-1 vegetation communities were identified as candidate Monarch habitat. Therefore, the fieldwork was completed to determine whether suitable breeding habitat is present within the CUM vegetation communities and if so, to determine if Monarchs are breeding within the CUM communities.

Results: The survey focused on completing visual inspections of all Milkweed patches for signs of breeding habitat. Based on the survey, three (3) search areas were investigated; of which, Search Area 2 contained two patches of Milkweed with breeding evidence. No additional field investigations were recommended, assuming the development footprint remains outside of Monarch Area Search 2 (refer to Figure 4 in Volume 2, Appendix A1 for the locations of the search areas).

3. **Breeding Bird Survey:** The CUM1-1 vegetation communities were identified as candidate Significant Wildlife Habitat (SWH) for Marsh Bird Breeding Habitat and Species of Conservation Concern (Common Nighthawk) habitat. Therefore, the fieldwork was completed to determine whether suitable breeding habitat was present and/or if any SWH indicator species were present.

   Results: The following Species at Risk (SAR) and provincially rare species were observed at the G.E. Booth WRRF: Barn Swallow (Special Concern), Purple Martin (S3B Ontario), Chimney Swift (Threatened), and Barn Swallow (Threatened). Refer to Volume 2, Appendix A1 for further details.

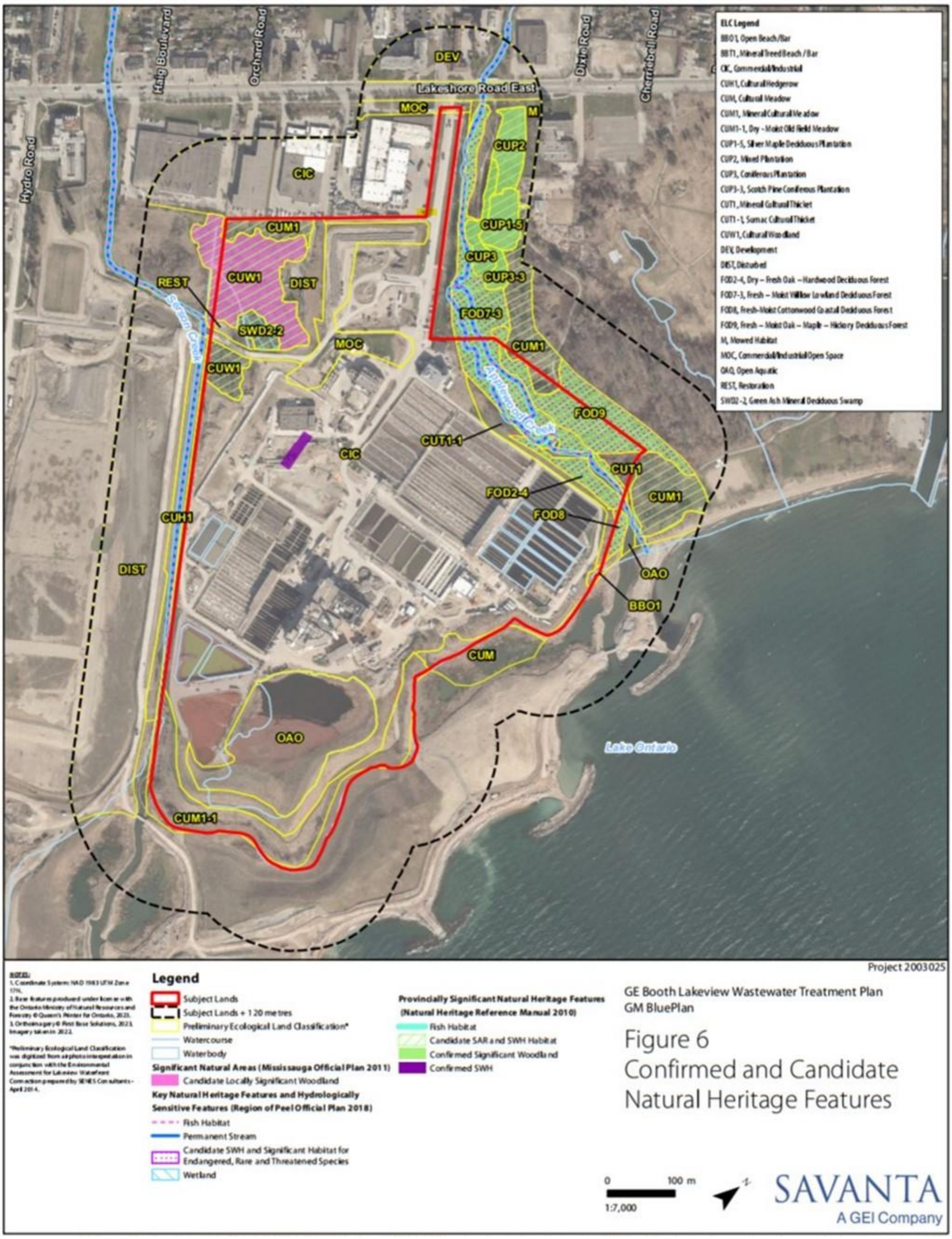


Figure 6-1 Confirmed and Candidate Natural Heritage Features at the G.E. Booth WWRF.

6.1.2 Areas of Natural and Scientific Interest

No Areas of Natural and Scientific Interest (ANSIs) were identified on or within the general vicinity of the G.E. Booth WRRF site.

6.1.3 Significant Wetlands

Within Ontario, significant wetlands are identified by the MNRF or designates (municipality, conservation authority, etc.). There are no Provincially Significant Wetlands (PSWs), or significant coastal wetlands identified on or adjacent to the G.E. Booth WRRF property at the current time, although wetland habitats are being created as part of JTLCA works as described in Section 6.1.11. As previously discussed in Section 6.1.1, the OAO community within the G.E. Booth WRRF was reviewed and is not considered a wetland community in accordance with ecological land classification (ELC) and Ontario Wetland Evaluation System (OWES) criteria. An unevaluated wetland community (SWD2-2) was identified by CVC ELC mapping (2022) within the northwestern woodland. The presence of the feature was confirmed through the field investigation described in Section 6.1.10 and the ELC mapping subsequently updated to include this feature.

6.1.4 Significant Woodlands

Significant woodlands are identified by the planning authority using criteria established by the MNRF. One Deciduous Forest, two cultural woodlands, and one deciduous swamp were identified within the G.E. Booth WRRF property. These features (northwestern CUW1/SWD, southern CUW1, and southeastern FOD) were reviewed against the Natural Heritage Reference Manual (NHRM) evaluation criteria for significance. The southeastern FOD is also part of a larger, more diverse woodland complex and is therefore identified as a significant woodland complex. The northwestern CUW1/SWD and southern CUW1 did not meet the test of significance. In terms of meeting the municipal criteria for significant woodland, the southeastern FOD meets the criteria while the northwestern CUW1/SWD would need to be evaluated further to understand whether it supports SAR and/or SWH, therefore this woodland will be treated as candidate locally significant woodland. The southern CUW1 does not meet the size criteria to be considered a significant woodland.

6.1.5 Significant Valleylands

Significant valleylands are defined and designated by the planning authority. General guidelines for determining significance of these features are presented in the Natural Heritage Reference Manual (MNR 2010) for Policy 2.1 of the Provincial Policy Statement (PPS). Recommended criteria for designating significant valleylands includes prominence as distinctive landform, degree of naturalness, and importance of its ecological functions, restoration potential and historical and cultural values. No significant valleylands are present within or adjacent to the G.E. Booth WRRF.

6.1.6 Wildlife

There are numerous wildlife species that have been documented in and near the G.E. Booth WRRF as a result of the LWC EA and/or Savanta's detailed investigations. Based on a review of background information and inventories completed in support of the JTLCA, these species include:

- Six (6) bat species, including Little Brown Myotis (*Myotis lucifugus*), Big Brown Bat (*Eptesicus fuscus*), and Silver-haired bat (*Lasionycteris noctivagans*). Little Brown Myotis is listed as endangered within Ontario and Canada.
- Targeted breeding bird surveys were completed throughout the LWC Study Area in 2003, 2011, and 2012 and identified 157 bird species, including Bank Swallow in 2011, which is a threatened bird species in Ontario and Canada. Targeted breeding bird surveys were conducted by Savanta in 2023 and identified Barn Swallow foraging over the ash lagoons; however, no nests were identified in the G.E. Booth WRRF property.
- 16 species of butterflies, including several migratory species such as the Monarch, which is listed as special concern in Ontario and endangered in Canada.
- 11 species of Odonata (Dragonflies and Damselflies).
- No targeted amphibian surveys were completed as part of the LWC EA process, however previous reports recorded Green Frog, American Toad, Northern Leopard Frog, and Gray Treefrog within the LWC Study Area.
- No targeted reptile surveys were completed as part of the LWC EA process, however Eastern Gartersnakes has been incidentally identified in the Study Area. As well, Midland Painted Turtle has also been known within the wetland communities of Marie Curtis Park.

A complete listing of the wildlife species is provided in **Volume 2, Appendix A1**. It is important to note that while these species have been documented within the LWC Study Area, suitable habitat may not be present within the G.E. Booth WRRF property to support these species.

6.1.7 Significant Wildlife Habitat

Significant wildlife habitat (SWH) is one of the more complex natural heritage features to identify and evaluate. There are four general types of SWH: seasonal concentration areas, rare or specialized habitats, habitat for species of conservation concern, and animal movement corridors. Further detail on these types of SWH is provided in **Volume 2, Appendix A1**. As shown in **Figure 6-1** and discussed in Section 6.1.1, the following candidate SWH types may be present within or adjacent to the G.E. Booth WRRF property in accordance with the MNRF's Ecoregion 7E SWH criteria:

- Turtle Wintering Areas within Applewood Creek;
- Bat Maternity Colonies within southeastern forested community;
- Barn Swallow habitat along Blower Building 1;
- Purple Martin habitat within the forested communities;
- Snapping Turtle habitat within Applewood Creek; and,
- Monarch habitat within the cultural meadow community associated with Area Search 2.

The following candidate SWH types were identified within the G.E. Booth WRRF property in accordance with the Peel-Caledon SWH Criteria:

- Bat Maternal Roosts and Hibernacula within FOD vegetation communities.

The above noted candidate SWH types will need to be confirmed with detailed ecological inventories should alterations be proposed adjacent to or within the vicinity of candidate SWH.

6.1.8 Species at Risk

A full list of SAR identified within the local study area (i.e. the G.E. Booth WRRF site and adjacent areas) is presented **Volume 1, Appendix A1**. The following SAR (threatened and endangered) were identified as candidate based on potential habitat availability within or adjacent to the G.E. Booth WRRF property:

- Blanding's Turtle – Threatened in Ontario and Canada;
- Little Brown Myotis – Endangered in Ontario and Canada;
- Northern Myotis – Endangered in Ontario and Canada;
- Tri-colored Bat – Endangered in Ontario and Canada;
- Butternut – Endangered in Ontario and Canada; and,
- American Eel - Endangered in Ontario and Canada.

The above species and associated habitats are warranted protection under provincial and federal regulations.

6.1.9 Watercourses and Fish Habitats

6.1.9.1 Applewood Creek

While upstream of South Service Road Applewood Creek is enclosed, the confluence of the creek with Lake Ontario remains naturalized and accessible to fish. A total of six (6) species were recorded within the LWC EA in the downstream reach to Lakeshore Road East. Lakeshore Road East is identified as a migratory barrier; however, upgrading of culverts along Lakeshore Road East for both Serson and Applewood Creeks are currently underway.

Applewood Creek has been identified as supporting permanent direct fish habitat for fish species such as the Fathead Minnow (*Pimephales promelas*) and Lake Chub (*Couesius plumbeus*).

6.1.9.2 Serson Creek

Serson Creek has undergone numerous alterations including splitting upstream of the Study Area. Baseflows are no longer piped underneath the G.E. Booth WRRF site to Lake Ontario and are being diverted through a straight open channel along the western boundary of the G.E. Booth WRRF property. Since the rehabilitation of Serson Creek, CVC identifies Serson Creek as an "engineered watercourse with an unclassified fish community under its current condition". As a result, it is assumed that Serson Creek provides direct fish habitat as a result of these discussions and the ongoing restoration work with the JTLCA.

6.1.10 Floodplains and Regulated Area

Applewood and Serson Creeks are located on or adjacent to the G.E. Booth WRRF site and are within CVC's Regulation Limit Area. Being adjacent to Lake Ontario, part of the site is also within CVC's Shoreline Hazard Limit. The Regulation Limit delineates hazardous lands, wetlands, shorelines, and areas susceptible to flooding, and associated allowances. Pursuant to the Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Regulation (O.Reg. 160/06), any development in or on areas defined in the Regulation (e.g., river or stream valleys, hazardous land, wetlands) requires a permit. CVC may grant permission for development in or on these areas if, in its opinion, the control of flooding, erosion, dynamic beaches, pollution or the conservation of land will not be affected by the development. The Regulation also prohibits straightening, changing, diverting, or interfering in any way with the existing channel of a river, creek, stream, or watercourse or changing or interfering in any way with a wetland without permission from the CVC.

The G.E. Booth facility remains outside of the erosion and floodplain hazard limits of Lake Ontario and Applewood Creek; however, Serson Creek was recently re-constructed immediately west of the G.E. Booth facility and while Serson Creek's floodline does not enter the G.E. Booth facility, a spill condition exists and therefore the Regulatory floodplain is undefined in the G.E. Booth facility. As part of any expansion work, the Region will need to consider reasonable flood protection for expansion areas to the satisfaction of the CVC.

6.1.10.1 Water Quality

Lake Ontario is shared between the Province of Ontario and New York State, with both provinces and countries sharing responsibility for its stewardship. Annually, the federal government of Canada and the United States, jointly publishes a State of the Great Lakes Report under the GLWQA. This report documents the following indicators:

- Drinking water
- Beaches
- Fish consumption
- Toxic chemicals
- Invasive species
- Groundwater
- Habitat and species
- Watershed impacts and climate trends
- Nutrients and algae

Overall, based on the above indicators the status for Lake Ontario is rated as "fair" with the trend "unchanging to improving".

In addition to the GLWQA, there are numerous other federal and provincial legislation governing the quality in Lake Ontario, as described in the Section 3.0. Of key importance to this study is to ensure that the MECP Water Management Policies, Guidelines and PWQOs continue to be met. The critical parameters for receiving water in Ontario consists of TAN, TP, un-ionized ammonia (UIA) and E. coli. These parameters with their corresponding PWQO are presented in **Table 6-1**. Wastewater effluent must be of high quality so that PWQO are not exceeded, outside an approved effluent mixing zone; The goal being to minimize risks to lake quality and surrounding water uses, including drinking water intakes (i.e., the Region of Peel's Lorne Park WTP intake), and nearshore recreational areas.

Table 6-1 Water Quality Levels for Key Parameters

Parameter	PWQO Concentration Limit
Un-ionized ammonia (UIA)[1]	0.02 mg/L
Total ammonia nitrogen (TAN)[2]	0.5 mg/L
Total phosphorus (TP)[1]	0.03 mg/L
E. coli[1]	100 E. coli per 100 mL

[1]Provincial Water Quality Objective (PWQO)
[2]Great Lakes Water Quality Agreement Water Source Protection Objective

In order to confirm the effluent limits for the expansion so that PWQO are met, a RWIA was undertaken to meet PWQOs. The results of the RWIA have been used in the Phase 3 evaluation of alternative treatment technologies and design concepts, and the development of the preferred design concept. The RWIA is presented in **Volume 2, Appendix B**, and further summarized in Section 8.0 of this ESR.

6.1.10.2 Fish Habitat

The Lake Ontario shoreline in the vicinity of the G.E. Booth WRRF has been degraded over time to support and protect infrastructure through dredging and armouring of the shoreline. As a result of the alterations within and adjacent to Lake Ontario, the natural environment has been altered, which has impacted the fish species in the area. A total of 52 species have been observed, of which 43 species were recorded as recently as 2008. The report suggests that species diversity was relatively high within the study area, however the abundance of fish collected was low due to the "degraded environment and low availability of fish habitat" (SENES Consultants 2014). The fish assemblage is consistent with a warm-water lake and/or riverine system. The fish collected are mostly generalist species that are tolerant of pollution, and include invasive and non-native species, including:

- Zebra Mussel (Dreissena polymorpha);
- Quagga Mussel (Dreissena rostriformis bugensis);
- Round Goby (Neogobius melanostomus); and,
- Rainbow Smelt (Osmerus mordax).

One aquatic SAR was identified within the LWC Study Area: American Eel, which is listed as endangered in Ontario and threatened in Canada. The Lake Ontario shoreline is currently being rehabilitated as part of the restoration work within the JTLCA.

In addition to the Lake Ontario shoreline, Applewood Creek has been identified as supporting direct permanent fish habitat. Through discussions with the CVC, it is understood that Serson Creek has been rehabilitated in proximity to the G.E. Booth WRRF property and therefore it is assumed that Serson Creek provides direct fish habitat as a result of these discussions and the ongoing restoration work with the JTLCA.

6.1.11 Jim Tovey Lakeview Conservation Area

The JTLCA is currently under construction and located immediately southeast of the G.E. Booth WRRF ash lagoons on the Lake Ontario shoreline. The JTLCA is a joint project effort between the Region of Peel, CVC, and the TRCA. The JTLCA project includes the creation of a new 26 ha conservation area along the eastern Mississauga shoreline, as illustrated in **Figure 6-2**. The purpose of this project is to enhance and re-create natural coastal habitats, build a natural park that encourages public access, use, and exploration along the waterfront, and facilitate sustainable city building.

Two coastal wetlands have been constructed east and west of Serson Creek, including extension of the Serson Creek channel and aquatic and terrestrial vegetation plantings. A third wetland is being constructed at Applewood Creek and the lakeshore. The result is that new natural habitats are being created, new species are moving into the area, and enhanced wildlife corridors and linkages are being established. The JTLCA is scheduled to be opened to the public in 2025.

The construction of JTLCA is also expected to alter the 100-year flood hazard lines along the Lake Ontario shoreline and this must be considered in the development of solutions and mitigation measures. It is likely that the post-development flood risk onsite at the G.E. Booth WRRF would be reduced; however, this will require confirmation once the JTLCA is constructed, and hazard lines are updated by CVC.

The Region of Peel is coordinating with CVC and TRCA staff to ensure that any development of the G.E. Booth WRRF site, including a potential new outfall continues to protect natural heritage features and is consistent with the initiatives being implemented as part of the JTLCA project.

Currently, the JTLCA and G.E. Booth WRRF share the first 300 m of the access road from Lakeshore Road East; after which, the G.E. Booth WRRF access road continues south to the plant, while the JTLCA access road moves west and then south along the west side of Serson Creek. This is an interim condition while the JTLCA is under construction as per a lease agreement with the Lakeview Community Partners which will expire in 2025. Long-term access to JTLCA for CVC will be along the shared access road from Lakeshore Road East and through the G.E. Booth plant. The access route through the G.E. Booth facility may periodically change pending G.E. Booth construction activities and operational requirements; however, an access route to the JTLCA through the G.E. Booth facility must be maintained at all times. The access location for the JTLCA within the G.E. Booth WRRF will be confirmed through a future Preliminary Design Report (PDR), completed as a component of the detailed design of the plant expansion.

Under the existing Lakeview Waterfront Connection Phase II Tri-Party Agreement, the Region and the CVC are to identify mutually agreeable final property boundaries between CVC's JTLCA and the G.E. Booth WRRF. The Region will transfer any surplus lands to the CVC to consolidate the JTLCA landform ownership, and the new security fence will be established upon the updated boundary by 2025. The preferred alternative developed through this EA will help to establish the property needs for the G.E. Booth WRRF and identify additional lands that could be available for temporary or permanent purposes that support conservation opportunities. The CVC has expressed interest in the long-term opportunities for additional conservation and/or recreational opportunities for the JTLCA in the retired ash lagoon and berm areas which should be considered by the Region.

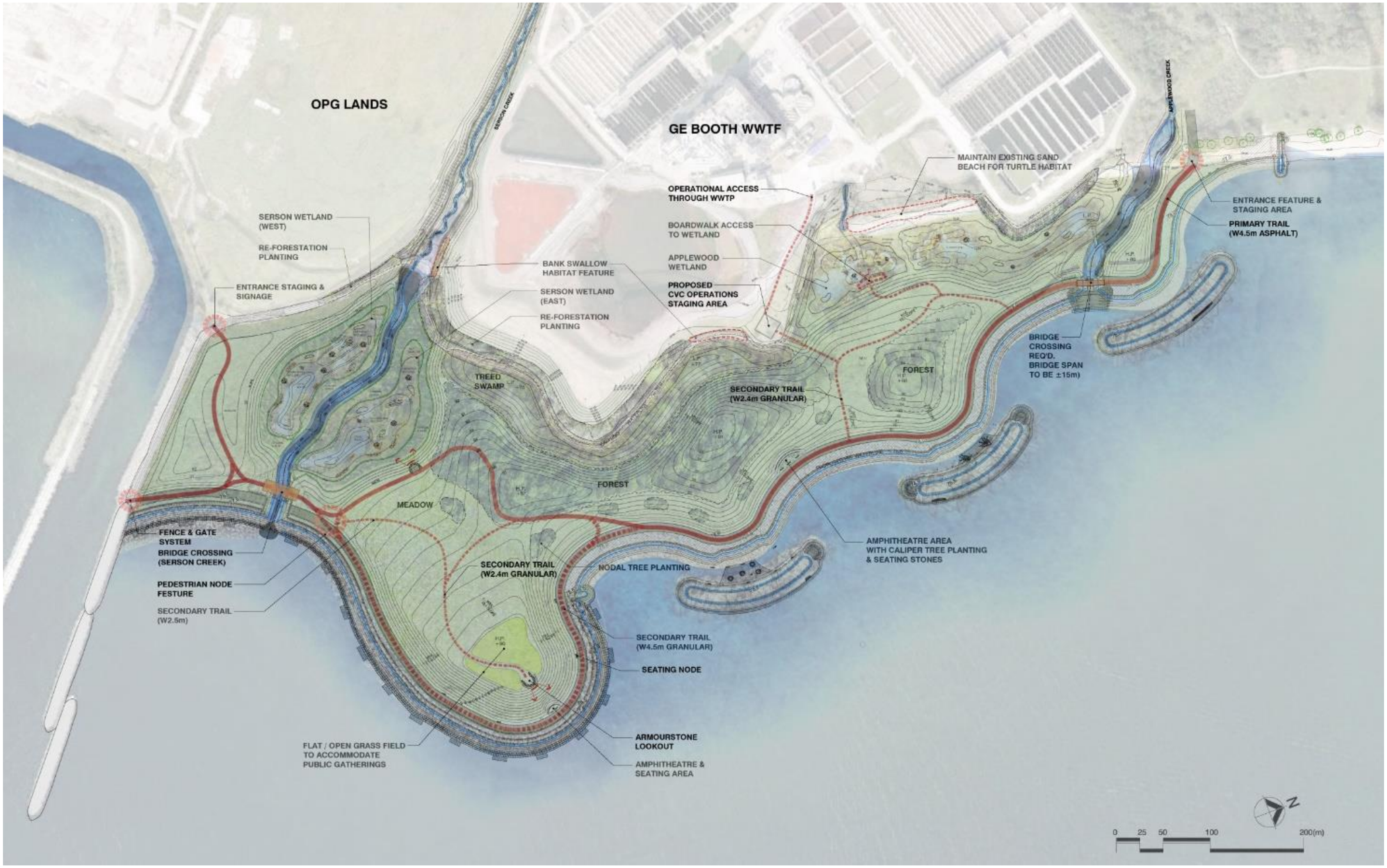


Figure 6-2 Jim Tovey Lakeview Conservation Area Rendering (Source: CVC, https://cvc.ca/jimtoveylakeviewca/about/)

6.2 Social/Cultural Environment

The social and cultural environment inventory documents how neighbouring lands are used by the public as well as the history of the community of Lakeview in the vicinity of what is now the G.E. Booth WRRF, as pictured in **Figure 6-3**. This section elaborates on specific historical, current, and future land uses and land users in or near the study area.

6.2.1 Residential, Commercial, and Industrial Land Use and Users

The G.E. Booth WRRF is located in an area that is currently zoned as a utility, with neighbouring lands to the west, the Lakeview Village development, identified as a Major Node. Lakeview Village, described further in Section 6.2.2, is designated as business employment, medium density residential, public open space, mixed use, and institutional, as illustrated in **Figure 6-4** from the City of Mississauga OP (2019). Lands east of the plant are designated as greenlands and public open space, while north of the plant is predominantly residential, with some mixed use along Lakeshore Road East (City of Mississauga, 2019).

Figure 6-3 Areas Surrounding G.E. Booth WRRF.

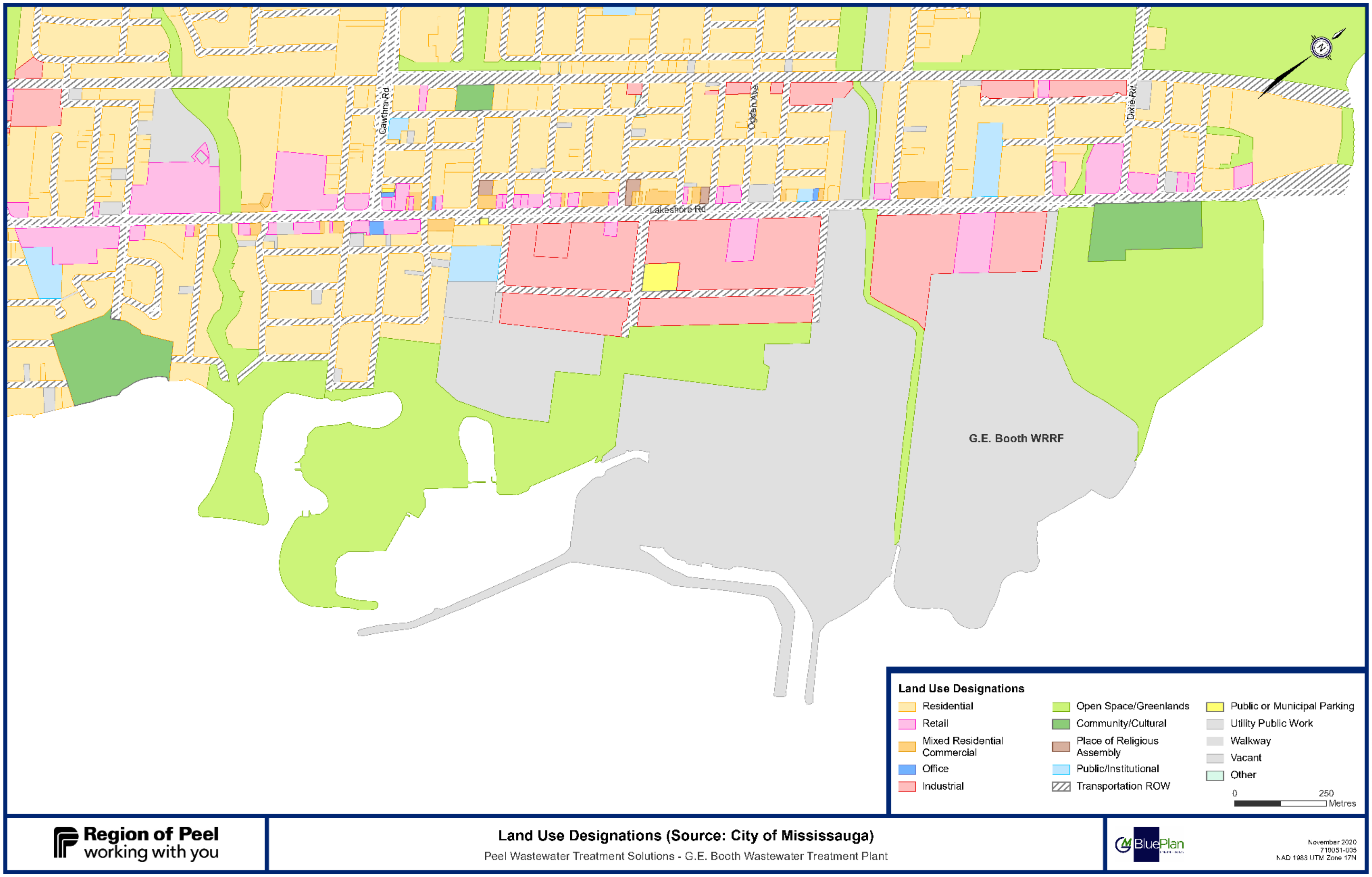


Figure 6-4 Land Use Designation Surrounding the G.E. Booth WRRF.

6.2.2 Lakeview Village

The Lakeview Village is located on the former Ontario Power Generation (OPG) coal-burning power plant site adjacent to the G.E. Booth WRRF. The Lakeview Village is planned as a mixed-use community with a variety of residential building types, parkland, cultural and employment uses, with buildings featuring environmentally sustainable designs. The community will feature shopping, dining, entertainment and recreational spaces for the significant population and employment growth planned for the area. The development will also include a District Energy Centre (DEC). Specific land use distribution is shown in **Figure 6-5**.

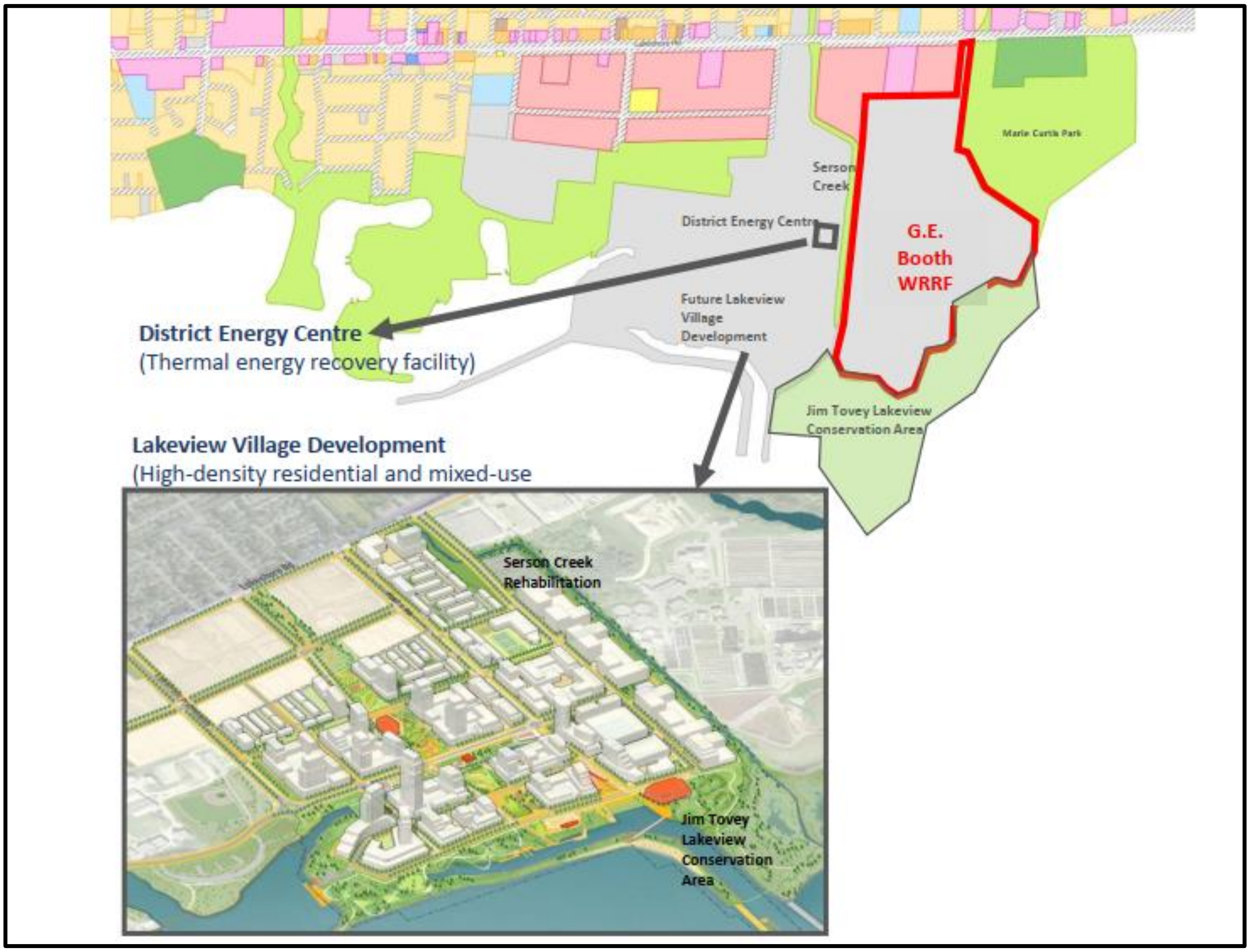


Figure 6-5 Lakeview Village Land Use (Source: Lakeview Village Development Master Plan, 2019)

Office and institutional buildings are planned to be constructed opposite the G.E. Booth WRRF near Serson Creek in an area called the Serson Innovation Corridor. The corridor may have buildings that are six (6) to eight (8) stories high and overlook the WRRF. The development may also include high-rise residential buildings; these buildings are deeper in the development, but the WRRF may still be visible from higher storeys. A public use area which includes a park and outdoor event space will be located to the southeast, near the Serson Creek outlet to Lake Ontario. Construction is expected to begin in 2023.

A unique feature of the site is the DEC. It is a thermal energy centred which will use treated effluent from the G.E. Booth WRRF to provide heating and cooling to facilities within the Lakeview Village Development. A pumping station will be constructed on the G.E. Booth WRRF site near the on-site outfall shaft to pump the treated effluent through heat exchanges in the DEC. The expansion project therefore will be designed to support the DEC.

The Region of Peel recognizes the importance of being part of this community and has worked with the developers and the City of Mississauga to develop community accepted plans for the G.E. Booth WRRF. The Region will continue to work with the City of Mississauga and developers through implementation.

6.2.3 Recreation

The study area is located adjacent to Lake Ontario and is a popular destination for recreational uses, several of which are described below.

6.2.3.1 Jim Tovey Lakeview Conservation Area

The JTLCA, part of the Lakeview Village Development Master Plan, is currently under construction and is expected to be open to the public in 2025. When complete, the JTLCA will join the Waterfront Trail and connect to Marie Curtis Park, as well as create new natural heritage features. Currently, the JTLCA and G.E. Booth WRRF share the first 300 m of the access road from Lakeshore Road East; after which, the G.E. Booth WRRF access road continues south to the plant, while the JTLCA access road moves west and then south along the west side of Serson Creek. This is an interim condition while the JTLCA is under construction as per a lease agreement with the Lakeview Community Partners which will expire in 2025. Long-term access to JTLCA for CVC will be along the shared access road from Lakeshore Road East and through the G.E. Booth plant.

6.2.3.2 Public Parks and Beaches

There are several public parks with beaches near the G.E. Booth WRRF: Marie Curtis Park and Dog Park, Lakeshore Park, and Lakeview Park.

Marie Curtis Park is located along the banks of Etobicoke Creek in the City of Toronto. It was created in the 1950s for flood control in response to destruction caused by Hurricane Hazel. The park includes a lakefront beach and has an off-leash dog area, playground, splashpad, washrooms and boat launch ramps. It is also a popular location for fishing, birdwatching, and observing wildlife.

The City of Mississauga is planning to convert the former Arsenal Lands between the G.E. Booth WRRF and Marie Curtis Park into a public park (Not Yet Named Park P-358). This park is a key feature in the City's 2019 Waterfront Parks Strategy Refresh and will complement use of the Small Arms Inspection Building and offer a connection to the JTLCA. The Arsenal Lands also house a historic water tower which will be a feature of the future park.

Lakeview Park is located west of Hydro Road and has a soccer field and two baseball diamonds as well as parking. This park is just north of the Lakeview Village development.

6.2.3.3 Swimming

Marie Curtis Park beach is well-used by the public and water quality is tested almost daily by the City of Toronto from June to Labour Day. Water quality is tested to check E. coli levels against the City's beach quality standard of maximum 100 colony forming units (cfu) per 100 mL; on days where this is exceeded, a beach is deemed unsafe to swim. In 2020, Marie Curtis Park beach E. coli levels exceeded 100 cfu/100 mL on 24 occasions, or about 30% of the time. The highest measurement of the year occurred on July 10, with E. Coli levels at 805 cfu/100 mL.

6.2.3.4 Waterfront Trail

The Great Lakes Waterfront Trail is a major trail system that follows the shore of Lake Ontario from Niagara-on-the-Lake to Kingston, continuing along the St. Lawrence River to the Ontario-Quebec border. The trail is a significant feature of the Lake Ontario waterfront in Mississauga near the G.E. Booth WRRF.

Currently, the Waterfront Trail is routed through Marie Curtis Park where it then follows Lakeshore Road East between Applewood and Serson Creeks. After Serson Creek, the trail routes south along Hydro Road then west to the Lakefront Promenade. Once opened, the JTLCA will provide waterfront connectivity of the trail between Marie Curtis Park and the Lakefront Promenade, between the G.E. Booth WRRF and the Lake Ontario shoreline.

6.2.3.5 Gun Ranges and Clubs

In line with the cultural history of the Lakeview community, the Lakeshore Arms Academy operates a club at an indoor rifle range known historically as the Long Branch Indoor Rifle Ranges. The building has heritage designation and is located at the north end of the G.E. Booth WRRF property, accessible by the same driveway to the plant. The club operates one day per week on Saturdays.

6.2.3.6 Marinas and Yacht Club

There are three (3) marinas and yacht clubs in the vicinity of the G.E. Booth WRRF (outside the immediate study area): Lakefront Promenade Marina, Port Credit Yacht Club, and Lakeshore Yacht Club. Lakefront Promenade Marina and Port Credit Yacht Club are just west of the plant, in the Lakefront Promenade area, while Lakeshore Yacht Club is east of the plant, near Colonel Samuel Smith Park.

6.2.4 Adjacent Water Treatment Plants and Intakes

Drinking water sources are offered protection under the Ontario Clean Water Act (2006) which mandates development and maintenance of drinking water SPP by prescribed authorities. In the Greater Toronto Area, CVC, TRCA, and the Central Lake Ontario Conservation Authority (CLOCA) are responsible for the source water protection. Members of the three authorities have formed the Credit Valley – Toronto and Region – Central Lake Ontario (CTC) Source Protection Committee.

The Source Protection Committee documents drinking water sources, protection zones, and potential risks. The IPZ are of particular relevance to this project. An IPZ is an area of land or water that is a set distance from a surface water intake and factors in travel time to react to an emergency spill or adverse event. The IPZs are established based on site-specific threats documented in a respective source protection plan. There are three (3) levels of IPZ:

1. IPZ-1 is a 1-km radius around the intake point and represents an area of high vulnerability.
2. IPZ-2 is an area determined based on time of travel and time for an operator to react to an emergency or adverse event; this represents an area of moderate vulnerability.
3. IPZ-3 is the area upstream of the intake, such as rivers that outlet to Lake Ontario.

Specific to this Class EA, the Region of Peel A.P Kennedy WTP intake IPZ-1 and City of Toronto R.L. Clark WTP IPZ -1 intake located in the vicinity of existing shown in **Figure 6-6**.

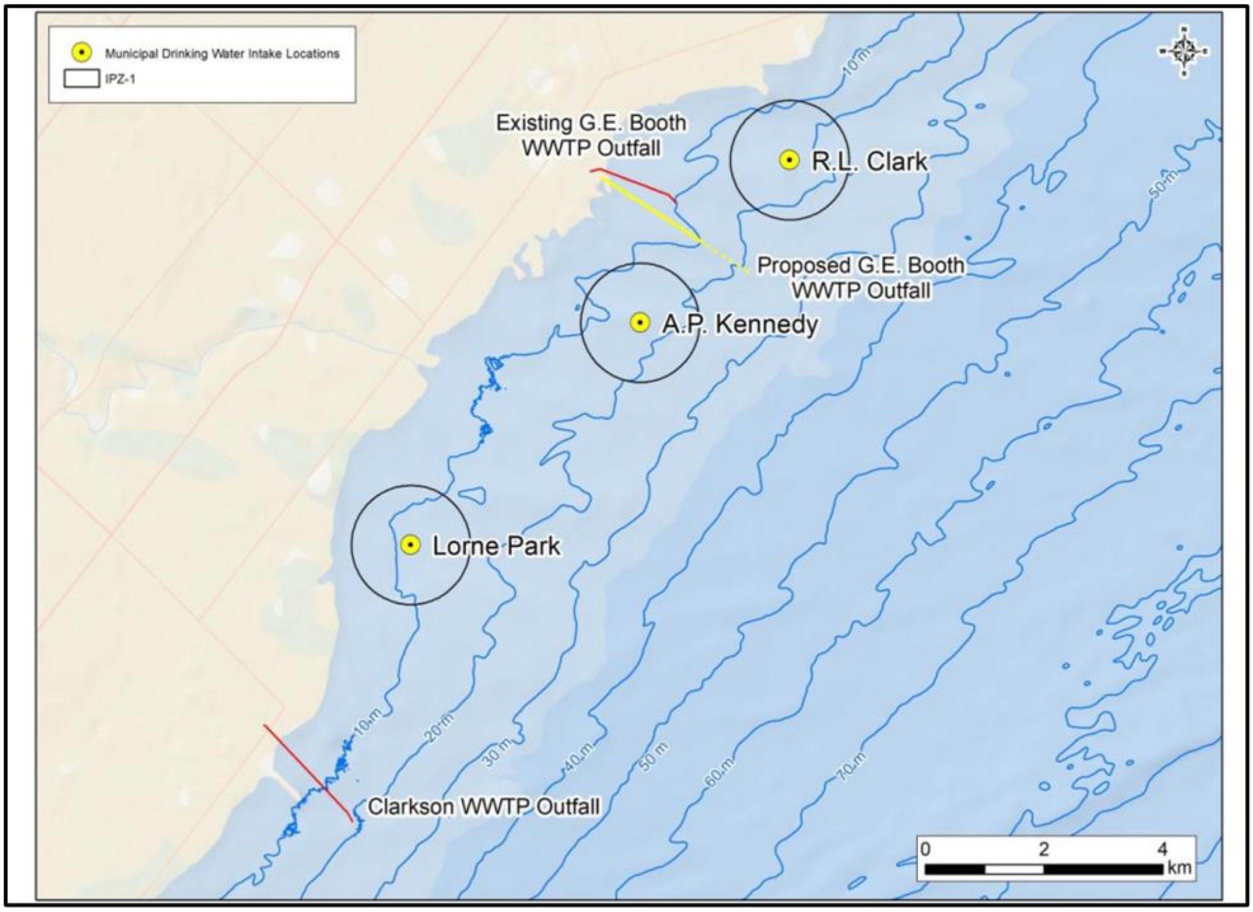


Figure 6-6 Water Treatment Plant Intake Protection Zones Near the G.E. Booth WRRF Outfall.

Protection of IPZs is essential to maintaining safe drinking water supplies. Threats could include chemical contaminants such as pesticide use and fuel handling as well as biological factors such as livestock grazing, and sewage treatment plant failures. The Region mitigates risks of sewage treatment failures through proper design, built in redundancy in treatment processes, stand-by power capacity, standard operating and maintenance procedures, and staff training.

Establishing effluent criteria and objectives that protect receiving waters and locating a new outfall to protect IPZs is considered in the RWIA presented in **Volume 2, Appendix B**, while details on mitigation measures are provided in Section 10.0 of this ESR.

6.2.5 Road Networks, Traffic Conditions and Transit

The area surrounding G.E. Booth WRRF is readily accessible by municipal roads, including Lakeshore Road East and other local residential roads. The facility is at the southern terminus of Dixie Road, a Regional Road, at Lakeshore Road East. The nearest 400-series highway is the Queen Elizabeth Way (QEW), approximately 2 km north of the plant.

Lakeshore Road East in the communities of Lakeview and Port Credit is congested with road width limited by the bridge crossing of the Credit River. The right of way is also shared by a portion of the Waterfront Trail and used by pedestrians and cyclists.

Public transit near the G.E. Booth WRRF is available through the City of Mississauga's MiWay system, beginning at the Long Branch Loop at the border between the Region of Peel and City of Toronto. MiWay has two (2) bus routes that start at the Long Branch Loop: Route 23 which travels west along Lakeshore Road East, and Route 5 which also travels west, but then turns north on Ogden Avenue. The Long Branch Loop is adjacent to the Long Branch GO Station, allowing transfers between MiWay and GO Transit systems.

Currently, biosolids are transported by trucks from Clarkson WRRF to G.E. Booth WRRF, travelling east along Lakeshore Road from Southdown Road. On average, three (3) trucks per day (40 m3 capacity) haul sludge from Clarkson WRRF to G.E. Booth WRRF. However, as identified in the Clarkson WRRF Schedule C Class EA, the Region is proceeding with providing sludge treatment capacity at the Clarkson WRRF and beneficially land applying the biosolids products. The goal is to have this treatment and management system in place at the Clarkson WRRF by 2029; at which time, trucking of sludge from Clarkson WRRF to the G.E. Booth WRRF will be minimized or phased out.

6.2.6 Aesthetics/Visual Conditions

The JTLCA and G.E. Booth WRRF share the first 300 m of the access road from Lakeshore Road East; after this point, the G.E. Booth WRRF access road continues south to the plant, while the JTLCA access road moves west and then south along the west side of Serson Creek. This is an interim condition while the JTLCA is under construction as per a lease agreement with the Lakeview Community Partners which will expire in 2025. Long-term access to JTLCA for CVC will be along the shared access road from Lakeshore Road East and through the G.E. Booth plant. The access road provides a view of the main gate to the plant as well as the facility buildings and stack.

Although the western boundary of the G.E. Booth WRRF is treed, facility buildings and the incineration stack are visible from Hydro Road, which transects the planned Lakeview Village development. Visibility from the Waterfront Trail near Applewood Creek is limited to generally forested or naturalized areas and historical shooting range structures until it nears the shoreline of Lake Ontario. Near the lakeshore, park lands near the trail are open, with sporadic trees and limited visibility of the plant.

As described above, the Lakeview Village development is planned directly adjacent to the G.E. Booth WRRF. Peel has continually worked with the City of Mississauga and the developers so that the visual impacts of the plant on surrounding communities are minimized. The current ash lagoons are planned to be replaced with an ash holding facility, the primary treatment tanks will be covered, and a greenspace buffer is planned between the Lakeview Village development and the G.E. Booth WRRF. Further design elements to minimize impacts are described in Section 9.0 and mitigation/restoration measures described in Section 10.0.

6.2.7 Air Quality and Odour Conditions

As part of the Region's standard operating procedures and a condition of their ECA for the G.E. Booth WRRF, the Region logs, investigates, and takes measures immediately to resolve odour complaints. Since 2005, the frequency of odour complaints from the plant has been low, averaging approximately seven (7) complaints per year. The majority of the recent odour complaints have been short-term during periods when tanks were out of service for maintenance and mitigated by plant staff. In addition, operations staff proactively take mitigative measures during activities that are likely to generate additional odours, such as dewatering of tanks for maintenance.

Field odour surveys were conducted as part of the planning of the Lakeview Village Development. An Air Quality & Noise Land-Use Feasibility Assessment study (RWDI, 2019) indicated that currently weak sewage odours were found to be moderately frequent at Hydro Road with moderate to strong odours occurring from time to time. As noted above, Hydro Road currently transects the planned Lakeview Village Development area.

As discussed in Section 5.4.8, a number of other enhancement works are underway or planned at the G.E. Booth WRRF to further reduce odour. The expanded plant is also being designed to minimize risks of odours. As part of this Class EA, an Air Quality Assessment (AQA) is being completed on the preferred expansion design concept that includes an assessment of the effectiveness of planned emission and odour control measures. The AQA Report will be included in the final ESR in **Volume 2, Appendix C**, with further details provided in Section 10.0.

6.2.8 Noise Conditions

Most sources of noise are within closed buildings, so noise off-site from operations of the G.E. Booth WRRF are limited. However, some noise is emitted through buildings vents and openings as well as from construction activities, but these are below the MECP sound level limits of between 40 – 55 decibels (dBA) (based on the existing receptors). With the new proposed Lakeview Development being constructed closer to the G.E. Booth WRRF than other sensitive receptors, the RWDI assessment (RWDI, 2019) suggests sound levels may be in excess of the minimum MECP noise guideline limit in the eastern part of the proposed Lakeview Development (provided G.E. Booth WRRF operations remain as current with no additional noise mitigation measures in place). While the levels of noise pollution produced from the G.E. Booth WRRF are anticipated to be minimal, it is also acknowledged that noise pollution has an impact on wildlife located in adjacent environmental areas.

As part of this EA, an Acoustic Assessment Report is being completed to establish a preferred design concept that includes noise mitigation measures. The Acoustic Assessment Report will be included in **Volume 2, Appendix D**, with further details provided in Section 10.0.

6.2.9 Archaeology

Two (2) Stage 1 Archaeological Assessment (AA)s were completed to confirm archaeological potential within the G.E. Booth WRRF Study Area. The first was a Stage 1 AA of both the Clarkson WRRF and the G.E. Booth WRRF sites, completed March 2021, and provided in **Appendix E-1**. The second was completed following the development of the preferred design concept as the new administration building is being planned outside the expansion boundaries identified in the March 2021 Stage 1 AA. This Stage 1 AA (May 2023) is provided in **Appendix E-2** and is currently being reviewed by Indigenous Communities prior to being submitted to the Ministry of Heritage, Sports, Tourism and Cultural Industries (MHSTCI). Much of the study area has been previously disturbed and does not require further archeological assessment, with exception of the treed area at the northwest corner of the property, shown in **Figure 6-7**. This area has retained archaeological potential; however, the conceptual design presented herein (See Section 9.0) avoids construction in this area.

In addition, a desktop marine archaeological assessment was completed to understand the archaeological potential of near-shore areas and extended study area into Lake Ontario which could be used for an additional outfall. No known records exist for archaeological resources. Additional details are included in **Appendix B-3** in the Marine Archaeology study report.

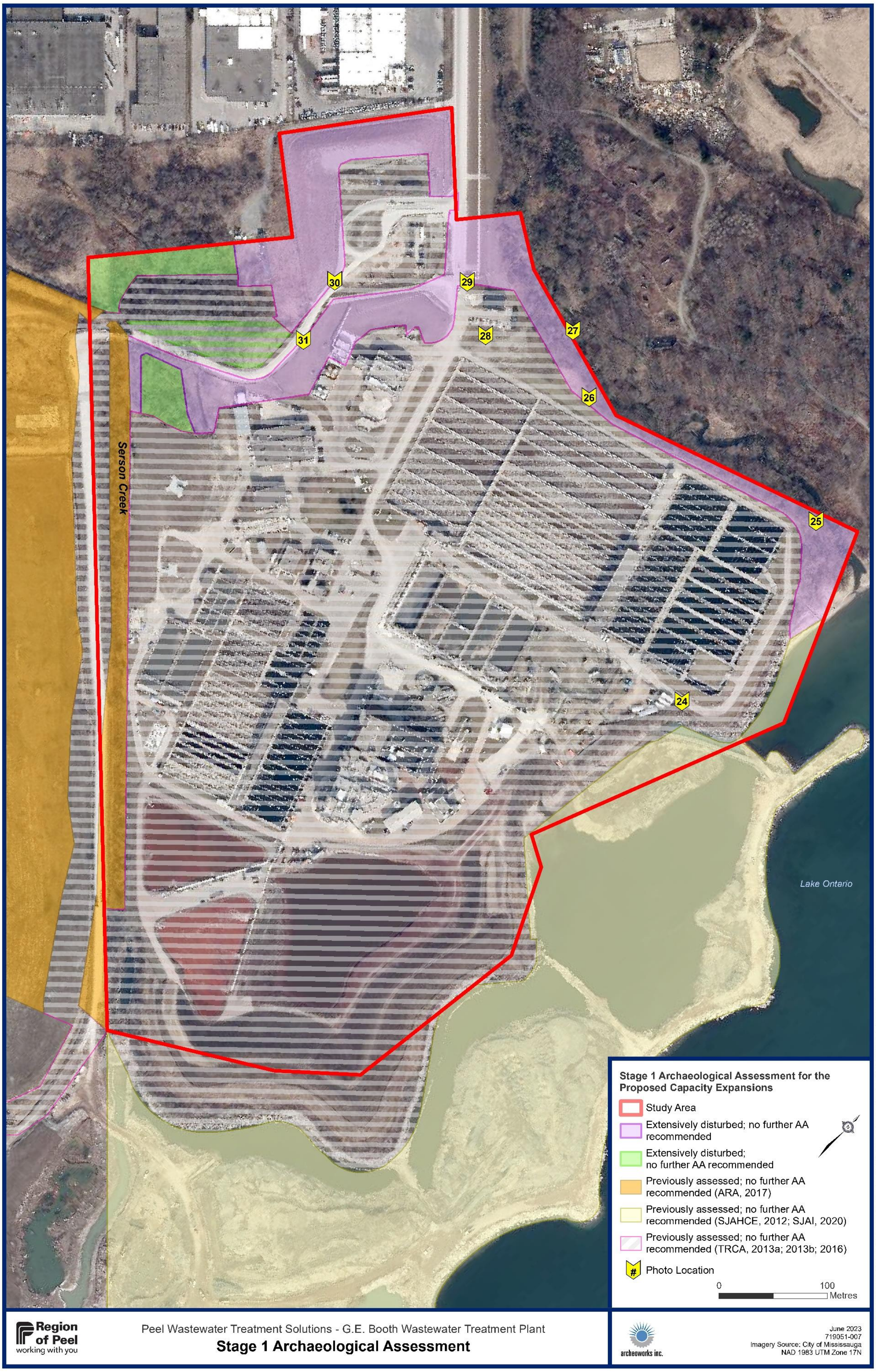


Figure 6-7 Archaeological Potential at G.E. Booth WRRF.

6.2.10 Cultural Heritage

The G.E. Booth WRRF facility is located in vicinity of the community of Lakeview. Though not officially named so until 1922, Lakeview was among the earliest settled parts of Toronto Township. The first recorded European settlers moved to the area in the early 1800s. The area remained rural for most of the 19th century, with settlers engaging in mixed agriculture. Beginning in the 1890s, much of the land south of Lakeshore Road came under the possession of the Ontario Militia Department, who among other things established a rifle range. The federal government also built Canada's first aerodrome and flying school in the Lakeview area in 1915. During the Second World War the Department of National Defence took over the rifle range property for military training, while also establishing the Canada Arms School, Small Arms Militia Training Centre, and factories for ammunition and small arms. Lakeview thus became a military-oriented community. After the war the federal government sold off the parcels for public use (power generation, parks, water and sewerage treatment) and private (commercial and industrial) use.

Several heritage resources remain as a result of the past military uses in the area. The following are located within 300 m of the G.E. Booth WRRF study area:

- Long Branch Indoor Rifle Range (1940) – designated Cultural Heritage Property under By-Law 170-2012;
- Long Branch Outdoor Rifle Range (1910) – designated Cultural Heritage Property under By-Law 0144-2017;
- Small Arms Limited Building (1941) – designated Cultural Heritage Property under By-Law 258-2009; and
- Arsenal Lands Water Tower – designated Cultural Heritage Property under By-Law 258-2009.

This conceptual design presented herein (refer to Section 9.0) has been developed to avoid impacts to these resources. However, this should be confirmed during detailed design through the completion of a cultural heritage evaluation.

6.2.11 Indigenous Communities Considerations

Indigenous communities have unique understanding of the natural environment given their relationship with traditional lands, practices, and way of life. As such they provide valuable information to help identify solutions and measures to mitigate impacts to natural and cultural resources.

This study area falls within the boundaries of the Head of the Lake Treaty 14, of which the Crown and the Mississaugas of the Credit First Nation (MCFN) entered into in 1806. The study area also falls within the boundaries of the 1760 Anglo-Huron Treaty, of which the Crown and the Huron-Wendat First Nation entered into in 1760. As such, the MCFN and the Huron-Wendat First Nation are recognized as the traditional stewards of the land, waters, and resources within these Treaty Lands and Territories.

As confirmed under Lake Treaty 14, this stewardship role extends to cultural and archaeological resources. As outlined in the MCFN Standard and Guidelines for Archaeology (February 2020), "respect for the traditional stewardship role should embrace two (2) precepts:

- MCFN have the right to be consulted on archaeological practice that affects their cultural patrimony, including the interpretation of archaeological resources and recommendations for the disposition of archaeological artifacts and sites within the Treaty area.
- Archaeological practice must include thoughtful and respectful consideration of how archaeological techniques can be used to reveal not only the data traditionally surfaced by archaeologists, but also culturally important data valued by MCFN.

As confirmed under the 1760 Anglo-Huron Treaty, the Crown signs protocols for consultation with Indigenous people to set out a process to be followed when consulting on potential adverse impacts to Aboriginal or treaty rights. The protocol sets out how the federal government consults the Huron-Wendat First Nation when developing and carrying out projects throughout their traditional territory, Nionwentsïo. These consultations are to be conducted in compliance with the 1760 Anglo-Huron Treaty.

Along with engaging the MCFN and Huron-Wendat First Nation through the EA process, the Region of Peel engaged with the Haudenosaunee Confederacy Chiefs Council (including the Haudenosaunee Development Institute [HDI) department] and the Six Nations of the Grand River, as recommended by the MECP at study initiation.

Further information on Indigenous Community engagement is provided in Section 12.0.

6.3 Physical Environment

The physiography, topography, geotechnical, and hydrogeological conditions are described in this section in order to identify the implications of the G.E. Booth WRRF expansion on design and construction requirements.

6.3.1 Physiology and Topography

The G.E. Booth WRRF is located within the Peel Plains Physiographic Region (Chapman and Putnam, 1984). The Peel Plains is a level to undulating tract of clay with limited areas of sandy alluvium borders stream valleys. The site generally slopes towards Lake Ontario, with no large topographic relief.

6.3.2 Hydrogeological and Geotechnical Conditions

The G.E. Booth WRRF study area has been studied extensively with several geotechnical and hydrogeological investigations completed over the years. **Appendix F, Volume 2** illustrates the on-site location where borehole investigations have taken place since 1970, as well as the selected borehole logs and borehole location plans from previous investigations. Subsurface conditions encountered in the various site-specific boreholes are broadly summarized in the following subsections.

6.3.2.1 Earth Fill

Earth fill over native sandy soils is present throughout the site. The amount and composition of earth fill encountered varies and may have changed since the boreholes were advanced due to cut and fill activities. Generally, however, the earth fill consists of gravelly sand, to sandy silt, to clayey silt, to silty clay, at thicknesses of up to 4.7 metres as illustrated in **Table 6-2**.

Table 6-2 Summary of Earth Fill Encountered Beneath Site.

Location on Site	Nearby WRRF Structures	Approx. Earth Fill Thickness (m)
North Entrance	Entrance Roadway, Peel Capital Office	1 to 2.5
Northeast	Plant 3 Aeration Tanks 15 and 16	3 to 4.7
East	Plant 3 Primary Clarifiers 12 and 13, Effluent Pumping Station	0.8 to 6
Southeast	Disinfection Building, Solids Receiving Building	1 to 3
South	Ash Lagoon No. 1	0 to 2.7
Southwest	Southwest of Plant 2 Aeration Tanks	2.3 to 2.6
West	Maintenance Building, Plant 1 & 2 Primary Inlet Conduit	1.2 to 3
Northwest	Grit Facility	3.4
Middle	Decant Tanks 6 and 7	2.6 to 3.4

6.3.2.2 Native Soils

The depth and elevation of the native soils varies across the site. The native soil deposits encountered beneath the site ranged from glacial till (silty clay to clayey silt to sandy silt glacial till), silty clay to clayey silt, wet sands, and till/shale complex (possibly weathered shale). **Table 6-3** presents a summary of the native soil conditions that were generally encountered across the site.

Table 6-3 Summary of Native Soil Deposits Encountered Beneath Site.

Location on Site	Nearby WRRF Structures	Native Soil Deposits	Approx. Top Depth / Elev. (m) of Native Deposits
North Entrance	Entrance Roadway, Peel Capital Office	Hard silty clay to clayey silt; Very dense and wet silty sand	1 to 2.5 / 81.5 to 78.5
Northeast	Plant 3 Aeration Tanks 15 and 16	Very dense and wet sands, silts, sand, and gravel; Hard clayey silt glacial till	3 to 4.7 / 76 to 77
East	Plant 3 Primary Clarifiers 12 and 13, Effluent Pumping Station	Very dense and wet sands to silts; Very stiff to hard clayey silt glacial till	0.8 to 6 / 77.7 to 72
Southeast	Disinfection Building, Solids Receiving Building	Stiff to very stiff clayey silt to silty clay; Very stiff to hard glacial till; Loose to compact wet sands	1 to 3 / 79 to 75
South	Ash Lagoon No. 1	Very stiff silty clay glacial till; Loose wet sands	0 to 2.7 / 78.5 to 76
Southwest	Southwest of Plant 2 Aeration Tanks	Very stiff to hard silty clay to silty clay till; Hard till/shale complex	2.3 to 2.6 / 76.4 to 76.3
West	Maintenance Building, Plant 1 & 2 Primary Inlet Conduit	Very dense and wet sands and silts; Very dense glacial till; Hard clayey silt	1.2 to 3 / 80 to 76.5
Northwest	Grit Facility	Hard clayey silt till; Very dense silty sand to sandy silt till	3.4 / 77

6.3.2.3 Bedrock – Onshore

Bedrock of the Georgian Bay Formation was encountered beneath the native soil overburden across the site. The bedrock consists of shale with limestone interbeds. The bedrock surface slopes down across the site toward Lake Ontario generally from a higher elevation in the north to a lower elevation in the southeast. The upper 1 to 2 metres of Georgian Bay Formation bedrock is typically weathered, and the boreholes indicate that the top of weathered bedrock surface was inferred at the depths and elevations indicated in **Table 6-4**.

Table 6-4 Summary of Bedrock Depths Onshore.

Location on Site	Nearby WRRF Structures	Approx. Depth / Elev. (m) of Inferred Bedrock Surface
North Entrance	Entrance Roadway, Peel Capital Office	2 to 8 / 80 to 74
Northeast	Plant 3 Aeration Tanks 15 and 16	Below 19 to 20 / 61.5 to 60 (bedrock not encountered)
East	Plant 3 Primary Clarifiers 12 and 13, Effluent Pumping Station	9 to 11.3 / 69.4 to 67
Southeast	Disinfection Building, Solids Receiving Building	4 to 6 / 74.5 to 72.7
South	Ash Lagoon No. 1	5 to 6.1 / 73.5 to 71.4
Southwest	Southwest of Plant 2 Aeration Tanks	Below 6.3 / 72.6 to 72.4 (bedrock not encountered)
West	Maintenance Building, Plant 1 & 2 Primary Inlet Conduit	Below 7.5 to 15 / 72 to 64 (bedrock not encountered)
Northwest	Grit Facility	10 / 70
Middle	Decant Tanks 6 and 7	9 to 10.5 / 69.5 to 68

Bedrock was not encountered in the northeastern area of the site and the boreholes extended to an elevation of 60 to 61.5 metres. Applewood Creek flows just north of the area and the bedrock surface may have eroded into a valley near the creek and now contains modern alluvial deposits.

6.3.2.4 Bedrock – Offshore

Conditions at the existing outfall are documented in the Soils Investigation Report for Outfall Sewer produced by Peto Associates Ltd in November 1972 (Peto Associates, 1972). Boreholes were completed at the time to support design and construction of the existing outfall and suggest weathered bedrock thickness increases from approximately 0.3 m to 2.0 m over sound bedrock, with the thickness increasing further from shore. **Figure 6-8** shows the location of boreholes and **Table 6-5** shows their relative bedrock depth.

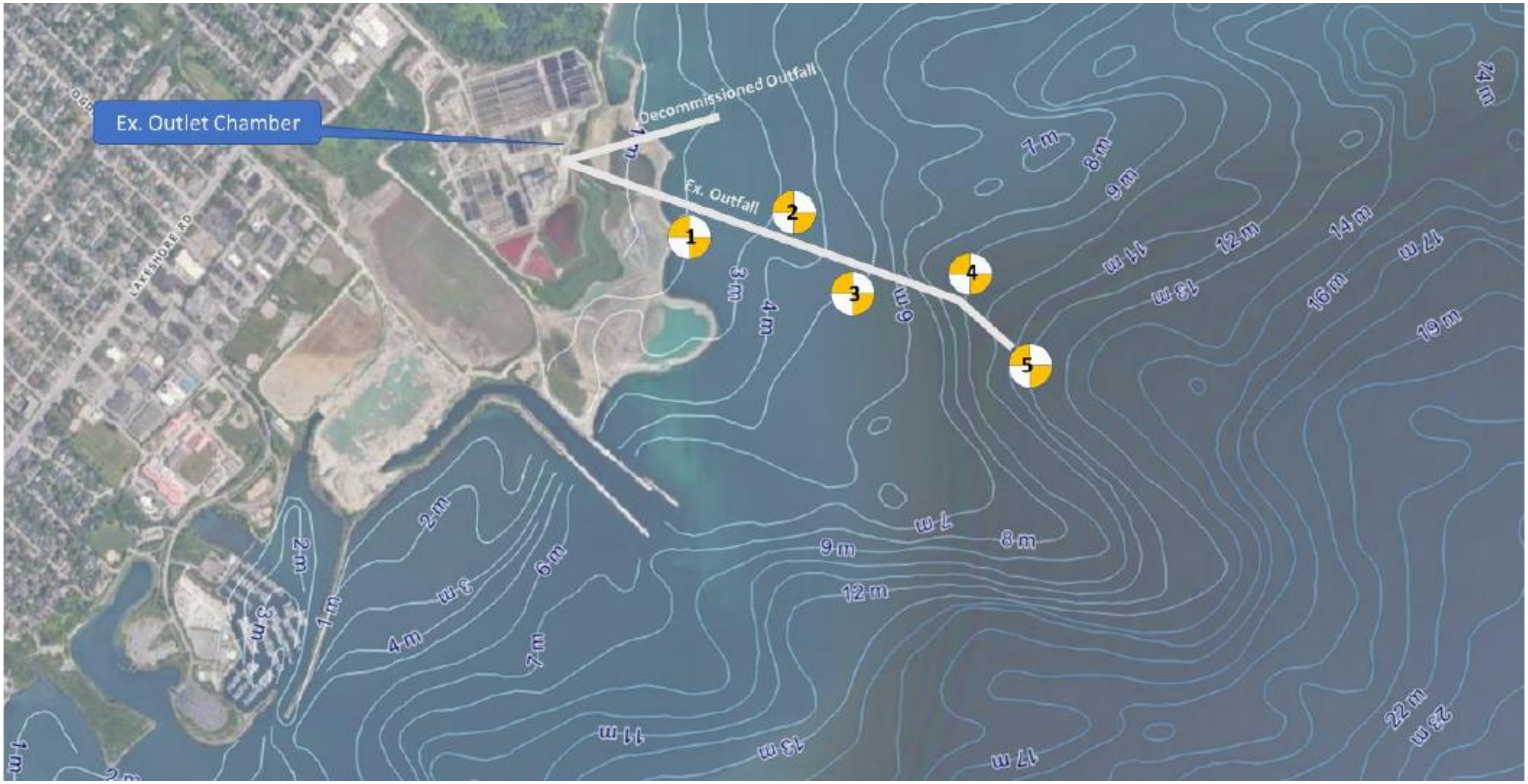


Figure 6-8 Available Geotechnical Borehole Information.

Table 6-5 Bedrock Depth at 1972 Boreholes.

1972 Borehole	Approximate Depth to Weathered Bedrock	Approximate Depth to Sound Bedrock
1	3.0 m	3.3 m
2	5.0 m	5.5 m
3	5.8 m	6.7 m
4	9.5 m	10.6 m
5	13.5 m	14.2 m

An analysis of the groundwater conditions along the existing outfall tunnel indicated the bedrock had a permeability ranging from 0.001 to 0.00001 centimetre per second (cm/sec) (Peto Associates, 1972). Based on this permeability range, groundwater inflow into the existing tunnel was not significant.

Although conditions are expected to be somewhat similar in area surrounding the existing outfall, additional geotechnical and hydrogeological information will be required to confirm subsurface conditions and validate design and construction assumptions for a new outfall.

6.3.2.5 Groundwater

Monitoring wells have previously been installed within the study area and results were also reviewed from the previous geotechnical and hydrogeological investigations. The groundwater table is generally located near 77 m asl in the northeastern part of the WRRF and slopes down to near 74 to 75 m asl near Lake Ontario. The average Lake Ontario level is approximately 74.8 asl and can fluctuate from 74 to 75.5 m asl, and potentially higher as an impact of climate change (see Section 6.4).

The in-situ hydraulic conductivity of the cohesionless deposits was also measured in some monitoring well locations using single well response test analysis methods. The following hydraulic conductivities were generally measured for the cohesionless deposits beneath the site:

Silty Sand to Sandy Silt: 1×10^{-6} m/s
Silty Sand to Sandy Silt Glacial Till: 1×10^{-6} m/s
Sand to Gravelly Sand: 1×10^{-4} m/s

Groundwater control would likely be required during construction for excavations that extend below the groundwater table in the cohesionless deposits. Historical hydrogeological reports support this, as they show that active dewatering systems are required during construction activities. Pre-treatment of the groundwater would be required prior to discharge to the Region of Peel / City of Mississauga storm sewer system.

Typically, the target drawdown level is about 0.5 to 1 m below the proposed subgrade elevation to ensure the subgrade does not become disturbed by groundwater inflow. The dewatering and water taking rates depend on the excavation length, width, and depth below the groundwater table.

6.3.3 Areas of Potential Environmental Concerns

A Phase 1 Environmental Site Assessment (ESA) was completed for the G.E. Booth WRRF to understand potential areas of contamination in or near the property, that may have resulted from current or historical use. The Phase 1 ESA focused on the G.E. Booth WRRF property and extended to 250 metres from the property boundary.

The Phase 1 ESA identified the risk of soil and/or groundwater contamination caused by potentially deleterious fill material, fuel handling and storage, polychlorinated biphenyls (PCBs), as well as other industrial activities. It also documented the potential for presence of designated substances such as asbestos and lead. Each source, along with identified Areas of Potential Environmental Concern (APEC), were identified. Overall, eight (8) APECs were identified at the G.E. Booth WRRF. **Figure 6-9** shows the locations of the APECs, while details are described in the Phase 1 ESA report provided in **Appendix G, Volume 2**.

During detailed design, additional investigations are recommended if upgrades or expansion works are recommended in any of the on-site APEC areas. The investigations could be carried out in the context of a Phase Two ESA to identify soil and groundwater quality with greater certainty, such as to support an excess soils management plan or a construction dewatering plan or to identify potential hazards in areas to be excavated.

6.4 Climate Change

he Region of Peel, at a Council level, have prioritized Climate Resiliency Region-wide across all services. The implications of climate change on infrastructure can be wide-ranging and can encompass numerous aspects of a project. Likewise, infrastructure upgrades, expansions, operations, and maintenance activities may increase GHG emissions thereby impacting air quality and climate.

This section provides an overview of the existing climate and projections, the potential impacts of climate change to the G.E. Booth WRRF and the potential implications of the G.E. Booth WRRF on climate change. The information is used to support the development and evaluation of alternative solutions and design concepts, as well as short and long-term adaptative management practices.

6.4.1 Conditions and Projections

In 2016, the Region of Peel undertook a study to characterize recent trends and future projections in climate across an array of climate indicators of interest in the Region (Auld et al. 2016)[1]. The study used state-of-the-science climate modelling recommended by the Intergovernmental Panel on Climate Change (IPCC) to obtain future climate conditions for the period of 2011-2100, resulting in three future time horizons: the 2020s, 2050s and 2080s. The summary below provides potential future climate conditions based on the Representative Concentration Pathway (RCP) of 8.5, otherwise known as the "business as usual" future emission scenario. The RCP 8.5 pathway represents little action being undertaken to reduce GHG emissions at a global scale and takes a precautionary approach. This is the recommended pathway by most institutions for climate change adaptation planning.

[1] Auld, H., Switzman, H., Comer, N., Eng, S., Hazen, S., and Milner, G 2016. Climate Trends and Future Projections in the Region of Peel. Ontario Climate Consortium, 2016.

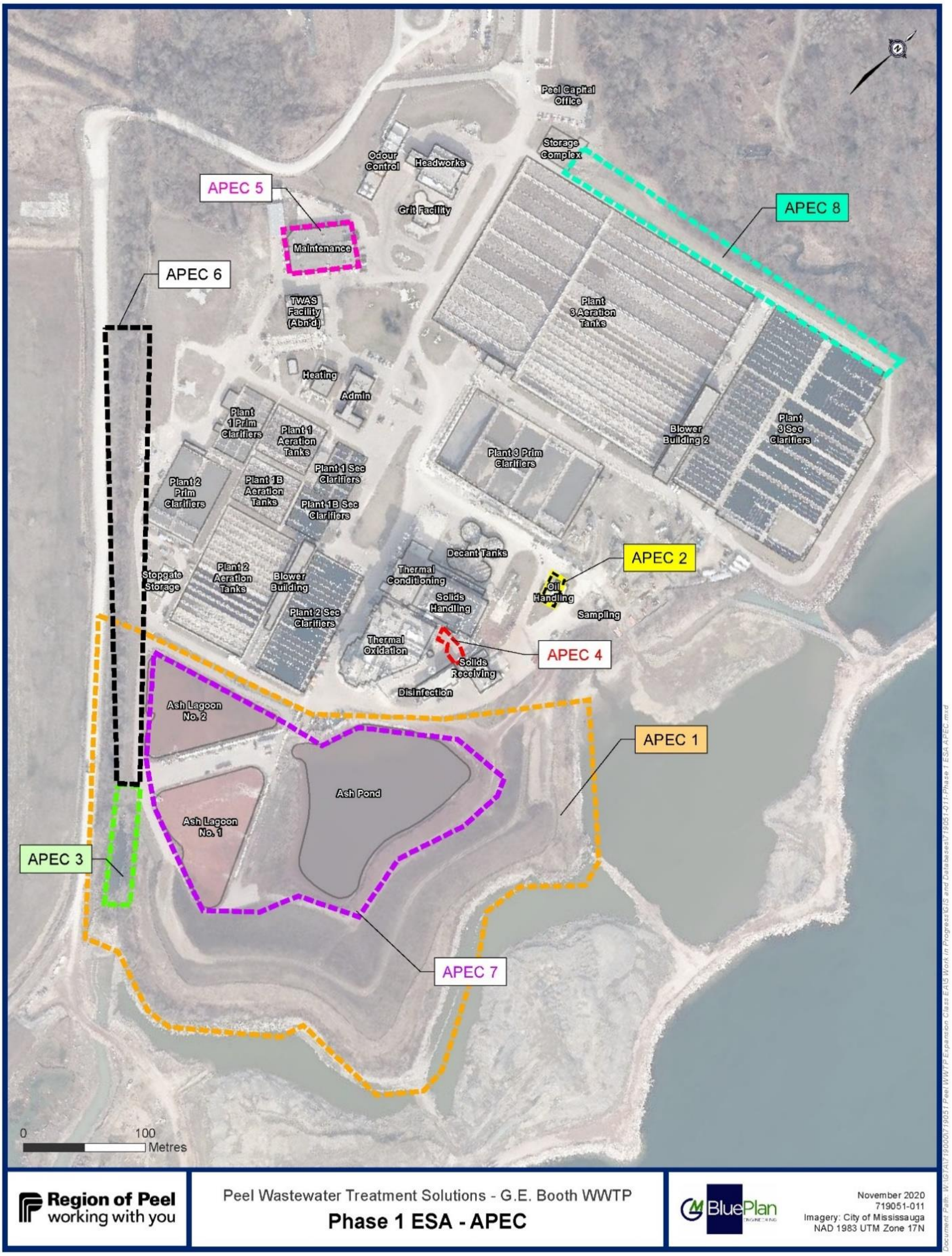


Figure 6-9 Areas of Potential Environmental Concern (APEC) at the G.E. Booth WRRF.

6.4.2 Historical Climate Characterization

On an annual and seasonal basis, higher mean temperatures are found in the southern portion of Peel than in the northwest regions. This trend is attributed primarily to the effects of elevation that increase to the north, and the presence of Lake Ontario and intensely urbanized land use in the south. Higher topographic elevation in northern Peel, due to the presence of the Niagara Escarpment and Oak Ridges Moraine (ORM), results in cooler temperatures. Historically, the annual average difference in temperature between the south and the north is approximately 3°C. Because of the moderating effect of Lake Ontario in the south, the elevation and snow cover differences throughout Peel, and the fact that warming is occurring at the surface and near surface atmosphere, northern Peel can be expected to warm at a faster rate than southern Peel.

The northwestern portion of Peel is historically the wettest area within the Region on seasonal and annual bases, with the southern portion receiving relatively less precipitation. Northwest Peel receives an average total amount of precipitation between 835 mm and 925 mm per year and southern area in Mississauga receives between 794 and 836 mm. The north-south trend in precipitation is driven primarily by the influence of topographic and elevation features of the ORM, Niagara Escarpment and some regional storm track differences. These differences include, but are not limited to, the Great Lakes influences on summertime convective precipitation, the extent of northern progression of tropical air in winter and transition seasons, springtime and fall positions of frontal zones. These features cause a slight rain shadow effect (reduction of precipitation) delivered to Peel compared to other surrounding areas. Frontal systems drive the precipitation regime in the Greater Toronto Area from the west and south-west, causing more precipitation on the windward side of the ORM and Niagara Escarpment in north Peel. Conversely, Lake Ontario exerts an influence on the southern Region of Peel and Lake Huron-Georgian Bay on the northern Region of Peel by delivering additional moisture to the area, especially during winter months in the form of lake-effect precipitation, given particular conditions.

These historical climate conditions are reflected in existing shoreline hazard mapping produced by CVC. The G.E. Booth WRRF is located in CVC's jurisdiction, and specifically within the Lake Ontario Shoreline East Subwatershed (CVC 2011). CVC delineates floodplain maps for riverine flooding (based on inundated areas from the 100-year storm event, or Hurricane Hazel conditions, whichever is greater), and shoreline hazard (based on the 100-year flood level, allowances for shoreline dynamics and wave uprush). Based on the Lake Ontario Integrated Shoreline Assessment completed in 2018 (CVC 2018), portions of the Study Area are located within the regulatory floodplain, as well as the plant's associated infrastructure located at the shoreline (e.g., outfalls). The construction of the JTLCA directly south of the Study Area is expected to alter the 100-year flood hazard lines along the Lake Ontario shoreline (CVC 2018). However, the extent to which this may reduce flood risk on this Study Area requires further review once lands are constructed and hazard lines have been updated by CVC.

6.4.3 Future Climate Characterization

Based upon the latest climate modelling projections, it is anticipated that climate conditions will change and potentially exacerbate existing issues, such as those relating to erosion, flooding, and shoreline dynamics. **Table 6-6** provides potential future climate conditions based on the Representative Concentration Pathway (RCP) of 8.5, otherwise known as the "business as usual" future emission scenario. The RCP 8.5 pathway represents little action being undertaken to reduce GHG emissions at a global scale and is the recommended pathway by most institutions for climate change adaptation planning since it takes a precautionary (risk-based) approach.

Table 6-6 Climate Conditions and Projections.

Climate Condition	Climate Variable	Trend	Historical Baseline (1981-2010)	Mid-Century (2050s) Climate Model Projections	End of Century (2080s) Climate Model Projections
Temperature	Mean Annual Air Temperature (°C)	Increase	7.4	9.4	12.3
	Mean Winter Air Temperature (°C)	Increase	-4.8	-2.6	0.6
	Mean Spring Air Temperature (°C)	Increase	6.1	7.8	10.4
	Mean Summer Air Temperature (°C)	Increase	19.3	21.3	24.3
	Mean Fall Air Temperature (°C)	Increase	9.1	11.0	13.7
	Max Annual Air Temperature (°C)	Increase	12.3	14.2	17.1
	Max Winter Air Temperature (°C)	Increase	-1.0	0.9	3.7
	Max Spring Air Temperature (°C)	Increase	11.3	13.2	15.7
	Max Summer Air Temperature (°C)	Increase	25.1	27.1	30.3
	Max Fall Air Temperature (°C)	Increase	13.7	15.7	18.5
	Min Annual Air Temperature (°C)	Increase	2.5	4.5	7.6
	Min Winter Air Temperature (°C)	Increase	-8.7	-6.1	-2.3
	Min Spring Air Temperature (°C)	Increase	0.8	2.6	5.2
	Min Summer Air Temperature (°C)	Increase	13.5	15.5	18.4
	Min Fall Air Temperature (°C)	Increase	4.4	6.3	9.0
Heat	Days Max Temperature > 35°C	Increase	0	2	14
	Days Max Temperature > 30°C	Increase	12	26	62
Drought	Total Annual Dry Days (#/year)	No Change	234	231	230
Freeze-Thaw	Days between -2°C and +2°C	Decrease	87	71	53
Precipitation	Annual Total Precipitation (mm)	Increase	852	926	951
	Winter Precipitation (mm/month)	Increase	61	71	76
	Spring Precipitation (mm/month)	Increase	68	78	84
	Summer Precipitation (mm/month)	No Change	77	78	75
	Fall Precipitation (mm/month)	Increase	77	82	82
Ice and Snow	Ice Storm Potential (# of days/year)	No Change	2.4	1.9	2
	Days with Freezing Conditions (#/year)	Decrease	147	96	71
	Days Min Temperature < -15°C	Decrease	19	8	4
Wind	Mean Annual Windspeed (km/hr)	No Change	16.2	15.8	10.8
	Wind Gusts Exceed 52km/hr (#days/year)	No Change	44.7	44.7	49.2
	Wind Gusts Exceed 63km/hr (#days/year)	No Change	12.3	12.3	13.5
Water Level	Lake Ontario Water Level - high scenario (90th percentile), m IGLD	Increase	74.77	75.55	76.02

Lightning	Probability of Lightning Strike (in time horizon)	Increase	0.3%	N/A	N/A

6.4.4 Potential Impacts to the Wastewater System

Wastewater systems are vulnerable to changes in climate conditions; based on understanding of the wastewater systems and changing climate parameters, **Table 6-7** describes potential impacts on wastewater infrastructure.

Table 6-7 Potential Climate change Impacts on Water and Wastewater Infrastructure.

Climate Condition	Climate Parameter	Potential Impact on Wastewater Infrastructure
Temperature	Annual mean temperature Monthly mean temperature	• With increasing mean temperatures comes the potential for more hot weather days, leading to impacts on water availability. • Extended spring and fall seasons leading to greater potential for higher flows (e.g., during the Spring freshet), potentially impacting plant operations (e.g., more by-passing events).
	Annual maximum temperature Monthly maximum temperature	• Increases in extreme high temperatures could also impact heating, ventilation, air conditioning systems (HVAC), which could affect staff working conditions and process equipment.
	Annual minimum temperatures Monthly minimum temperatures	• Potential for freeze thaw events to impact buried infrastructure, particularly out until mid-century as temperatures fluctuate between freezing and thawing more frequently.
Heat	Multi-day extreme heat	• Mechanical and maintenance issues associated with deterioration of equipment under extreme heat conditions. • Increased water demand potentially impacting plant operations.
Drought	Multiple days or extended periods of no precipitation	• Extended periods of dry weather could result in influent wastewater of higher strength (less dilution), potentially impacting plant operations. • Depending on the pipe material within the conveyance system, there is a possibility of increased hydrogen sulphide generation which could result in corrosion and/or odour issues.

Climate Condition	Climate Parameter	Potential Impact on Wastewater Infrastructure
Freeze-Thaw	Number of freeze-thaw events or cycles	• Freeze/Thaw cycles and frost penetration can impact buried conveyance and treatment infrastructure. • Pipe deflection resulting in an increase in I/I flows at the treatment facility. • Frost build-up within conveyance and treatment pipework can affect overall capacity. • Potential for impact to roads on the property.
Precipitation	Annual total precipitation Monthly total precipitation	• Flooding of infrastructure. • Increased inflow. • Higher probability of overflows or spills. • Potential for erosion impacts. • Additional energy expended on pumping. • Increased "wear and tear" on infrastructure due to higher flows and velocities. • More days with wet (rainfall) conditions, plus more intense rain events may reduce the number of days suitable for facility maintenance.
	Extreme rainfall events	• Flooding of infrastructure (exceedance of capacity). • Rainfall entering conveyance infrastructure through inflow and infiltration (I/I) and may overflow onto the street if the wastewater rises to ground level and the manhole is not sealed and bolted. • More frequent and/or more intense, or longer duration of individual wet-weather events could impact the treatment process. • Primary clarification performance may be reduced during wet-weather flow events, which could result in more days per year with increased organic mass loading to the secondary treatment process units.
Ice and Snow	Ice storms and days with freezing conditions	• Increased snow load on buildings and supporting infrastructure (i.e., power lines). • More water availability, but potentially when it is not helpful (e.g., extended or more extreme Spring freshet). • Potential for a disruption for operations/support staff ability to accessing the infrastructure for day-to-day operations, rehabilitation, and repairs. • Rain on snow events (flooding) has the potential to result in an increase in I/I flows. • Physical damage to infrastructure: buildings, communication systems, power lines, corporate fleets, etc. •

Climate Condition	Climate Parameter	Potential Impact on Wastewater Infrastructure
Ice and Snow	Ice storms and days with freezing conditions	• Accumulation of ice on infrastructure may result in power outages. • Hazardous driving conditions for operation, support, and maintenance staff.
Wind	High wind gusts	• Wind loading on assets and buildings. • An increase in high wind events could result in an increase in the occurrence of power outages. • May contribute to wave-run up, potential for; and erosion/impacts to exposed infrastructure.
Water Level	High water levels	• Flooding of property and infrastructure within shoreline vicinity; and • Increasingly variable (e.g., 90th percentile of historical average water levels, or higher highs) may cause backflow into shoreline infrastructure such as outfalls.
Lightning	Lightning strikes	• Loss of electricity and power. • Threat to communications infrastructure. • Damage to exposed infrastructure.

6.4.5 Impacts of the Project on Climate Change

Just as climate change poses potential threats to the project; project construction and operations can also impact climate change. Day to day operations and maintenance of a wastewater treatment facility can contribute to GHG emissions. During construction, the shipment of resources, materials, and labour release GHG emissions, how much is dependent on the distance those resources need to travel, and the technologies being used for transportation.

Alternative solutions and treatment process designs were developed to provide flexibility and redundancy for adapting to the potential climate change parameters and to limit the impacts of the project on climate change by implementing measures to reduce GHG emissions and energy use.

6.5 Environmental Conditions at the Clarkson WRRF

The existing environmental conditions at the Clarkson WRRF are described in detail in the Clarkson WRRF ESR (May 2023) and summarized here to provide background information that was used to support the evaluation of alternative solutions presented in Section 7.0.

6.5.1 Natural Environment

The Clarkson WRRF is located in the Carolinian or Deciduous Forest Zone (as referred to as the mixed wood plains), an area characterized by a relatively warmer climate that supports plant species typical of more southern areas. Overall, much of the Clarkson WRRF property and surrounding area have been previously disturbed, with few natural areas. The majority of the surrounding area is identified as industrial, and approximately 77% of the Clarkson WRRF is developed or disturbed land cover.

Within the WRRF site and surrounding area, no ANSIs, provincially rare vegetation communities, and provincially significant wetlands have been identified. In addition, no open watercourse features were identified within the Clarkson WRRF property. However, Lakeside Creek is located just south of the Clarkson WRRF, terminating at the south side of Lakeshore Road West and Lake Ontario is south of the property.

Figure 6-10 summarizes the major natural features on and surrounding the Clarkson WRRF. Ecological communities on the site include land categorized as CUM, meadow marshes (MAM), or deciduous swamp (SWD). Two (2) communities were identified as non-provincially significant wetland community types. These wetlands account for approximately 3% of the land cover within the plant and include Mineral Meadow Marsh (MAM2) and Green Ash Mineral Deciduous Swamp (SWD2-2). The preferred design concept for the Clarkson WRRF will encroach on the MAM2 located in the northwest area of the plant site. As mitigation, the community will be relocated and restored on site (i.e., southwest area of the site). The SWD2-2 is deciduous forest community in the northeast corner of the Clarkson WRRF property and has been identified as a candidate SWH for Bat Maternity Colonies. The preferred design concept for the Clarkson WRRF will avoid the area categorized as SWD2-2 and ensure there is adequate buffer between construction working area and SWD2-2.

Figure 6-10 Natural Heritage Features at the G.E. Booth WRRF.

6.5.2 Social and Cultural Environment

The Clarkson WRRF is located in an area designated as an Employment Area, with the property itself designated a Utility Public Work, as per the City of Mississauga Official Plan (2019). **Figure 6-11** provides an overview of the Clarkson WRRF surrounding land uses. As shown, the property immediately south of the Clarkson WRRF is a public park (Lakeside Park) and designated as Open Space/Greenlands. The remainder of the properties surrounding the Clarkson WRRF are primarily zoned as Industrial, with some Office and Retail uses. The nearest residential land use is approximately 700 metres north of the northern property limits, at the corner of Southdown Road and Orr Road.

Figure 6-11 Clarkson WRRF and Surrounding Land Uses.

As part of the Class EA for the Clarkson WRRF, a Stage 1 AA was completed to confirm archaeological potential within the Clarkson WRRF site. The results of the Stage 1 AA indicated that most of the site has been previously disturbed and did not retain archaeological potential. The exception was areas near the edges of the property. A Stage 2 AA was therefore undertaken in the areas identified with archaeological potential that would be impacted by expansion. No archaeological resources were identified through the Stage 2 AA, clearing the Clarkson WRRF expansion area for construction.

6.5.3 Physical Environment

Like the G.E. Booth WRRF, the Clarkson WRRF is located within the Peel Plains Physiographic Region (Chapman and Putnam, 1984). The Peel Plains is a level to undulating tract of clay with limited areas of sandy alluvium borders stream valleys. The site generally slopes towards Lake Ontario, with no large topographic relief.

Surficial geology mapping from the OGS indicates that the Clarkson WRRF is likely underlain by fine-grained (clay and/or silt) glacial till derived from glaciolacustrine deposits or shale. The area surrounding the Clarkson WRRF is also expected to consist of glacial till or coarse-textured glaciolacustrine deposits of sand and gravel. This area of Mississauga is underlain by relatively shallow bedrock of the Georgina Bay Formation, which consists of shale with limestone interbeds.

The well records indicate that the Clarkson area has soil overburden generally consisting of sand or clay, and shale bedrock at depths of approximately 3.5 to 5.0 metres below grade. This overburden's relatively low permeability will likely preclude the free flow of water, resulting in less risk of significant groundwater issues.

A Phase 1 Environmental Site Assessment (ESA) was completed as part of the Clarkson WRRF Class EA, which identified APEC on site. If construction is to occur in an APEC, further samples of soil and groundwater must be collected and analyzed to confirm if the APECs identified in the Phase I ESA are a concern, and to identify appropriate mitigation or disposal methods.

6.5.4 Summary

There are no significant environment features on site at the Clarkson WRRF that would interfere with construction on site. Further investigations will be undertaken during design to confirm mitigation measures and construction techniques. Further details on the design concept and mitigation measures are presented in the Clarkson WRRF ESR (May 2023).

7.0 Phase 2 – Alternative Solutions

A range of integrated alternative solutions were considered during Phase 2, balancing the needs and opportunities for both the G.E. Booth and Clarkson WRRFs in three (3) areas: wastewater treatment, outfall capacity, and biosolids management. Phase 2 addressed important technical questions that guided the development and assessment of alternative solutions. Because the Region's wastewater system is integrated, Phase 2 activities for both the Clarkson WRRF and G.E. Booth WRRF Class EAs were undertaken together.

Questions Addressed in Phase 2:

What is the overall concept for wastewater treatment in Peel?

Should there be an expansion at one or both existing Water Resource Recovery Facilities? If so, how large should the expansions be?

Is there enough outfall capacity or will additional capacity be required? If additional capacity is required, how and where should it be provided?

How much solids capacity is at the WRRFs and how should the end products (biosolids) be managed?

7.1 Phase 2 Evaluation Methodology

The following summarizes the steps taken throughout Phase 2 to identify and recommend an overall alternative solution for the G.E. Booth and Clarkson WRRFs.

Study Area Baseline Inventory **(Sections 5.0 and 6.0)**	The G.E. Booth and Clarkson WRRF sites and their surrounding lands were reviewed for natural, social, and cultural environment constraints, as well as servicing and technical considerations. Special attention was paid to sensitive features such as significant natural habitats, SAR, surrounding existing and planned land uses and users, and the potential for terrestrial and marine archaeological heritage features. Site conditions with respect to existing plant infrastructure, hydrogeology, geotechnical, and contamination were also reviewed.
Review Wastewater Treatment Concepts **(Section 7.2)**	The Region's 2020 Master Plan is the basis for establishing Peel's overall wastewater and water treatment management strategies. Through the Master Plan, a list of alternative treatment concepts to service Peel's growing population were established and assessed and preferred overall strategies were developed. As part of these Class EAs, the wastewater management concepts were reviewed and updated in light of the Study Opportunity Statement identified for these Class EAs.

Establish and Screen a Long List Alternative Wastewater, Biosolids and Outfall Capacity Strategies **(Section 7.3)**	A long list of alternative treatment strategies which included alternatives for wastewater treatment, biosolids management, and outfall capacity independently were established. These alternative strategies were evaluated against their ability to address the Study Opportunity Statement, as well as their overall feasibility for implementation including constructability, flexibility, and operational and technical considerations. The strategies were reviewed and evaluated to determine the most feasible and beneficial solutions to carry forward for the G.E. Booth and Clarkson WRRFs.
Develop Short List of Alternative Treatment Solutions **(Section 7.4)**	A short list of treatment alternatives was developed which encompassed different wastewater treatment, biosolids management, and outfall requirements for both plants together.
Evaluate Short List Alternative Solutions **(Section 7.5)**	The short list of alternative solutions was evaluated using a multi-criteria approach. The criteria covered potential impacts to the natural environment, socio-cultural environment, technical considerations, and economic considerations, and were developed in consultation with the public and stakeholders.
Select a Preferred Treatment Solution **(Section 7.6)**	Based on the results of the multi-criteria evaluation, an overall preferred Region treatment solution was selected, which included all treatment components for meeting future treatment needs at the G.E. Booth WRRF and Clarkson WRRF.

A review of the Phase 2 alternative solutions, evaluation process, and recommendations is provided in the following sections. Details on the alternatives and their evaluation are presented in **Volume 3, Appendix I**.

7.2 Review Wastewater Treatment Concepts

During Phase 1 and in the early stages of Phase 2 of the Class EA process, the following alternative wastewater treatment concepts were identified.

- Do Nothing
- Limit Community Growth
- Construct New WRRF or WRRFs
- Reduce Flows
- Upgrade / Expand the Wastewater Collection System
- Manage Wet Weather Flows through Real Time Control (RTC)
- Expand One or Both of the Existing WRRFs

These concepts build upon the work completed under the Region of Peel 2020 Water and Wastewater Master Plan and its recommendations; they were also reviewed based on adherence to the Study Opportunity Statement and overall implementation feasibility. The specific screening criteria applied to each concept were:

Phase 2: Screening (Must Have) Criteria
Can the solution meet 2041 treatment requirements?
Will the solution provide greater flexibility and reliability in wastewater treatment and biosolids management?
Can the solution be implemented without facing major constraints or time delays?

A concept was carried forward only if it passed all three (3) of the above criteria. Any alternative that failed one (1) or more screening criteria was screened out from further evaluation. A summary of the screening process, along with a description of each alternative wastewater treatment concept, is shown in **Table 7-1**.

Table 7-1 Wastewater Treatment Concepts

Wastewater Treatment Concept	Ability to Meet Screening Criteria	Screening Results
Do Nothing: Existing Programs and Infrastructure works continue as planned; no other infrastructure works.	Does not meet existing/future capacity needs to meet approved growth.	Will not meet 2041 treatment requirements. **Screened out ✘**
Limit Community Growth: Limit community growth as to not trigger the need for new infrastructure.	Does not comply with Regional Official Plan and Places to Grow growth targets.	Cannot be implemented under current Regional and Provincial Growth Policy requirements. **Screened out ✘**

Wastewater Treatment Concept	Ability to Meet Screening Criteria	Screening Results
Construct New WRRF or WRRFs: Construct one (1) or more new treatment facilities, presumably in Mississauga or Brampton, to treat additional flows.	Constructing a new WRRF (or facilities) is inconsistent with Peel's long-term vision and presents several challenges. A new treatment plant would require a new site, associated sewer and pumping station infrastructure to convey flows to the new site, and a new outfall to discharge treated effluent to a receiving body of water (e.g., Lake Ontario or one of Peel's Rivers or Creeks). Extensive planning and approvals would be necessary. The capital and operating costs associated with a new plant (or plants) would be very significant.	Faces major environmental, social, economic, and scheduling constraints. **Screened out ✘**
Reduce Flows: Reduce flows entering the wastewater collection system through: a) Reduce and control stormwater inflow and groundwater infiltration (I/I) into the sewers. b) Water efficiency program.	A review of the measured and projected reductions in flows from water conservation and I/I reduction programs have shown that they will not eliminate the need for the WRRF expansions. However, reducing flows to the wastewater collection system ultimately delay the timing for the future expansions and the required capacity of the future plants. Consequently, Water Efficiency and I/I Control Programs are part of the Region's Overall Wastewater Management Strategy.	Partial solution that supports the Class EA Objectives as identified in the Study Opportunity Statement. **Currently part of Peel's Overall Wastewater Treatment Strategy**
Upgrade / Expand the Wastewater Collection System: Upgrade/New sewers to meet capacity demands and diversion to optimize available capacities.	Through the Water and Wastewater Master Planning process, the Region developed an overall strategy for managing growth and meeting future needs. The Master Plan provides the framework and vision for the water and wastewater servicing needs for the lake-based service areas of the Region to 2041 and beyond. The recent Master Plan (2020) describes the planned wastewater upgrades and expansion projects necessary to meet future demands. These projects, including the East-to-West Diversion Trunk Sewer, are essential to meeting future wastewater treatment needs within Peel.	Partial solution that supports Class EA objectives as identified in the Study Opportunity Statement. **Currently part of Peel's Overall Wastewater Treatment Strategy**

Wastewater Treatment Concept	Ability to Meet Screening Criteria	Screening Results
Real Time Control (RTC): Manage excess peak flows within the wastewater collection system through the implementation of RTC.	The Region of Peel is undertaking a study to identify the feasibility of implementing RTC technology to manage incoming peak flows by optimizing the full wastewater collection system capacity. RTC involves control of flows and levels within the sewer system by automatically adjusting flow-regulating devices such as weirs and gates. By implementing RTC, gates and weirs can be adjusted to transfer flows between areas of the collection system, which would allow temporary storage and controlled release of large volumes of wastewater, effectively reducing peak flows to the plants. Average day flows to G.E. Booth WRRF and Clarkson WRRF would, however, remain the same. This alternative is carried forward for further assessment to identify potential implications of RTC on future capacity requirements at the G.E. Booth WRRF.	Partial solution that supports Class EA objectives as identified in the Study Opportunity Statement **Carried Forward for Further Assessment✓**
Expand One (1) or Both of the Existing Water Resource Recovery Facility: Expand either one (1) or both of the Region's lake-based plants – G.E. Booth and Clarkson WRRFs	Addresses existing and future capacity issues and provides flow flexibility	Addresses the Study Opportunity Statement and Focus of this Class EA **Carried Forward for Further Assessment✓**

Using the principles of environmental planning, alternatives included "Do Nothing" and "Limit Community Growth". These concepts were reviewed as baseline alternatives; however, neither would be able to meet the project objectives identified in the Study Opportunity Statement. Specifically, the "Do Nothing" concept would not solve the identified future capacity requirements, while "Limit Community Growth" would be inconsistent with Regional and Provincial Growth Policies. Constructing one (1) or more new facilities ("Construct New WRRF or WRRFs") was also reviewed but ultimately screened out. This concept is inconsistent with the Region's long-term vision as it does not take advantage of the investment made in the existing infrastructure across Peel over many years.

The concepts "Reduce Flows" and "Upgrade / Expand the Wastewater Collection System" were also reviewed. These concepts were identified to guide and manage the flows ultimately received at the treatment plants. A review of the measured and projected reductions in flows from water conservation and I/I reduction programs have shown that they will not eliminate the need for the WRRF expansions. They will, however, provide benefit to the ultimate solution and will continue to be part of the Region's overall wastewater management strategy.

RTC uses automation and control systems to optimize the performance of wastewater collection and treatment systems. Peak flows are stored in trunk sewers or tanks within the collection system and released back into the system after the wet weather event has occurred to help reduce overflows in the system and performance of wastewater treatment plants. Recognizing the benefits of RTC, the Region of Peel is undertaking a feasibility study to identify opportunities for use in the East-to-West Trunk sewer and other areas within its system. Based on the results of the study, Peel will integrate RTC as a component of their overall wastewater management strategy to support meeting peak flow capacity needs in the lake-based wastewater system.

The alternative concepts carried forward for further assessment as part of the G.E. Booth and Clarkson WRRFs Class EAs: **"Expand One or Both of the Existing WRRFs"** and **"Real Time Control"**.

7.3 Establish and Screen Long List of Alternatives

Due to the complexity of the overall treatment system, strategies were developed for wastewater treatment, biosolids management, and outfall capacity, respectively. Each set of strategies was developed independently and screened for adherence to the screening criteria listed above in Section 7.2. Those strategies that met the screening criteria were carried forward in development of the short list of alternative solutions.

The following sub-sections detail the alternative strategies identified for Wastewater Treatment (Section 7.3.1), Biosolids Management (Section 7.3.2), and Outfall Capacity (Section 7.3.3) as well as the recommended overall regional strategy.

7.3.1 Wastewater Treatment Strategies

Expanding one (1) or both of the existing WRRFs will have various implications for each facility. Currently, the rated average flow capacity of the G.E. Booth WRRF is 518 MLD and the Clarkson WRRF is 350 MLD. Three (3) alternatives were considered to either maintain or increase these capacities to meet wastewater treatment needs to the year 2041, with a vision for meeting longer term needs. These alternatives align with those in the 2020 Master Plan and assume that any expansions will be within the existing site boundaries. They include the following:

- W.1 Expand the G.E. Booth WRRF only.
- W.2 Expand the Clarkson WRRF only.
- W.3 Expand both WRRFs.

Table 7-2 presents a summary of the screening of the long list of wastewater treatment strategies. The recommended strategies to carry forward for additional evaluation were **W.2 Expand the Clarkson WRRF** and **W.3 Expand both the G.E. Booth WRRF and the Clarkson WRRF**.

Table 7-2 Long List of Wastewater Treatment Alternative Strategies.

ID	Alternative Strategy	Description	Relevant Screening Criteria	Comments
W.1	Expand G.E. Booth WRRF Only	Treat all future flows at the G.E. Booth WRRF. Maintain the Clarkson WRRF at its current rated capacity of 350 MLD.	Does not take advantage of the surplus capacity at the Clarkson WRRF or the approved East-to-West Diversion Trunk Sewer. Does not provide operational flexibility. Site capacity constraints limit the ability to implement this solution.	Does not provide greater flexibility or reliability for wastewater treatment, faces major environmental, social, economic and scheduling constraints. **Screened out ✗**
W.2	Expand Clarkson WRRF Only	Treat all future flows at the Clarkson WRRF. Maintain the G.E. WRRF at its current rated capacity of 518 MLD.	Takes advantage of the surplus capacity at the Clarkson WRRF and the approved East-to-West Diversion Trunk Sewer Provides some operational flexibility. Does not take advantage of the remaining site capacity at the G.E. Booth WRRF.	Has the potential to address the project objectives and basic feasibility criteria. **Carried Forward ✓**
W.3	Expand Both Facilities	Expand both plants beyond their current approved rated capacity to meet future treatment needs.	Balances capacity of both plants, provides operational flexibility and allows for incremental expansion of plants.	Has the potential to address the project objectives and basic feasibility criteria. **Carried Forward ✓**

7.3.2 Biosolids Management Strategies

7.3.2.1 Overview Strategies

The existing biosolids management approach, currently implemented by the Region of Peel, is based on processing the sludge produced through the wastewater treatment processes of both plants at the G.E. Booth facility. This involves trucking digested sludge from the Clarkson WRRF to the G.E. Booth WRRF (approximately three (3) trucks per day, with trucks capacity of 40 m^3.) The sludge produced from the G.E. Booth WRRF along with the sludge produced from the Clarkson WRRF is ultimately processed through incinerators at G.E. Booth WRRF. The incinerator ash is stored in on-site ash lagoons with ash ultimately disposed of at landfill.

There are two (2) overall strategies that were considered for biosolids management:

- B.1 Continue with the status quo of trucking sludge from Clarkson WRRF to the G.E. Booth WRRF for incineration.
- B.2 Independently treat sludge and manage biosolids at each WRRF.

7.3.2.2 Biosolids Market Assessment

To support the screening process and alternatives assessments, a biosolids product market analysis was prepared and included in **Volume 3, Appendix L**. The report summarized the regulatory framework for the management of biosolids in Ontario, defined the different biosolids treatment processes, the products they produce and their characteristics, identified the availability of target markets, and provided an overview of estimated demand and market potential.

The biosolids market end use analysis indicated that the greatest target market availability is found in agricultural cropland. It is anticipated that this market represents a biosolid demand higher than the biosolids quantity currently produced at Clarkson and G.E. Booth WRRFs combined. Conversations with third-party operators and vendors indicate that the biosolids market in Southern Ontario would be able to absorb some, if not all, biosolids produced at the two (2) WRRFs.

Beneficial reuse options for incinerator ash are also available. Municipal wastewater sludge incinerator ash has been used in the production of concrete, asphalt, bricks, light weight blocks and tile.

Landfilling options, while available, are considered only as a contingency measure by the Region of Peel, if other beneficial use options become unavailable during emergency situations.

7.3.2.3 Screening of Biosolids Management Strategies

Table 7-3 provides a review of these strategies based on the screening criteria in Section 7.2. Strategy B.1 is to continue with the status quo. As solids loading increases, truck traffic from Clarkson WRRF to G.E. Booth WRRF will increase. In addition, additional incinerator capacity will be required at the G.E. Booth WRRF to meet solids treatment needs in the Region until 2041. The major challenge with continuing with the existing management strategy is that it relies on one (1) process (incineration) for management at both WRRFs sludge, increasing risks to the Region. The strategy therefore does not meet the screening criteria of providing greater flexibility and reliability in biosolids management. Other challenges with the strategy are that it increases truck traffic to G.E. Booth WRRF, which is inconsistent with the Region's objective of community acceptability, and it is not compatible with Regional Energy Management and GHG reduction goals.

Strategy B.2 allows for the implementation of different alternative sludge treatment methods at both the G.E. Booth WRRF and the Clarkson WRRF. Treatment methods may include digestion, dewatering, thermal-drying, alkaline stabilization, or composting, while end use options for biosolids include beneficial land application such as farming, parks or golf courses, landfill, or ash reuse options, as identified in the biosolids product market assessment. As determined through the Biosolids Product

Market assessment, there are third-party management firms and adequate markets to support the implementation of this strategy.

Strategy B.2 was identified as the preferred biosolids management strategy to be carried forward in developing alternative solutions due to its ability to meet all project objectives and all three (3) screening criteria. The benefits of this strategy are that it:

- Provides additional incineration capacity to manage G.E. Booth WRRF biosolids in the future;
- Allows the Region of Peel to diversify their biosolids management program in the future;
- Maximizes existing infrastructure investments (i.e., incinerators); and,
- Allows Peel to stop trucking of digested and dewatered sludge from the Clarkson WRRF to the G.E. Booth WRRF for incineration in the long-term.

Strategy B.2 therefore has been used as the basis for formulating the Phase 2 alternative solutions, with the more detailed identification and evaluation of alternative methods of treating solids and utilizing biosolids at the Clarkson WRRF and the G.E. Booth WRRF being completed in Phase 3 of the Class EA.

Table 7-3 Biosolids Management Long List of Alternative Strategies

ID	Alternative Strategy	Description	Relevant Screening Criteria	Comments
B.1	Status Quo	Continue to incinerate all existing and future sludge at the G.E. Booth WRRF.	Does not provide greater flexibility in the treatment and end use options for biosolids management. Relying on incineration alone for sludge management, means minimum sludge management resilience and increased risk to Peel. Limits beneficial use options.	Does not address the project objectives in terms of providing greater flexibility and reliability in biosolids management. **Screened out** ✗
B.2	Independent sludge treatment and management of biosolids at each WRRF.	Each plant treats and manages their respective sludge, independently. Allows Peel to phase out the trucking of dewatered sludge from the Clarkson WRRF to the G.E. Booth WRRF for incineration on a regular basis. Continued use of incineration at the G.E. Booth WRRF and explore options for managing future biosolids in excess of incinerator capacity.	Provides opportunity for greater flexibility in the treatment and end use options for biosolids management. Allows the Region to explore different treatment options at each WRRF and different end use options for the biosolids (e.g., beneficial land application such as farming, parks or golf courses, landfill or ash reuse options).	Addresses all project objectives. **Carried Forward** ✓

7.3.3 Outfall Capacity and Peak Wet Weather Flow Management

The final effluent from the G.E. Booth WRRF is discharged to Lake Ontario through a 3.65-metre diameter and 1,400-m-long outfall with discharge port diffusers in the last 200-metre section. The outfall has a peak approved capacity of 1,523 MLD (17,627 L/s) per the ECA. Hydraulic analysis indicates that the outfall is at its capacity limits, and to avoid the risk of overall plant flooding, the G.E. Booth WRRF is operated to allow a maximum of 100 mm of flooding downstream of the secondary clarifier weir. Flooding of the weir at the G.E. Booth WRRF has occurred occasionally during high wet-weather flow events. In addition to the need to address existing outfall capacity challenges, the G.E. Booth WRRF outfall will be unable to meet future treatment requirements of an expanded plant.

The Clarkson WRRF existing outfall is 3 m in diameter and 2,200-m in length with eighteen 500 mm diameter dispersion shafts that have 450 mm diameter diffuser nozzles. The outfall has a rated capacity of 1,400 MLD; however, the hydraulic capacity analysis indicates that it has a capacity of approximately 1,600 MLD. The Region plans to removal of accumulated sediment in the outfall and replace the existing outfall nozzles with duckbill diffusers to further optimize outfall performance. As such, no additional outfall capacity is required at the Clarkson WRRF to meet future treatment requirements of an expanded plant.

The long list of alternatives for providing this additional outfall capacity at the G.E. Booth WRRF are listed below and illustrated schematically on **Figure 7-1**:

- O.1 Status Quo (allow in-plant surcharging)
- O.2 Construct a pumping station to increase flow through the outfall pipe
- O.3 Construct a new, larger outfall into Lake Ontario
- O.4 Upgrade the existing outfall by opening more or revising the diffuser ports
- O.5 Divert peak flows in the system prior to being conveyed to the G.E. Booth WRRF to take advantage of potential surplus outfall capacity at the Clarkson WRRF.

Error! Reference source not found. provides a review of these strategies based on the screening criteria in Section 7.2.

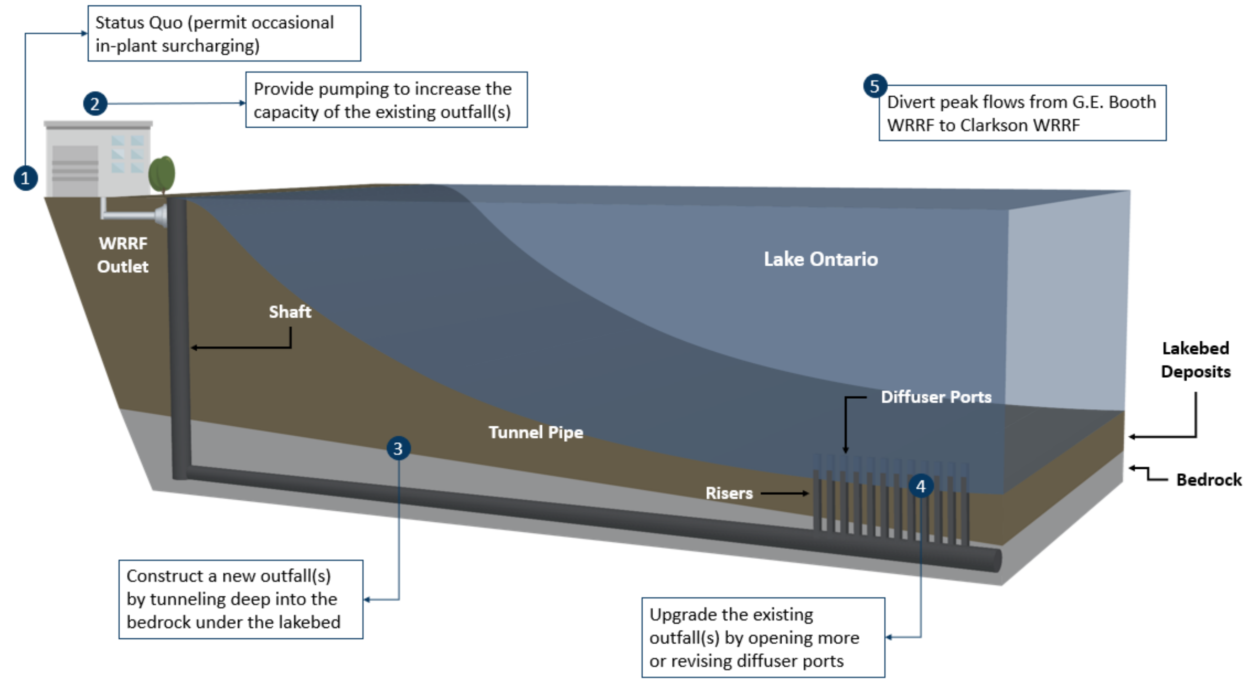


Figure 7-1 Potential Options to Increase Outfall Capacity at the G.E. Booth WRRF.

Table 7-4 Outfall/ Peak Flow Management Options for G.E. Booth WRRF.

ID	Alternative Strategy	Description	Relevant Screening Criteria	Comments
O.1	Status Quo	No change to existing outfall at G.E. Booth WRRF	The current outfall as it is configured, has current capacity challenges, and will not meet future treatment needs.	Does not address the project objectives in terms meeting future treatment needs and providing reliable of treatment. **Screened out ✗**
O.2	Construct a pumping station to increase flow through the outfall.	A new pumping station could be constructed at the G.E. Booth WRRF to allow the outfall to be restored to its ECA rated capacity of 1523 MLD. It would be operated during high peak flow events to reduce the risk of the flooding over the secondary clarifier weirs.	This alternative has the ability to provide additional outfall capacity provided for existing flows only.	Has the ability to meet the project objectives if the rated capacity of the G.E. Booth WRRF is not increased. **Carried Forward for W.2 – Expand Clarkson WRRF only✓**
O.3	Construct a new, larger outfall into Lake Ontario.	This alternative involves constructing a new larger diameter outfall and diffuser deeper into Lake Ontario, via tunnelling in the bedrock under the lakebed.	This would allow Peel to adequately increase outfall capacity in the long-term, while continuing to meet MECP water quality requirements aimed at protecting human health and the environment.	Addresses all project objectives. **Carried Forward ✓**
O.4	Upgrade the existing outfall.	Provide more capacity by opening more or revising the diffuser ports.	Existing outfall does not have any spare diffusers and diffusers are already the maximum size.	Does not meet project objectives as it cannot be implemented. **Screened out ✗**

ID	Alternative Strategy	Description	Relevant Screening Criteria	Comments
O.5	Divert peak flows from G.E. Booth WRRF to the Clarkson WRRF.	Construct an effluent pumping station at the G.E. Booth WRRF to increase flow through the existing outfall pipe to restore its rated peak flow capacity and divert excess peak flows to the Clarkson WRRF to take advantage of surplus outfall capacity at the Clarkson WRRF. Peak flows can be diverted through the East-to-West Diversion, with RTC in the system supporting the management of peak flows.	By utilizing existing peak flow capacity at Clarkson WRRF, a new outfall at G.E. Booth WRRF would not be required.	Has the ability to meet the project objectives provided surplus capacity is available in the Clarkson WRRF Outfall. **Carried Forward ✓**

Based on the outcome of the screening, the feasible outfall/peak flow management strategies for G.E. Booth WRRF are:

- O.2 Construct a new effluent pumping station to restore the existing outfall to its rated flow capacity;
- O.3 Construct a new, larger outfall into Lake Ontario; and
- O.5 Divert peak flows to the Clarkson WRRF via an effluent pumping station at the G.E. Booth WRRF and supported by RTC in the system.

7.4 Alternative Solutions

Based on the screening of the wastewater, biosolids, and outfall/peak flow management strategies presented above, alternative solutions to meet future treatment requirements within the Region of Peel were developed on a Region-basis for both WRRFs together. For each alternative solution, diversion requirements through the East-to-West Diversion Trunk Sewer (in consideration of the available flow diversion capabilities), and schedules for expansion were established. In addition, capacity analyses were undertaken to identify liquid and solid unit process needs for each alternative. In developing the solids treatment needs, the diversion requirements and associated different solids contents of the wastewater between the East and West catchment areas were accounted for. Expansion concepts for each WRRF were then developed, which illustrate the general areas on each WRRF site where expansion facilities would be located.

The expansion concepts in Phase 2 were developed at a high-level, considering the following assumptions:

- Wastewater (liquid) treatment unit processes at each plant will be expanded using similar treatment processes as currently used at the plants;

- Solids treatment and biosolids management:
    - Significant investment has been made in the incinerators at the G.E. Booth WRRF. Consequently, incineration will continue at the G.E. Booth WRRF until they reach the end of their remaining useful life (i.e., likely another 20 years);
    - Additional treatment capacity will be provided at the G.E. Booth WRRF in excess of the existing incineration capacity; and,
    - Capacity will be provided at the Clarkson WRRF to treat solids generated at the plant. For Phase 2 comparison purposes, digestion expansion was assumed, with beneficial land application of the biosolids product.

These assumptions were applied to allow a similar basis of comparison of alternative solutions. Assessments of alternative technologies and design concepts for G.E. Booth WRRF have been evaluated in Phase 3 of the Class EA and are presented in Section 8.0.

The following long-term alternative solutions were developed and assessed:

Alternative Solution 1: Maintain G.E. Booth WRRF at 518 MLD, Expand Clarkson WRRF to 500 MLD, Treat Biosolids at Each Site, New Effluent Pumping Station at the G.E. Booth WRRF.

Alternative Solution 2: Expand G.E. Booth WRRF to 550 MLD, Expand Clarkson WRRF to 450 MLD, Treat Biosolids at Each Site and either:

a. New Outfall at G.E. Booth WRRF or
b. Peak Flow Diversion to the Clarkson WRRF (new Effluent Pumping Station at G.E. Booth WRRF and RTC in collection system).

Alternative Solution 3: Expand G.E. Booth WRRF to 550 MLD, Expand Clarkson WRRF to 500 MLD, Treat Biosolids at Each Site, New Outfall at G.E. Booth WRRF

Alternative Solution 4: Expand G.E. Booth WRRF to 600 MLD, Expand Clarkson WRRF to 400 MLD, Treat Biosolids at Each Site and either:

a. New Outfall at G.E. Booth WRRF or
b. Peak Flow Diversion to the Clarkson WRRF (new Effluent Pumping Station at G.E. Booth WRRF and RTC in collection system).

Alternative Solution 5: Expand G.E. Booth WRRF to 600 MLD, Expand Clarkson WRRF to 500 MLD, Treat Biosolids at Each Site, New Outfall at G.E. Booth WRRF.

Figure 7-2 to **Figure 7-8** present illustrate key components of each of the above alternatives, as well as the site expansion concepts for each site.

Alternative Solution 1

Region of Peel working with you

Maintain G.E. Booth WRRF at 518 MLD, Expand Clarkson WRRF to 500 MLD, Treat Biosolids at Each Site, and Effluent Pumping Station

Clarkson WRRF

Wastewater

- Expand from 350 MLD to 500 MLD

Biosolids

- Provide treatment of biosolids
- Beneficial land use of biosolids products

Outfall / Peak Flow Management

- No change

Expansion Scheduling: Upgrade by 2029

G.E. Booth WRRF

Wastewater

- Maintain existing approved capacity of 518 MLD

Biosolids

- Maintain existing incinerators; manage sludge in excess of the incinerator capacity

Outfall / Peak Flow Management

- Effluent Pumping Station of 1500 MLD peak flow capacity

Expansion Scheduling: Upgrade by 2041

East-to-West Diversion Requirements

Divert 80 MLD (ADF) in 2026
Divert 120 MLD (ADF) by 2031

Figure 7-2 Alternative Solution 1

Alternative Solution 2A

Region of Peel working with you

Expand G.E. Booth WRRF to 550 MLD, Expand Clarkson WRRF to 450 MLD, Treat Biosolids at Each Site and New Outfall

Clarkson WRRF

Wastewater

- Expand from 350 MLD to 450 MLD

Biosolids

- Provide treatment of biosolids
- Beneficial land use of biosolids products

Outfall / Peak Flow Management

- No change

Expansion Scheduling: Upgrade by 2029

G.E. Booth WRRF

Wastewater

- Expand from 518 MLD to 550 MLD

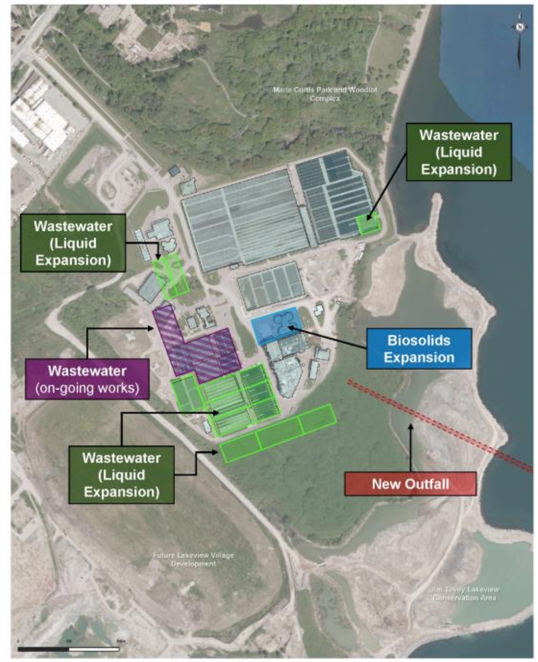
Biosolids

- Maintain existing incinerators; manage sludge in excess of the incinerator capacity

Outfall / Peak Flow Management

- New outfall

Expansion Scheduling: Upgrade by 2036



East-to-West Diversion Requirements

Divert 80 MLD (ADF) in 2026

Divert 120 MLD (ADF) by 2031

Figure 7-3 Alternative Solution 2A

Alternative Solution 2B

Region of Peel working with you

Expand G.E. Booth WRRF to 550 MLD, Expand Clarkson WRRF to 450 MLD, Treat Biosolids at Each Site and New Effluent Pumping Station with RTC

Clarkson WRRF

Wastewater

- Expand from 350 MLD to 450 MLD

Biosolids

- Provide treatment of biosolids
- Beneficial land use of biosolids products

Outfall / Peak Flow Management

- No change

Expansion Scheduling: Upgrade by 2029

G.E. Booth WRRF

Wastewater

- Expand from 518 MLD to 550 MLD

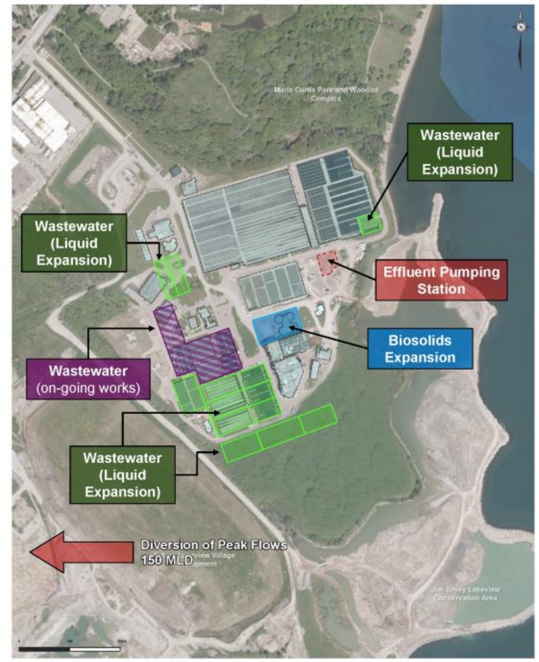
Biosolids

- Maintain existing incinerators; manage sludge in excess of the incinerator capacity

Outfall / Peak Flow Management

- Construct effluent pump station and divert 150 MLD peak flows, with real time control (RTC)

Expansion Scheduling: Upgrade by 2036



East-to-West Diversion Requirements

Divert 80 MLD (ADF) in 2026
Divert 120 MLD (ADF) by 2031

Figure 7-4 Alternative Solution 2B

Alternative Solution 3

Region of Peel
working with you

Expand G.E. Booth WRRF to 550 MLD, Expand Clarkson WRRF to 500 MLD, Treat Biosolids at Each Site and New Outfall at G.E. Booth WRRF

Clarkson WRRF

Wastewater

- Expand from 350 MLD to 500 MLD

Biosolids

- Provide treatment of biosolids
- Beneficial land use of biosolids products

Outfall / Peak Flow Management

- No change

Expansion Scheduling: Upgrade by 2029

G.E. Booth WRRF

Wastewater

- Expand from 518 MLD to 550 MLD

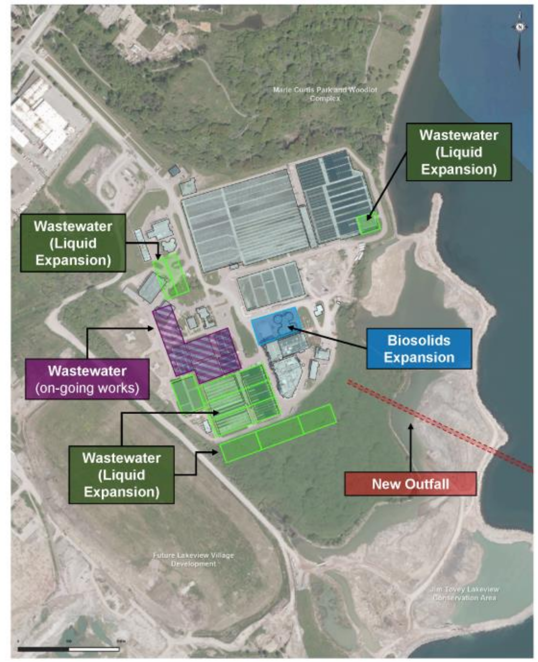
Biosolids

- Maintain existing incinerators; manage sludge in excess of the incinerator capacity

Outfall / Peak Flow Management

- New outfall

Expansion Scheduling: Upgrade by 2041



East-to-West Diversion Requirements

Divert 80 MLD (ADF) in 2026
Divert 150 MLD (ADF) by 2031

Figure 7-5 Alternative Solution 3

Alternative Solution 4A

Region of Peel working with you

Expand G.E. Booth WRRF to 600 MLD, Expand Clarkson WRRF to 400 MLD, Treat Biosolids at Each Site and New Outfall at G.E. Booth WRRF

Clarkson WRRF

Wastewater

- Expand from 350 MLD to 400 MLD

Biosolids

- Provide treatment of biosolids
- Beneficial land use of biosolids products

Outfall / Peak Flow Management

- No change

Expansion Scheduling: Upgrade by 2029

G.E. Booth WRRF

Wastewater

- Expand from 518 MLD to 600 MLD

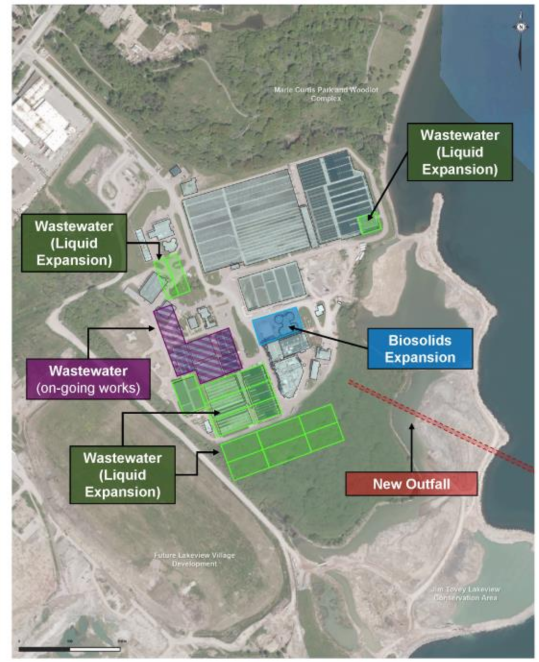
Biosolids

- Maintain existing incinerators; manage sludge in excess of the incinerator capacity

Outfall / Peak Flow Management

- New outfall

Expansion Scheduling: Upgrade by 2031



East-to-West Diversion Requirements

Divert 70 MLD (ADF) in 2026

Figure 7-6 Alternative Solution 4A

Alternative Solution 4B

Region of Peel
working with you

Expand G.E. Booth WRRF to 600 MLD, Expand Clarkson WRRF to 400 MLD, Treat Biosolids at Each Site and New Effluent Pumping Station with RTC

Clarkson WRRF

Wastewater

- Expand from 350 MLD to 400 MLD

Biosolids

- Provide treatment of biosolids
- Beneficial land use of biosolids products

Outfall / Peak Flow Management

- No change

Expansion Scheduling: Upgrade by 2029

G.E. Booth WRRF

Wastewater

- Expand from 518 MLD to 600 MLD

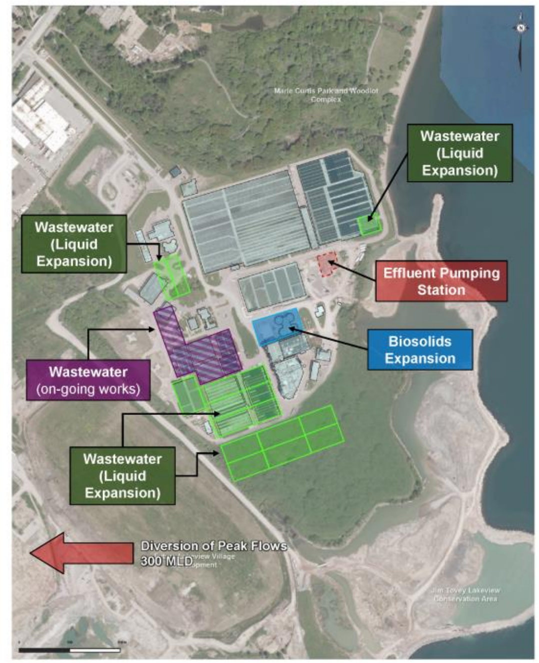
Biosolids

- Maintain existing incinerators; manage sludge in excess of the incinerator capacity

Outfall / Peak Flow Management

- Construct effluent pump station and divert 150 MLD peak flows, with real time control (RTC)

Expansion Scheduling: Upgrade by 2041



East-to-West Diversion Requirements

Divert 80 MLD (ADF) in 2026
Divert 120 MLD (ADF) by 2031

Figure 7-7 Alternative Solution 4B

Alternative Solution 5

Region of Peel
working with you

Expand G.E. Booth WRRF to 600 MLD, Expand Clarkson WRRF to 500 MLD, Treat Biosolids at Each Site and New Outfall at G.E. Booth WRRF

Clarkson WRRF

Wastewater

- Expand from 350 MLD to 500 MLD

Biosolids

- Provide treatment of biosolids
- Beneficial land use of biosolids products

Outfall / Peak Flow Management

- No change

Expansion Scheduling: Upgrade by 2029

G.E. Booth WRRF

Wastewater

- Expand from 518 MLD to 600 MLD

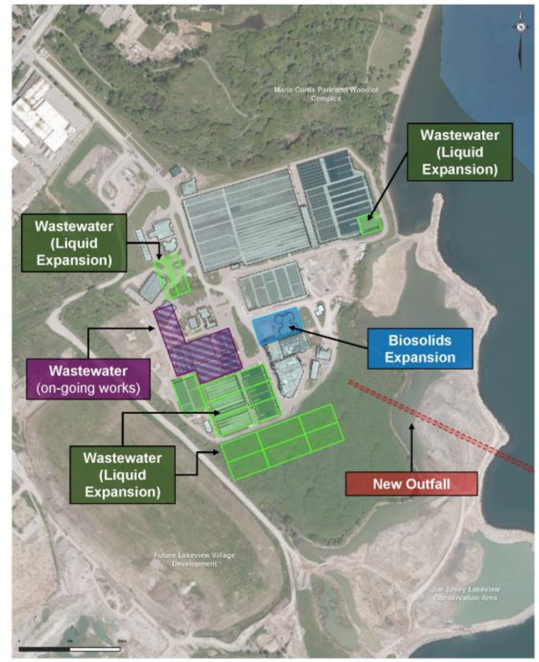
Biosolids

- Maintain existing incinerators; manage sludge in excess of the incinerator capacity

Outfall / Peak Flow Management

- New outfall

Expansion Scheduling: Upgrade by 2041



East-to-West Diversion Requirements

Divert 80 MLD (ADF) in 2026
Divert 140 MLD (ADF) by 2031

Figure 7-8 Alternative Solution 5

7.5 Evaluation of Alternative Solutions

7.5.1 Evaluation Methodology

7.5.1.1 Evaluation Criteria

Each alternative solution was evaluated against four (4) key categories; natural environment impacts, social/cultural impacts, technical feasibility, and economic considerations associated with each alternative. The criteria were developed to reflect the goals of the Region of Peel and the objectives of the Problem and Opportunity Statement. Each category is comprised of specific sub-criteria that reflect all components of the environment as defined in Ontario's EA Act. **Figure 7-9** below shows an overview of the criteria and sub-criteria for each category. **Volume 3, Appendix I1** provides additional details and brief descriptions for each criteria used.

Figure 7-9 Evaluation Criteria

7.5.1.2 Measuring Impacts and Scoring Alternatives

To clearly differentiate the potential positive and negatives associated with each option, a rating scale of one (1) to ten (10) was developed. The rating scale is defined in **Table 7-5** below.

Table 7-5 Impact Score

Impact Description	Numeric
Positive to Very Minimal Impact	9-10
Minimal Impact	7-8
Moderate Impact	5-6
Moderate to Severe Impact	3-4
Severe Impact	1-2

The impacts for each criterion were described and rated using the above scale by a team of engineers, scientists, planners, and Region staff based on the conceptual design assumptions, technical evaluations, and environmental inventories completed as part of the Phase 2 evaluation, as presented in Section 5.0 and Section 6.0 of this ESR. In assigning impact ratings, net effects (effects after mitigation) were considered.

Impact ratings were summed for each criteria category and normalized, such that each category (i.e., natural, social/cultural, technical, and economic) are weighted equally at 25% each. The alternative with the highest summed score out of 100% has the least net effects and is recommended as the preferred solution.

7.5.2 Evaluation Results

A summary of the evaluation results is provided in the following sub-sections, while the complete evaluation matrix is provided in **Volume 3, Appendix I2.**

7.5.2.1 Natural Environment

Criteria were developed to reflect potential impacts on all components of the natural environment - land, air, water, plants, and animals. The criteria include potential impacts of alternative solutions on terrestrial and aquatic habitats/systems, surface and ground water quality, and air quality (including the potential impacts of the solutions on climate change). A summary of the differential natural environment impacts is provided below.

- ✓ Alternatives with the largest capacity expansions at the G.E. Booth WRRF have greater potential to impact the terrestrial and aquatic habitats and species, and more substantial mitigation measures will be required to reduce risks to these features. Although there are natural areas on the Clarkson WRRF and G.E. Booth WRRF properties, as well as surrounding areas, these natural areas are more prevalent on and surrounding the G.E. Booth WRRF site, given the proximity to Applewood and Serson Creeks, and the newly constructed natural areas of the JTLCA.
- ✓ Alternatives with no new outfall at the G.E. Booth WRRF may have more potential to impact aquatic systems, because the existing outfall extends only about 1.4 km offshore, and as flows

through the outfall increase, the size and area of the effluent plume will increase. The plume may impinge on the nearshore, impacting water quality and associated aquatic habitats.

- ✓ All alternatives will include energy recovery and reuse technologies to help reduce GHG emissions. Reducing reliance on incineration benefits all alternatives in terms of reducing energy and GHG emissions. However, alternatives with pumping will have less opportunity for energy recover/reuse given their need for large standby power equipment.

From an overall natural environment perspective, Alternative Solution 2B (Expand G.E. Booth WRRF to 550 MLD, Expand Clarkson WRRF to 450 MLD, Treat Biosolids at Each Site and New Outfall at G.E. Booth WRRF), and Alternative 3 (Expand G.E. Booth WRRF to 550 MLD, Expand Clarkson WRRF to 500 MLD, Treat Biosolids at Each Site and New Outfall at G.E. Booth WRRF), are ranked highest.

7.5.2.2 Social and Cultural Environment

Social environmental criteria reflect the potential impacts to surrounding land and lake users that may occur because of the operation of the expanded WRRF such as odour, noise/vibrations, visual aesthetics, recreation use and truck traffic impacts, as well as impacts that may occur during construction. The impacts on archaeological and cultural heritage resources were also considered under this category. A summary of the differential social and cultural environment impacts is provided below.

- ✓ Alternatives with the largest capacity expansions at the G.E. Booth WRRF have more potential for odour, visual aesthetic, and truck traffic concerns during operation, and extensive mitigation measures will be required to reduce risks. Nuisance impacts associated with construction will also increase the larger the expansion at the G.E. Booth WRRF. This is due to the existing and planned residential communities, including the adjacent planned Lakeview Community Development, adjacent to the G.E. Booth WRRF. The Clarkson WRRF is located in a more industrial area.
- ✓ Alternatives with no new outfall at the G.E. Booth WRRF may have some challenges at meeting Lake Ontario PWQOs in the nearshore and not interfering with water treatment plant (WTP) IPZs as flows increase. Recreational uses and users may also be affected as a result.
- ✓ No alternatives are expected to impact archaeological and cultural heritage resources.

From a social/cultural environment perspective, Alternative Solution 1 (Maintain the G.E. Booth WRRF at 518 MLD, Expand Clarkson WRRF to 500 MLD, Treat Biosolids at Each Site a new effluent pumping station G.E. Booth WRRF), is ranked highest. However, it does not solve the challenges with the existing outfall meeting PWQO in the future.

7.5.2.3 Technical Environment

Technical considerations include factors relating to the operation of the wastewater collection and treatment system, such as treatment effectiveness, flexibility at meeting long-term needs, ease of operation, ability to provide treatment redundancy, energy efficiency potential, and climate change adaptivity. Technical considerations also include factors related to the ease by which construction of facilities can be implemented, including compatibility with existing systems, on-site geotechnical, hydrogeological and soil conditions and permit and approval requirements. A summary of the differential technical impacts is provided below.

- ✓ The alternatives with a new outfall are the most effective at meeting the stated project objectives. There is a risk of the existing outfall not meeting nearshore water quality objectives as flows to the G.E. Booth WRRF increase. In addition, alternatives with no new outfall may not be as adaptable to climate change impacts as lake levels rise.
- ✓ Alternative Solution 1, Maintaining the G.E. Booth WRRF at its rated capacity of 518 MLD will reduce Peel's future treatment options thereby limiting flexibility and increasing risks. Likewise, alternatives with lower plant capacity expansions at the Clarkson WRRF do not take full advantage of the East-to-West flow diversion strategy and may also limit long-term flexibility (beyond 2041).
- ✓ Alternatives with peak flow diversion may present more risks in meeting future needs.
- ✓ All alternatives will allow for opportunities to further promote energy use and recovery. In particular, opportunities exist to increase energy recovery associated with biosolids generation and treatment at Clarkson WRRF. However, alternatives with pumping will be somewhat less energy efficient.

From an overall technical perspective, Alternative 3 (Expand G.E. Booth WRRF to 550 MLD, Expand Clarkson WRRF to 500 MLD, Treat Biosolids at Each Site and New Outfall at G.E. Booth WRRF), is ranked highest, closely followed by. Alternative Solution 2B (Expand G.E. Booth WRRF to 550 MLD, Expand Clarkson WRRF to 450 MLD, Treat Biosolids at Each Site and New Outfall at G.E. Booth WRRF).

7.5.2.4 Economic Considerations

Three (3) criteria were considered in determining the cost implications of each alternative, including:

- Phase 2 Class EA level capital cost estimates;
- Relative comparison of operation and maintenance costs; and
- Potential implications on Peel's cash flow forecasts.

The capital cost estimates for each alternative are presented in **Table 7-6**. The costs estimates were based on experience on other similar sized projects and assumptions with respect to the technologies to be implemented. These estimates are considered Phase 2 Class EA level cost estimates only and were developed as a basis to compare alternatives and identify potentially significant cost differences. As indicated in **Table 7-6**, all alternatives involve a significant capital investment, ranging from $850 to $1200 M. Alternatives without a new outfall are at the lower end of the range, while those with a new outfall are at the higher end of the range.

Table 7-6 Phase 2 Class EA Level Capital Cost Estimates of Alternative Solutions

Alternative	Liquid Treatment [A]	Odour Control	Solids Treatment [B]	Pumping Station	Outfall	Total
1	$ 535 M	$ 25 M	$ 253 M	$ 50 M	N/A	$ 863 M
2A	$ 540 M	$ 40 M	$ 228 M	N/A	$ 200 M	$ 1,008 M
2B	$ 540 M	$ 40 M	$ 228 M	$ 50 M	N/A	$ 858 M
3	$ 630 M	$ 40 M	$ 253 M	N/A	$ 200 M	$ 1,123 M
4A	$ 520 M	$ 50 M	$ 205 M	N/A	$ 200 M	$ 975 M
4B	$ 520 M	$ 50 M	$ 228 M	$ 50 M	N/A	$ 848 M
5	$ 700 M	$ 50 M	$ 253 M	N/A	$ 200 M	$ 1,203 M

[A] For liquids treatment, conventional treatment assumed with unit cost of $1750 per m^3/d.
[B] For solids treatment at the G.E. Booth WRRF, THP + Digestion was used as the basis for estimate. For solids treatment at the Clarkson WRRF, digestion expansion was used as the basis for estimate.

Operation and maintenance (O&M) costs were not estimated in an absolute manner in Phase 2. Rather, relative estimates were made based on the wastewater, biosolids, effluent pumping station and outfall requirements for each of the alternatives. Based on the review, all alternatives will have relatively comparable O&M costs, with alternatives using effluent pumping being on the slightly higher end of the scale.

The timing of expansion requirements in terms of estimated construction schedule was determined considering capacity needs and diversion requirements to understand the implications on Peel's cash flows for budgeting purposes. **Table 7-7** presents a summary of the timing of expansions.

Table 7-7 Estimated Timing of Construction Expansion Requirements to 2041

Alternative	G.E. Booth WRRF Capacity Expansion	Clarkson WRRF Capacity Expansion	G.E. Booth WRRF Effluent Pumping Station	G.E. Booth WRRF New Outfall
1	2036 - 2041	2024 - 2029	2025 - 2030	N/A
2A	2036 - 2041	2024 - 2029	N/A	2025 - 2030
2B	2036 - 2041	2024 - 2029	2025 - 2030	N/A
3	2036 - 2041	2024 - 2029	N/A	2025 - 2030
4A	2026 - 2031	2024 - 2029	N/A	2025 - 2030
4B	2026 - 2031	2024 - 2029	2025 - 2030	N/A
5	2036 - 2041	2024 - 2029	N/A	2025 - 2030

All alternatives have similar expansion timing requirements, except Alternatives 4A and 4B, where capacity expansions at the WRRFs will be over similar time periods. Because expansions at the plants would need to occur over a short time span, these alternatives may have more significant implications on the Region's cash flows. In addition, effluent pumping at G.E. Booth WRRF only delays the need for a new outfall; capital expenditures for the outfall would be required shortly after the 2041 planning period.

In terms of overall economic considerations, all alternatives ranked similarly in terms of preference, with the exception of Alternatives 4A and 4B which ranked slightly lower based on similar expansion schedules.

7.5.3 Evaluation Outcome

Alternative 3 (Expand G.E. Booth WRRF to 550 MLD, Expand Clarkson WRRF to 500 MLD, Treat Biosolids at Each Site and New Outfall at G.E. Booth WRRF) and Alternative 2A (Expand G.E. Booth WRRF to 550 MLD, Expand Clarkson WRRF to 450 MLD, Treat Biosolids at Each Site and New Outfall at G.E. Booth WRRF), ranked highest overall. Alternative 3, however was selected as the preferred as it best aligned with Peel's objectives identified in **Table 1-1**. In particular it provides the greatest flexibility and reliability in wastewater treatment and biosolids management. Alternative 3 also has the following benefits:

- Reduces the risks of nearshore water quality impacts, and associated impacts on aquatic and recreational users, by constructing a large outfall deeper into Lake Ontario at the G.E. Booth WRRF;
- Minimizes risks to natural areas on and surrounding the WRRFs;
- Offers opportunities for improving odour control, noise management, visual aesthetics, and climate change adaptivity, particularly at the G.E. Booth WRRF;
- Offers opportunities to improve energy recovery and reuse at both WRRFs;
- Allows for beneficial land use of biosolids, as well as new markets for incinerator ash; and
- Allows phasing of construction at both the G.E. Booth WRRF and the Clarkson WRRF to minimize cash flow implications.

7.6 Preferred Solution

The preferred overall Region solution involves flow diversion, expansions at both WRRFs, treatment of biosolids at each plant independently, and a new outfall at the G.E. Booth WRRF. Details on the Clarkson WRRF Class EA are documented in the Clarkson WRRF ESR which was completed and filed in May 2023. The preferred alternative confirmed in the Clarkson ESR is to expand the Clarkson WRRF from 350 MLD to 500 MLD, and to stop trucking dewatered sludge from the Clarkson WRRF to the G.E. Booth WRRF on a regular basis. Sludge produced at the Clarkson WRRF will be primarily treated and managed at the Clarkson WRRF.

A summary of the preferred solution for the G.E. Booth WRRF is shown on **Figure 7-10**, with more details presented in the following subsections.

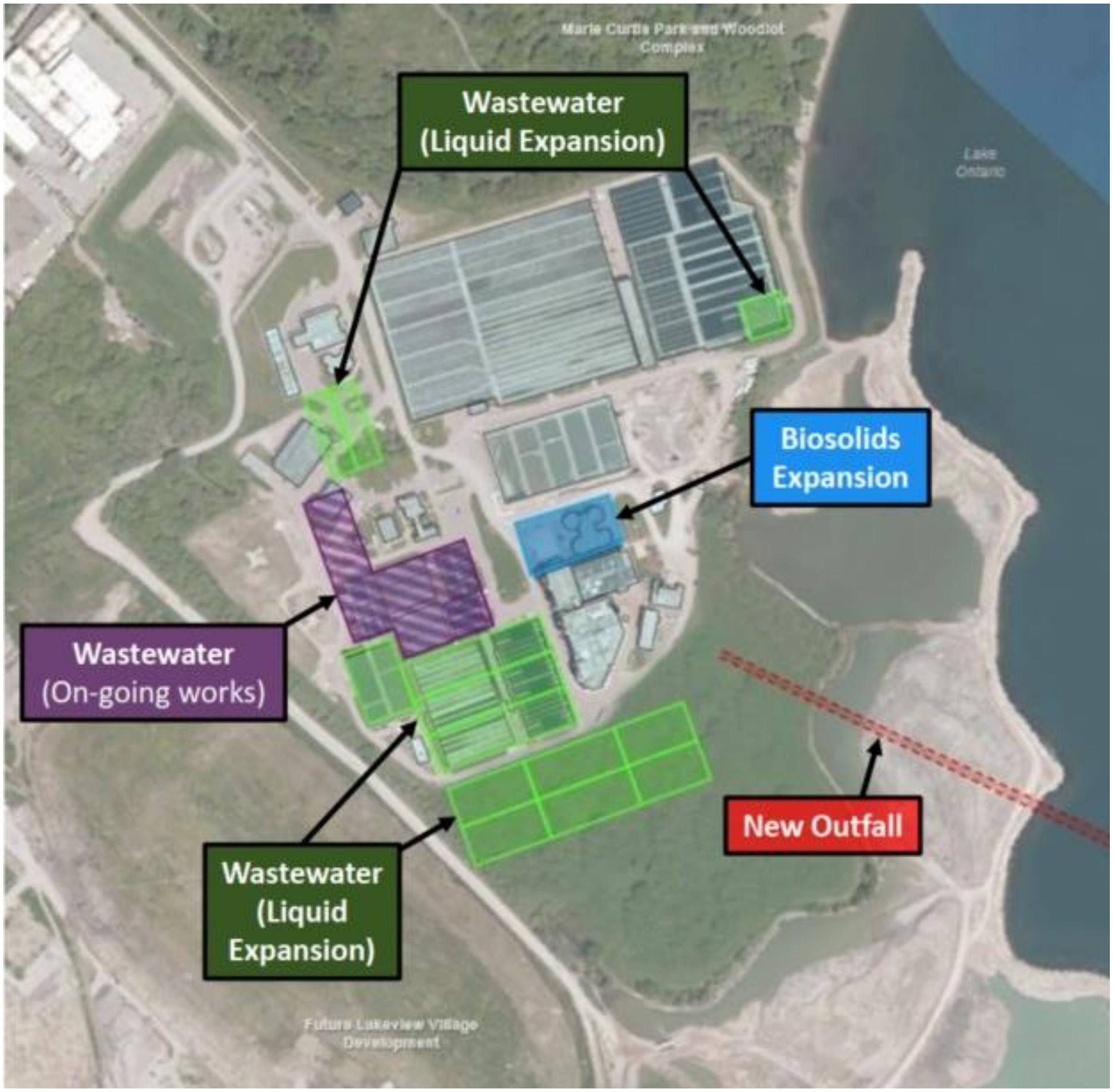


Figure 7-10 Overview of Preferred Solution for G.E. Booth WRRF

7.6.1 Flow Diversion and Expansion Timing

Figure 7-11 presents the flow diversion and expansion requirements for the G.E. Booth WRRF. To meet future needs, 80 MLD from the G.E. Booth WRRF natural catchment will need to be diverted to the Clarkson WRRF catchment via the East-to-West Diversion, starting in 2026 when the diversion becomes operational. In 2029, the rated capacity of the Clarkson WRRF would be expanded from 350 MLD to 500 MLD; this would allow for diversion of an additional 70 MLD from the G.E. Booth natural catchment to the Clarkson WRRF by 2031, for a total of 150 MLD. In 2041, the G.E. Booth WRRF would reach 90% of its approved capacity, triggering expansion from 518 MLD to 550 MLD.

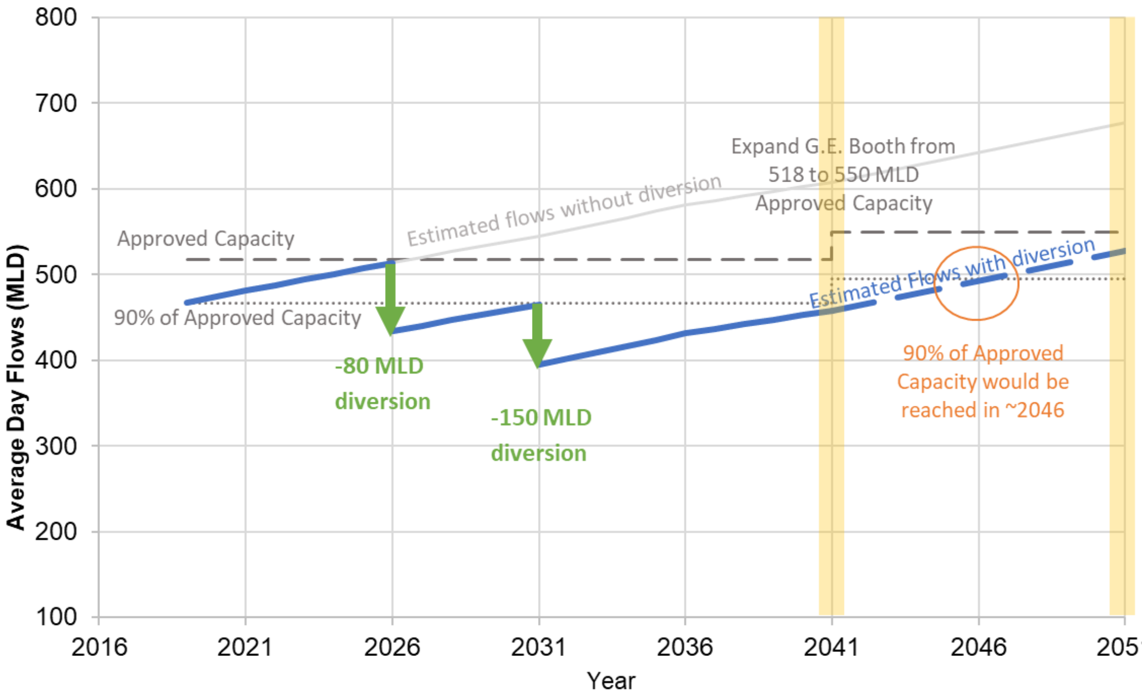


Figure 7-11 Preferred Solution: Diversion and Expansion Approach for the G.E. Booth WRRF

As indicated above, expansion facilities at the G.E. Booth WRRF must be in service by 2041 to meet wastewater treatment needs.

7.6.2 Wastewater Capacity Needs

A capacity assessment was completed for the G.E. Booth WRRF at the expanded flow of 550 MLD. As indicated on **Figure 7-12** it was determined that additional screening, primary, secondary and outfall capacities are required to meet future needs.

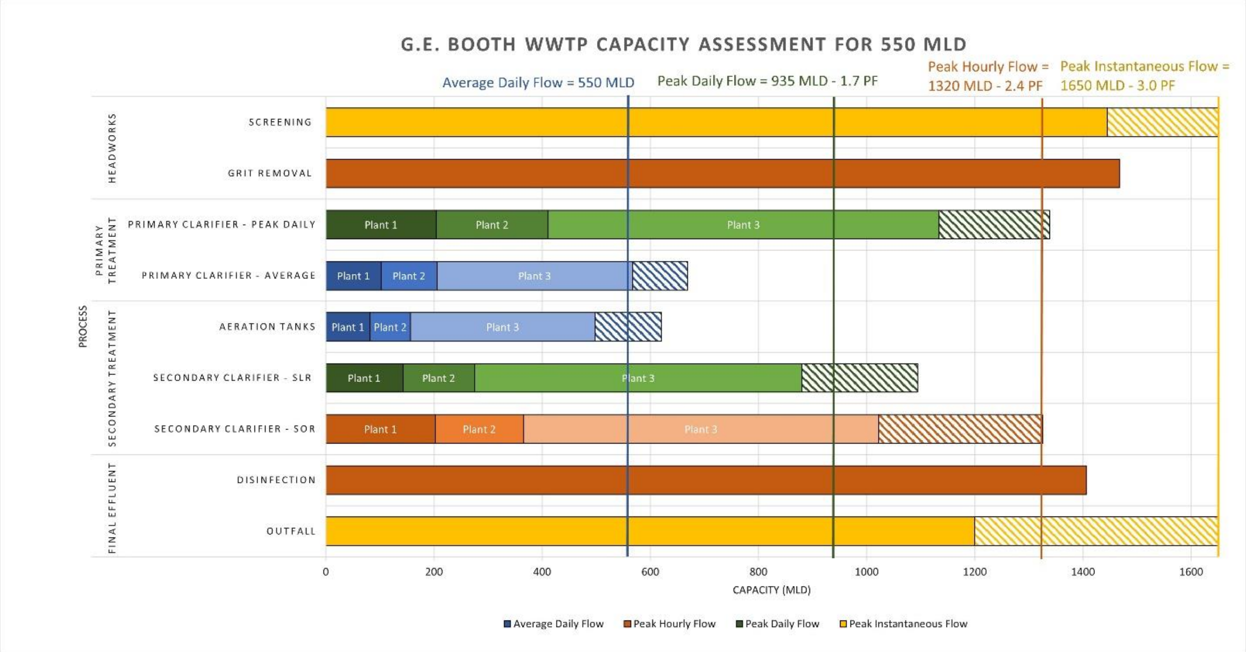


Figure 7-12 Unit Process Capacity Requirements at 550 MLD at the G.E. Booth WRRF

7.6.3 Solids Capacity Needs

When sludge treatment is provided at the Clarkson WRRF, the trucking of sludge from the Clarkson WRRF to the G.E. Booth WRRF for incineration will no longer continue on a regular basis, thereby freeing up additional incinerator capacity at the G.E. Booth WRRF. However, the capacity assessment indicates that additional solids treatment capacity will be required at the G.E. Booth WRRF to meet 2041 needs. **Table 7-8** illustrates the existing solids treatment capacities of each unit process in comparison to the treatment needs at the expanded flow of 550 MLD based on maximum month load conditions. As indicated the WAS thickening, dewatering, and incinerator facilities will have insufficient capacity to meet future peak month loadings.

Table 7-8 G.E. Booth WRRF Sludge Handling Capacity Assessment at 550 MLD

Process	Existing Capacity (DT/day)	Future Capacity Needs (DT/day) at 550 MLD
WAS Thickening	104	112
Sludge Dewatering	240	283
Cake Pumping	360	362
Incineration	210	270

7.6.4 New Outfall

The existing outfall does not have capacity to meet capacity needs in the year 2041. As shown in **Figure 7-12**, 1,650 MLD peak instantaneous flow capacity will be required in the outfall to meet future needs (assuming a peaking factor of 3). However, since an outfall's life span is approximately 75 to 100 years, the outfall will be designed at higher peak flow design capacity to allow the Region flexibility to meet longer term needs, as well as adapt to future conditions relating to climate change.

7.6.5 Real Time Control (RTC)

RTC was carried forward in Phase 2 as part of the overall solution for managing peak wet weather flows in the Peel existing sanitary trunk and collection system. Consequently, the implications of RTC on the G.E. Booth WRRF were also considered in the development and assessment of alternative design concepts.

8.0 Phase 3 – Alternative Design Concepts

Phase 3 of the Class EA process examines alternative design concepts to implement the Phase 2 preferred solution, while taking input from the public and other stakeholders into consideration.

As described previously, the interrelated nature of the Region's wastewater collection and conveyance systems meant that the solution established for the G.E. Booth WRRF was dependent on the solution selected for the Clarkson WRRF. Consequently, the G.E. Booth WRRF Class EA was completed in conjunction with the Clarkson WRRF Class EA through to the end of Phase 2. Phase 3 was then completed separately for each WRRF to identify the preferred conceptual design for each plant expansion. This section describes the Phase 3 evaluation process and its results for the G.E. Booth WRRF expansion.

Questions Answered During Phase 3

What technologies should be used to treat wastewater and sludge?

Where should the treated biosolids go and be used?

Where should the new outfall be located and what construction techniques should be used?

What is the preferred design concept to expand the G.E. Booth WRRF? (i.e., How should the site look?)

What measures should be put in place to control impacts to the natural, social, and cultural environments, and protect the community?

8.1 Phase 3 Evaluation Methodology

Phase 3 was undertaken separately for each of the following components:

- Wastewater Treatment;
- Sludge Treatment/Biosolids Management; and
- Outfall.

8.1.1 Wastewater and Sludge/ Biosolids Components

The flow diversion requirements, existing and future unit process capacities, effluent quality objectives and limits were considered in the development and assessment of wastewater and sludge/biosolids design concepts. The evaluation processes for selecting preferred wastewater and sludge/biosolids design concepts were similar and involved the following steps described in the sections below.

8.1.1.1 Screening of Long Lists of Treatment Technologies

Similar to the Phase 2 screening, the long list of liquid and solids treatment technologies were assessed based on "must have" criteria. The alternatives that "pass" the screening process were carried forward to establish a short list of alternative wastewater design concepts and sludge/biosolids design concepts. The applied screening criteria are described in **Table 8-1**.

Table 8-1 Phase 3 Liquid and Solids Treatment Technology Screening Criteria

Screening Criteria	Description
Maturity of Technology	The technology must have been in use for long enough that most of its' initial operational issues and inherent problems have been removed or reduced by further development. It must be robust, reliable, and have a successful track record.
Proven Application at Large WRRFs	The technology must be able to serve WRRF's of the size of the G.E. Booth WRRF. The technology will have a successful operating history at facilities of equivalent size or larger.
Compatibility with Existing and Future Processes	The technology must be compatible with the existing treatment processes at the WRRF, consider existing infrastructure investments, and be constructible given existing site conditions. For biosolids, it must also compliment the end use alternatives and markets that have been identified for the Region of Peel.
Compatibility with Regional Energy Management and GHG Reduction Goals	Offers opportunities for energy efficiency, reduction in chemical inputs or potential for resource recovery to help support Regional Energy Management and GHG Reduction Goals.

8.1.1.2 Assessment of Alternative Design Concepts

The short list of wastewater treatment and sludge treatment/biosolids management design concepts were assessed using detailed evaluation criteria that considered all components of the environment; natural, social, cultural, technical, and economic. These criteria are similar to the criteria used for Phase 2 but revised to reflect the more detailed evaluation undertaken in Phase 3. **Figure 8-1** provides a summary of the evaluation criteria while detailed descriptions on each criterion and their measures are provided in **Volume 3, Appendix K1.**

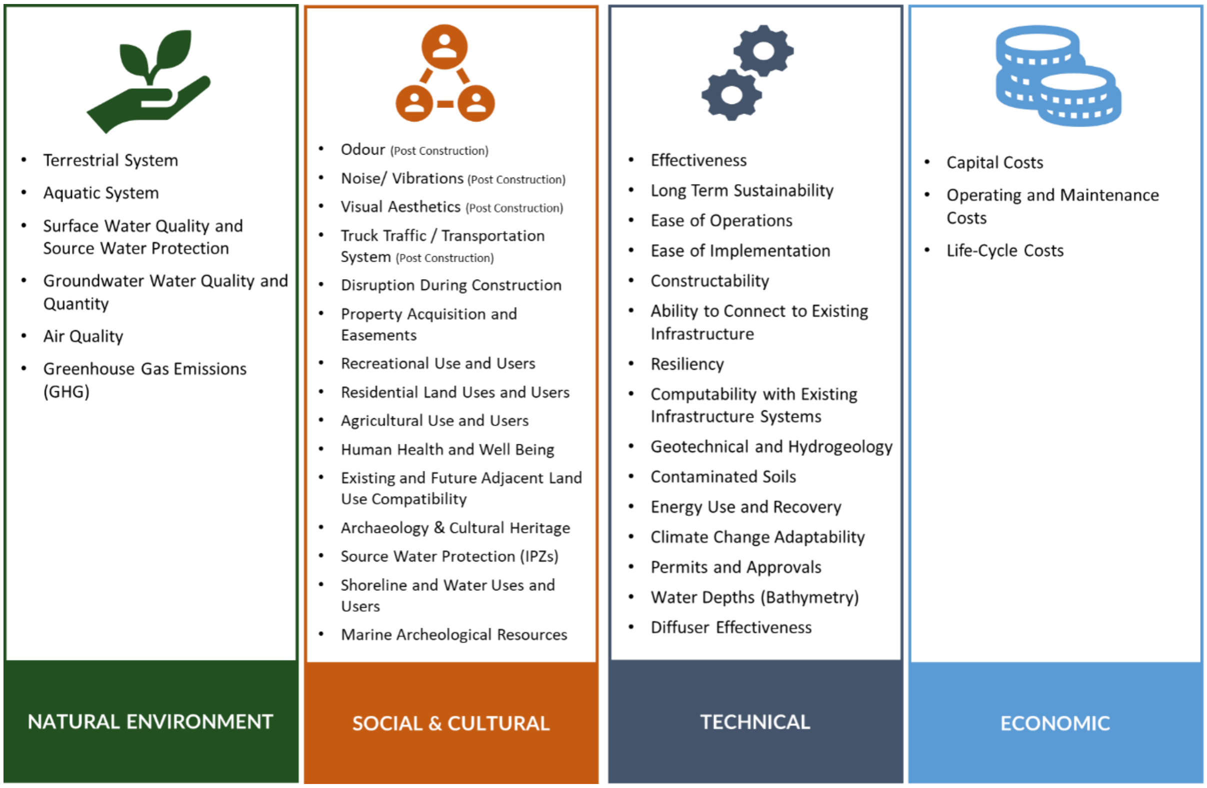


Figure 8-1 Detailed Evaluation Criteria for Wastewater and Sludge/Biosolids Components

Alternative impacts for each criterion were scored by a team of engineers, scientists, and planners using the same rating scale used in Phase 2 (i.e., one (1) to ten (10); with a score of ten (10) assigned to the alternative having the least impacts and deemed most preferred and a score of one (1) assigned to the alternative having the most impacts and deemed least preferred. Impacts were quantified where possible (i.e., GHG emissions, costs, and truck traffic). In assigning impact ratings, net effects (effects after mitigation) were considered. Site specific environmental investigations and analysis were undertaken to support the evaluation as described in Section 6.0 and in **Volume 2 – Supporting Technical Reports**. VE input was also instrumental in assessing the alternatives and establishing the preferred design concept.

8.1.1.3 Selection of Preferred Design Concepts

Alternatives that rated the highest and best reflected the goals of the Region as identified in **Table 1-1** were selected as the preferred design concepts.

Sections 8.2 and Section 8.3 present the assessment of alternative design concepts for the wastewater and sludge/biosolids components, respectively.

8.1.2 Outfall Component

To identify a preferred design concept for the outfall, evaluations were completed of alternative shaft locations and pipe alignments. The shaft would be used to set up and launch the tunneling equipment and to remove the tunnel spoil and waste material during excavation. It would also be used as the discharge point for the treated effluent conduits from the WRRF. The outfall would consist of the outfall pipe and diffusers and would extend into Lake Ontario.

As a first step, the outfall capacity, shaft size, outfall diameter, and approximate depth required for the diffusers were established in consideration of long-term needs, hydraulics, and the results of the RWIA. Alternative shaft locations and pipe alignments were then identified and assessed based on the natural, social/cultural, technical, and economic impacts. The criterion applied to assess impacts, while similar to those identified in **Figure 8-1**, were specific to the outfall alternatives. The evaluation criteria applied to assess alternative shaft locations and alternative outfall alignments are provided in **Volume 3, Appendix K2**. Alternative impacts for each criterion were scored by a team of engineers, scientists, and planners using the same rating scale and approach as described above, and a preferred alternative was selected.

8.2 Wastewater Treatment Design Concepts

8.2.1 Long List of Wastewater Treatment Technologies

Table 8-2 lists the unit processes typically applied for wastewater treatment and their general function, as well as the existing treatment processes at the G.E. Booth WRRF and the long list of alternative treatment technologies considered for the G.E. Booth WRRF expansion. Since preliminary and primary treatment processes for the expansion would be similar to the existing processes, and tertiary treatment is not required to meet future effluent limits, the evaluation of alternative design concepts focused on screening a long list of secondary treatment and disinfection technologies.

Table 8-2 Major Unit Processes at G.E. Booth WRRF

Unit Process and Function	G.E. Booth WRRF – Existing Process Technologies	Long List of Alternative Treatment Technologies
Preliminary Treatment: Involves processes such as screening and grit removal to remove large debris and heavy, abrasive, inorganic solids	The G.E. Booth WRRF has a headworks facility which houses the screens and grit removal system. This system includes mechanical screens to remove untreatable debris, vortex operated grit chambers to remove heavier inorganic particles, and a strength waste receiving station.	The existing facility will be expanded to maintain protection of downstream equipment and processes using similar equipment as those existing at the plant.
Primary Treatment: Removes suspended solids to reduce the organic and solids load on the downstream biological treatment system.	From the headworks facility, wastewater is conveyed to the primary treatment (clarifiers). The Region has the ability to add chemicals to improve phosphorus removal.	The existing primary treatment facility will be expanded using similar technology to the existing processes.

Unit Process and Function	G.E. Booth WRRF – Existing Process Technologies	Long List of Alternative Treatment Technologies
Secondary Treatment: Involves processes to encourage biological activity to remove soluble BOD_5, suspended and non-settleable colloidal solids, nitrogen, and phosphorus.	From the primary clarifiers, treated wastewater flows to the secondary treatment facilities, which are aeration tanks and secondary clarifiers. The existing process is a conventional activated sludge process (CAS).	4. Conventional Activated Sludge (CAS) 5. CAS with Chemically Enhanced Primary Treatment (CEPT) 6. CAS with Wet Weather Flow (WWF) Management 7. Biological Nutrient Removal (BNR) 8. Ballasted Activated Sludge 9. Membrane Bioreactors (MBR) 10. Membrane Aerated Biofilm Reactors (MABR) 11. Integrated Fixed Film Activated Sludge (IFAS)/Moving Bed Bioreactor (MBBR) 12. Sequencing Batch Reactors (SBR) 13. Aerobic Granular Sludge (AGS) 14. Biological Aerated Filters (BAF)
Tertiary Treatment: Includes processes such as filtration. Filtration is typically required for facilities with very low effluent TP limits.	Not currently applied at the G.E. Booth WRRF.	As effluent limits for the G.E. Booth WRRF are achievable with secondary treatment; tertiary treatment is not required.
Disinfection: Involves the destruction and/or inactivation of pathogens in the effluent prior to discharge to the receiving water.	Effluent from the secondary treatment process passes through the disinfection facility which involves dosing the effluent with chlorine to kill any bacteria or viruses. The effluent is de-chlorinated to remove residual chlorine prior to discharge.	15. Chlorination/Dechlorination 16. Ultraviolet (UV) Disinfection 17. Ozonation 18. Peracetic Acid (PAA)

8.2.2 Disinfection Alternatives

The screening criteria were applied to the long list of disinfection technologies, and the results are presented in **Table 8-3**. Ozonation and peracetic acid technologies did not pass the screening process. The resulting short-listed disinfection technologies were:

- **Chlorination/Dechlorination:** This technology involves expanding the existing disinfection facility at the G.E. Booth WRRF using chlorination and dechlorination. This disinfection approach is integrated into the existing outfall; however, a new outfall would be required to service the 550 MLD G.E. Booth WRRF.

- **Ultraviolet (UV):** This technology involves construction of a new UV disinfection facility including in-channel UV disinfection systems and power equipment. The secondary effluent will be diverted to the new UV facility before discharging to the new outfall.

The screening on disinfection technologies is provided in **Volume 3, Appendix K. Table 8-4** and **Table 8-5** provides a summary of the evaluation of the above short listed disinfection alternatives, while the detailed evaluation scoring matrix is provided in **Volume 3, Appendix K**. Both chlorination / dechlorination and UV disinfection received a similar total score, with UV disinfection having a slightly higher score.

To confirm UV disinfection as the preferred alternative, it was reviewed against the key priorities of the Region as shown in Table 8-3**.** UV disinfection best aligns with the Region's objectives of Environmental Protection, Community Acceptability, and Fiscal Responsibility.

Table 8-3 Disinfection Alternative's Ability to Meet the Key Study Objectives

Region's Key Objectives	Review Outcome
Long-term Sustainability	Both alternatives would be designed to meet current needs, while not compromising the ability to meet future needs.
Resiliency	Both alternatives would be designed to have adequate levels of redundancy to be resilient to potential changes in conditions in the future.
Environmental Protection	Although both disinfection alternatives meet MECP requirements in terms of protecting the environment, with chlorination/dechlorination there is a risk of disinfection by-product formation and release into Lake Ontario. UV, therefore, best aligns with the Region's Environmental Protection objective.
Community Acceptability	UV disinfection would reduce the need for disinfection chemical deliveries resulting in reduced vehicle traffic to the plant. In addition, UV disinfection may be perceived by the public as a more environmentally acceptable technology. Consequently, it best aligns with the Region's Community Acceptability objective.
Ease of Operations	Both technologies are proven and easy to operate.
Energy Efficiency	UV uses much more energy than chlorination/dechlorination.
Fiscally Responsible	The initial capital cost outlay is much greater for a UV disinfection facility. However, operating costs are much less resulting in similar 30-year life cycle costs. In the long-term, UV is the more fiscally responsible alternative.

Table 8-4 Evaluation of Disinfection Alternatives – Natural, Social/ Cultural and Technical Considerations

Criteria Category	Alternative 1 (Chlorination/Dechlorination) and Alternative 2 (UV Disinfection)	Evaluation Outcome
Natural Environment	Expanding the chlorination / dechlorination or constructing a new UV disinfection facility would have limited impacts on natural environment features as the footprint of the expanded or new disinfection facility would be within the site boundary in the ash pond area. While both facilities would be located in a disturbed area of the site (ash pond), with limited natural features, additional mitigation measures would be necessary to reduce risks to surrounding natural features. Both chlorination/dechlorination and UV are effective disinfection methods and are able to meet effluent quality requirements before discharge to receiving waters. With chlorination / dechlorination, there is a risk of disinfection by-product formation and release into Lake Ontario. As a result, chlorination/dechlorination has slightly more potential to impact surface water quality than UV disinfection. Air emissions at the G.E. Booth WRRF currently meet MECP requirements. Chlorination / dechlorination would not impact air emissions at the G.E. Booth WRRF. UV disinfection would require increased standby power requirements, but air emissions from the generators can be controlled to meet air quality standards. UV disinfection has higher overall Scope 2 emissions than chlorination / dechlorination due to the power draw of the lamps, however chlorination / dechlorination has higher Scope 3 emissions due to chemical use.	From a natural environment perspective, both alternatives are ranked similarly. UV has higher potential for construction related impacts and higher overall GHG emissions than chlorination / dechlorination. However, there is more potential risk of by-product formation and release into Lake Ontario as a result of chlorination / dechlorination. For both alternatives, impacts to the natural environment can be mitigated through proper construction and operation techniques.
Social/Cultural Environment	Overall, concerns related to odour, noise, and visual aesthetics with both disinfection alternatives are minimal. The chlorination / dechlorination alternative is already integrated at the existing site however as the G.E. Booth WRRF would require a new outfall, this may involve impacts on the surrounding environment. Any chemical odour is contained within the disinfection facility where the chemicals are stored, and UV disinfection would not have any impacts with respect to odour and noise. There would be regular truck traffic to deliver chemicals for chlorination / dechlorination, while no regular deliveries would be required for UV disinfection. However, there may be reduced additional construction required for an expansion of the existing chlorination / dechlorination facility, whereas UV would require construction of a new facility. No archaeological resources are expected to be impacted with any of the alternatives, based on Stage 1 and 2 archaeological assessments.	With both alternatives, impacts to the social/cultural environment are minimal and can be mitigated. Overall, both alternatives ranked the same.
Technical Consideration	With respect to technical considerations, each alternative would be designed to effectively disinfect wastewater to meet effluent objectives. The UV system would be designed with a spare train to provide firm capacity and redundancy in case of maintenance. The UV disinfection option has the highest energy requirements due to the power draw from the UV lamps. Furthermore, installation of the UV system may require expansion to the standby power system to ensure emergency power is available to achieve disinfection compliance at all flows. The chlorination/dechlorination requires minimal energy to dose chemical to the outfall, so the energy consumed is negligible in comparison. Chlorination/dechlorination is the process currently in use at the G.E. Booth WRRF resulting in almost identical operation and maintenance requirements at the new facility. UV would require construction of new facilities and would be slightly more complex to operate and maintain. UV disinfection involves greater system headloss and there may be modifications required to direct secondary effluent to a new disinfection facility. However, UV disinfection would make the G.E. Booth WRRF less reliant on external chemical deliveries which would make it less vulnerable to supply chain disruptions.	From a technical perspective, chlorination / dechlorination and UV disinfection both ranked similarly.

Table 8-5 Evaluation of Disinfection Alternatives – Economic Considerations

Criteria Category	Alternative 1: Chlorination / Dechlorination	Alternative 2: UV	Evaluation Outcome
Capital Cost	$29.4 M	$52.9 M	Although operating costs are lower for UV, the significant capital expenditures required for UV means a similar life cycle cost for chlorination / dechlorination and UV disinfection. From a cost perspective, both options have similar rankings.
Annual O&M Cost	$1.3 M	$0.6 M	
30-Year NPV Life Cycle Cost	$60.5 M	$63.6 M	

8.2.3 Development of Wastewater Treatment Design Concepts

8.2.3.1 Screening of Long List of Secondary Treatment Technologies

The long list of secondary treatment technologies presented in **Table 8-2** were reviewed against the screening criteria described in **Table 8-1.** The results of the treatment technology screening are provided in **Volume 3, Appendix M**. Based on the results of the technology screening, three (3) technologies were identified for further evaluation and the development of the design concept alternatives.

- **Conventional Activated Sludge (CAS) Process:** This is the existing process used at the G.E. Booth WRRF. Wastewater flows into a primary clarifier where suspended solids settle out and primary treated wastewater is directed to an aeration tank where it mixes with activated sludge. Mixed liquor (the combination of primary treated wastewater and activated sludge) in the aeration tank is mixed and aerated to stimulate the conversion of soluble and colloidal organic matter in the wastewater to microorganisms (biomass). The mixed liquor then flows to a secondary clarifier, where solids settle to the bottom of the tank and secondary treated effluent flows to the disinfection process. A portion of the settled solids are recycled to the head of the aeration tank (return activated sludge or RAS) to maintain a consistent mixed liquor suspended solids concentration and the excess (waste activated sludge or WAS) is sent to the solids' management process train.
- **CAS Process Optimized with Chemically Enhanced Primary Treatment (CEPT):** The CAS process with CEPT includes the same processes as those described for CAS but with the addition of metal salts and polymer upstream of primary treatment. The addition of chemical coagulants such as ferric chloride or alum, neutralizes colloidal particles and other low density suspended solids to facilitate the formation of floc, while polymer increases the size and density of floc. The CEPT process can achieve higher removal rates of TSS and BOD. This improved removal efficiency reduces the organic and solids loading in the primary effluent and reduces the size requirement for aeration tanks. Furthermore, the settled primary solids (known as raw sludge) are high in energy value and increase the amount of biogas produced in anaerobic digestion.
- **CAS Process Optimized with Wet Weather Flow (WWF) Management:** This alternative involves implementing WWF management to reduce peak flows to the G.E. Booth WRRF. This could involve either a parallel, high-rate treatment facility at the plant or Real Time Control (RTC) in the upstream collection system. The G.E. Booth WRRF would be expanded with new CAS trains. This would allow the construction of smaller CAS tanks.

8.2.3.2 Wastewater Design Concepts

Four (4) wastewater design concepts were developed based on the short list of secondary treatment technologies with preliminary treatment, primary treatment, and disinfection common to all four (4) design concepts. These design concepts are as follows:

Design Concept 1: Expansion of existing facility using the Conventional Activated Sludge (CAS) process: This design involves expanding the G.E. Booth WRRF to a rated capacity of 550 MLD with new CAS process trains which are consistent with the existing facility and would follow the same operating philosophy. The process flow diagram for this alternative is shown in **Figure 8-2**.

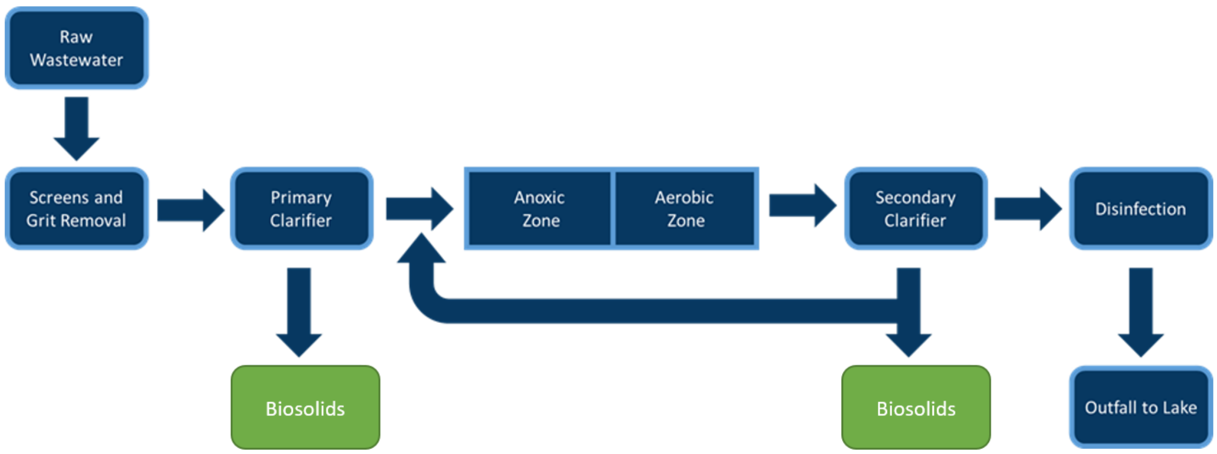


Figure 8-2 Process Flow Diagram Using the CAS Process

Design Concept 2: CAS Process Optimized with Chemically Enhanced Primary Treatment (CEPT): This alternative involves expanding the G.E. Booth WRRF with new CAS process trains optimized with CEPT. The addition of metal salts and polymer upstream of the primary clarifiers would aid with solids settling, reducing the organic and solids load to the secondary treatment process. This would reduce the size of the aeration tanks and the energy consumption required for aeration. Furthermore, the high energy solids from primary treatment would allow for more biogas production through anaerobic digestion. The process flow diagram for this alternative is shown in **Figure 8-3**.

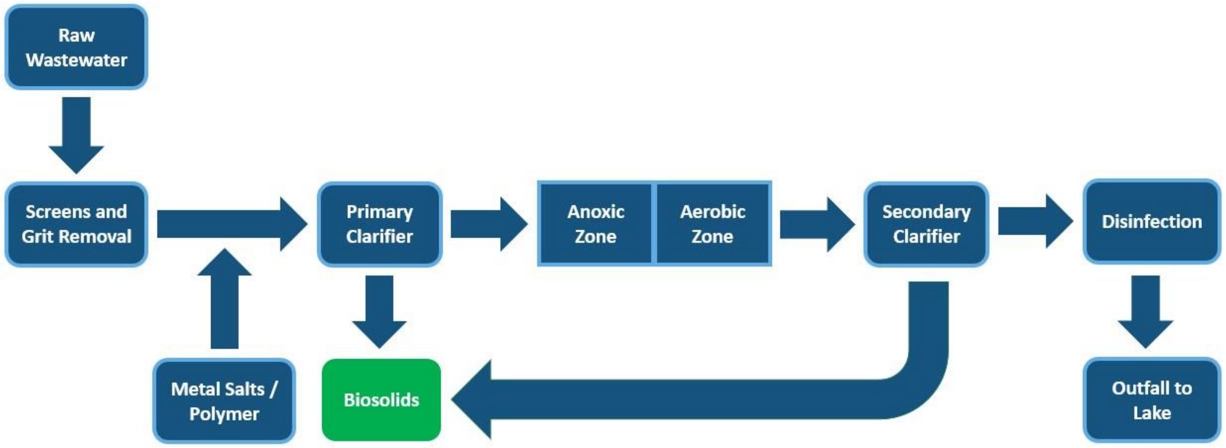


Figure 8-3 Process Flow Diagram of Expansion Using the CAS with CEPT Process

Design Concept 3A: Expansion of Existing Facility Using the CAS Process Optimized with a High-Rate Treatment Facility: This alternative involves expanding the G.E. Booth WRRF using the CAS process to bring the plant capacity to 550 MLD. However, in this concept, wet weather flows above 1,210 MLD would be diverted to a new headworks and high-rate treatment facility for treatment. Thus, peak hour flows to secondary treatment would be limited to 1,210 MLD (peak hour peaking factor reduced to 2.2). Due to the reduced peak flows to the secondary clarifiers throughout the whole plant, only Plant 3 would be derated in this concept and the construction of a new train in the lagoon area (as required for Design Concepts 1 and 2) would not be required. Thus, this option only requires the build-out of Plant 1. The process flow diagram for this alternative is shown in **Figure 8-4**.

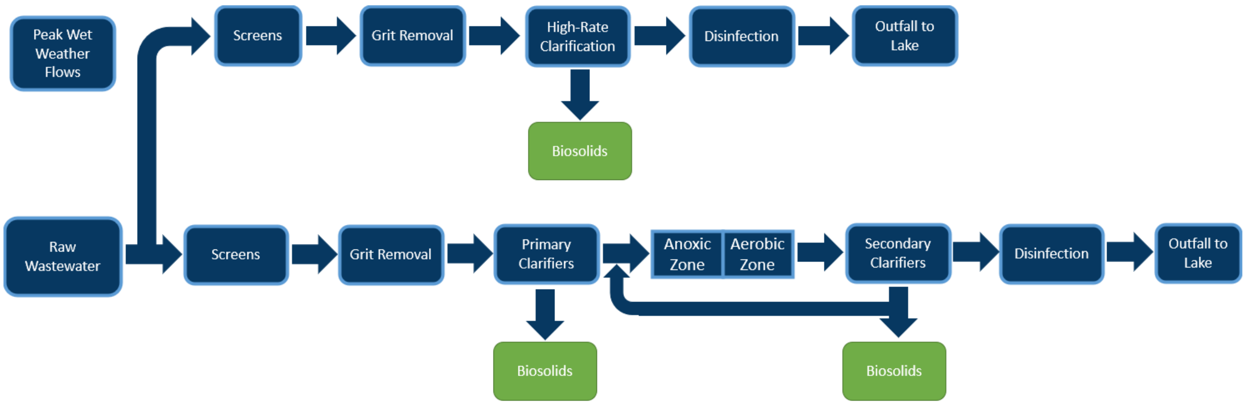


Figure 8-4 Process Flow Diagram of Expansion Using the CAS Process Optimized with a High-Rate Treatment Facility

Design Concept 3B: Expansion of Existing Facility Using the CAS Process Optimized utilizing Real Time Control (RTC) in the Collection System: This alternative involves expanding the G.E. Booth WRRF using the CAS process to bring the plant capacity to 550 MLD as shown on **Figure 8-2**. However, in this concept, RTC would be used in the collection system to attenuate peak flows to the G.E. Booth WRRF. A separate project is underway to assess the implementation of RTC in the collection system. The study evaluated the projected behaviour of the collection system under various design wet weather flow events and confirmed that during a five (5)-year design event, the implementation of RTC could reduce peak flows to the G.E. Booth WRRF to below 1,210 MLD (peak hour peaking factor reduced to 2.2). The projected conditions during the five (5)-year event at the G.E. Booth WRRF for 2026, 2031, and 2041 are identified in **Figure 8-5.**

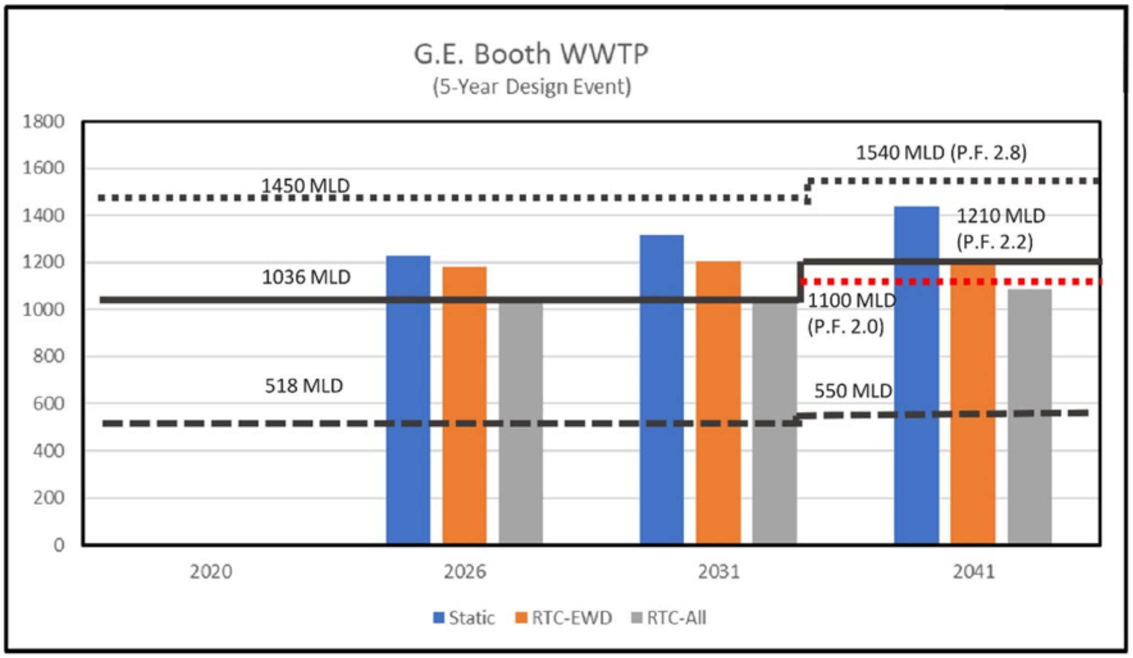


Figure 8-5 RTC Peak Flow Management for G.E. Booth WRRF during 5-Year Design Event (Stantec, 2021)

Due to the reduction in peak flows to the entire plant, only Plant 3 would be derated in this concept and the construction of a new process train in the lagoon area would not be required. Thus, to make up for the capacity shortfalls in the existing facility, only Plant 1 would be built out. The expansion of Design Concept 3B also involves an expansion of the Plant 3 secondary clarifier No.11, a new disinfection system (sized for reduced peak hourly flows), and a new outfall.

8.2.4 Evaluation of Alternatives and Selection of the Preferred Design Concept

The four (4) wastewater design concepts were evaluated using the criteria and approach outlined in Section 8.1. The evaluation matrix in **Volume 3, Appendix L** provides details on the impacts of the alternative design concepts on the natural, social/cultural, technical, and cost environments, while **Table 8-6** and **Table 8-7** provides a summary of the impacts.

Although there are minimal differences in the scoring among all four (4) design concepts, alternatives which managed wet weather flows (i.e., Alternatives 3A and 3B) rated slightly higher. This is because these alternatives required less tankage on site, as peak flows are managed in the system. Alternative 3B which includes RTC in the collection system has the lowest capital expansion and lifecycle costs of all alternatives.

To confirm the preferred design concept, alternatives were reviewed against the Region's key priorities of the Region as shown in **Table 8-6.** As illustrated the alternative that best aligned with the Region's objectives is Design Concept 3B: Expansion Using CAS Optimized with RTC.

Table 8-6 Evaluation of Wastewater Treatment Design Concepts – Natural Environmental, Social/Cultural Environment, and Technical Considerations

Criteria Category	Design Concept 1: CAS; Design Concept 2: CAS with CEPT; Design Concept 3A: CAS with High-Rate Clarification, Design Concept 3B: CAS with RTC	Evaluation Outcome
Natural Environment	Design Concepts 1 and 2 require construction into the ash lagoons and pond which has a greater potential to impact Serson Creek and the on-site wetland then Design Concepts 3A & 3B. All alternatives would meet the target dilutions calculated for the new outfall via CORMIX modelling meaning there is low potential to impact the Intake Protection Zones of the Arthur P. Kennedy Water Treatment Plant or the R.L. Clark Water Treatment Plant. All alternatives would be designed to include emission control and treatment to ensure air quality standards are met and impacts would be mitigated. The new Lakeview development may provide challenges with incinerator point of impingement requirements. Design Concept 2 has higher Scope 1 and 3 emissions from increased sludge to incinerate and chemical use. However, Design Concept 2 also has lower Scope 2 emissions compared to the other alternatives due to low aeration requirements. Overall, Design Concept 2 scored slightly lower than Design Concepts 1, 3A, and 3B.	No significant difference in the ranking of alternatives. However, Design Concepts 3A and 3B scored the highest based on not requiring construction in the ash lagoons and pond and lower potential impacts associated with air quality and GHG emissions.
Social / Cultural Environment	Overall, concerns related to odour, noise, and visual aesthetics would be minimal and similar among all alternative design concepts. All alternatives would be designed to include odour control and treatment to meet air quality standards to mitigate impacts to human health. Similarly, noise and vibrations would be mitigated to meet requirements of the nearest receptors. The visual aesthetics of the site can be improved with new facilities for all alternatives. There would be increased truck traffic to deliver chemicals for the CAS and CEPT design concepts with the CEPT design concept having the largest number of trucks due to additional chemical deliveries (two types of iron and polymer). No archaeological resources are expected to be impacted with any of the alternatives, based on Stage 1 and 2 archaeological assessments. The new Lakeview Development is being planned directly adjacent to the G.E. Booth WRRF site to the west and can be considered as incompatible with the G.E. Booth WRRF. However, the expansion provides the opportunity to enhance noise and odour controls at the G.E. Booth WRRF, as well as implement visual site improvements. The current upgrades and planned expansions are being designed to mitigate impacts to neighbouring areas.	No significant difference in the ranking of alternatives. However, Design Concepts 3A and 3B ranked the highest based on potentially lowered impacts to adjacent residents.
Technical Considerations	Each alternative design concept would be designed to effectively treat wastewater to meet effluent objectives and wet weather management needs. All four concepts would be designed with a spare train to provide firm capacity through the facility (i.e., adequate treatment capacity is provided to meet demands when a treatment process is out of service for maintenance). All of the alternatives are relatively easy to operate as they are variations of CAS, which is the existing wastewater treatment process used at the G.E. Booth WRRF. Design Concept 3A may require slightly more operational intervention due to the high-rate clarification facility. Design Concepts 1 and 2 may involve greater implementation complexity due to the tie-in of the train in the lagoon, as well as Design Concept 3A due to the effluent conduit from the high-rate clarification facility. Design Concepts 1 and 2 would result in increased excess soil management requirements due to their larger footprint which could involve complexities with soil export. Design Concept 2 has the lowest energy requirements overall, due to lower aeration and mixing requirements. Design Concepts 3A and 3B are designed for wet weather flow management and would have minimal potential for bypasses during wet weather events. There are limited applications of high-rate clarification in Ontario, which may increase the timeline for MECP approvals. No significant challenges are expected in receiving permits and approvals with any of the alternatives. Implementation of RTC in the system may take longer to plan, design, and construct. However, given that expansion of the G.E. Booth WRRF is not required until later in the planning period this is not expected to be an issue.	No significant difference in the ranking of alternatives. However, Design Concepts 3A and 3B scored the highest based on their WWF management and the reduced complexities involved with construction not being required in the ash lagoon and pond areas.

Table 8-7 Evaluation of Wastewater Treatment Design Concepts (Economic Considerations)

Criteria Category	Design Concept 1: CAS	Design Concept 2: CAS with CEPT	Design Concept 3A: CAS with High-Rate Clarification	Design Concept 3B: CAS with RTC	Evaluation Outcome
Capital Cost	$364 M	$357 M	$377 M	$333 M	All alternatives have comparable lifecycle costs. Alternative 3B has the lowest capital costs, while Design Concept 3A has the highest capital costs. Alternatives 1, 3A, and 3B have similar operating costs, while Alternative 2 has the highest operating cost and lifecycle cost.
Operating and Maintenance (O&M) Costs	$13 M	$15 M	$13 M	$13 M	
Life Cycle Costs	$760 M	$810 M	$773 M	$728 M	

Table 8-8 Alternative Wastewater Treatment Design Concept's Ability to Meet the Key Study Objectives

Region's Key Objectives	Review Outcome
Long-term Sustainability	All alternatives would be designed to meet current needs, while not compromising the ability to meet future needs.
Resiliency	Alternatives 3A and 3B best align with the Resiliency objective. The high-rate treatment option would improve the resiliency of the facility to wet weather flows. The RTC option would be more robust as it would reduce the overall peak flows to the facility leveraging storage in the collection system.
Environmental Protection	Alternatives 3A and 3B best protect the environment. CAS with high-rate clarification or with RTC eliminates the need for a new process train in the ash lagoon area, which would have less potential to impact the natural features on-site as well as the JTLCA.
Community Acceptability	Alternatives 3A and 3B are expected to be more acceptable to the local community than the other alternatives. CAS with high-rate clarification or with RTC eliminates the need for a new process train in the ash lagoon area, which would have less potential to impact the Lakeview Village Development.
Ease of Operations	Alternatives 3A and 3B would be slightly easier to operate than the other alternatives, as peak flows would be controlled.
Energy Efficiency	The CEPT option (Alternative 2) has the lowest energy use due to reduced aeration requirements.
Fiscally Responsible	The RTC alternative (Alternative 3B) has the lowest capital and lifecycle costs.

8.3 Sludge Treatment/ Biosolids Management Design Concepts

8.3.1 Screening of Long List of Solids Treatment Technologies

The long list of solids treatment technologies is presented in **Table 8-9**. The solids treatment technologies are categorized into seven categories, each of which produce different end products. These categories are anaerobic digestion, anaerobic digestion with thermal hydrolysis (THP) pre-treatment, aerobic digestion, thermal drying, chemical stabilization, composting, and thermal conversion. There are several technology options for each of these categories.

The screening criteria identified in **Table 8-1** were applied to the long list of treatment technologies. The screening of these technologies is detailed in **Volume 3 – Appendix M1**. Based on the technology screening, the following six (6) technologies were selected for further evaluation:

- Expand Incineration
- Transport Additional Solids Off Site to the Clarkson WRRF for Management
- Thermal Hydrolysis Process (THP) followed by Anaerobic Digestion prior to Incineration
- Third-Party Management of Additional Solids
- Anaerobic Digestion, Dewatering, and Direct Thermal Drying
- Anaerobic Digestion Prior to Incineration

Table 8-9 Summary of Long-List of Solids Treatment Technologies

No.	Category	Description	Long List of Solids Treatment Technologies
1	Anaerobic Digestion	The Clarkson WRRF uses anaerobic digestion and centrifuges to stabilize and dewater their biosolids prior to transport to the G.E. Booth WRRF for incineration and ash disposal. Anaerobic digestion is a popular process at the scale of these WRRFs to meet the CP2 limits class. Temperature or acid phased steps can be added to anaerobic digestion to reduce solids retention and potentially produce biosolids that meet stricter CP1 pathogen reduction requirements.	• 1a. Conventional Anerobic Digestion • 1b. Temperature-Phased Anaerobic Digestion • 1c. Acid-Gas Phased Anaerobic Digestion
2	Anaerobic Digestion with Hydrolysis Pre-treatment	The thermal hydrolysis process (THP) can be used to condition solids prior to anaerobic digestion. The process consists of a high-temperature, high-pressure steam, and solids pre-treatment process that is installed upstream of mesophilic anaerobic digestion. The process may also utilize alkaline hydrolysis (sodium hydroxide - NaOH) to increase Volatile Solids Reduction (VSR) and biogas production in the subsequent anaerobic digestion process. NASM CP1 pathogen reduction requirements can be achieved.	• 2a. Thermal Hydrolysis Process (THP) • 2b. Thermal/Alkaline Hydrolysis Process
3	Aerobic Digestion	An aerobic digester operates on the same principle as the activated sludge process; however, an anaerobic system operates in the absence of gaseous oxygen, while aerobic process uses oxygen directly from the surrounding atmosphere. The end products of an aerobic process are primarily carbon dioxide and water which are the stable, oxidized forms of carbon and hydrogen.	• 3a. Conventional Aerobic Digestion • 3b. Autothermal Thermophilic Aerobic Digestion
4	Thermal Drying	Thermal drying is the process of evaporating the water in the dewatered cake by the addition of heat. With the exception of incineration, the moisture content of thermally dried biosolids is the lowest of the process alternatives considered. Thermal drying results in a product that meets the requirements of CFIA indicator organisms and the Category A CCME Guidance. The dried product can be used as a fertilizer or soil conditioner on acidic or alkaline soils. The dried biosolids can also be used as a biofuel.	• 4a. Direct (Convection) Thermal Drying (Rotary Drum, Belt Dryer, Fluidized Bed) • 4b. Indirect (Conduction) Thermal Drying (Paddle Dryer, Disc Dryer) • 4c. Solar Dryer
5	Chemical Stabilization	Alkaline stabilization is a reliable physical chemical process used to stabilize wastewater solids. In the process, an alkaline material such as lime is mixed with biosolids to further stabilize the product. The process may be supplemented with heat, acid, or high-speed mixing.	• 5a. Alkaline Stabilization • 5b. Alkaline Stabilization with Supplemental Heat or Acid • 5c. Alkaline Stabilization with Heat and High-Speed Mixing
6	Composting	Composting is a biological process in which organic material undergoes biological degradation to a stable product. This technology can be applied for stabilization of dewatered wastewater solids supplied in undigested, digested, or chemically stabilized forms. The high-quality product can be used as a soil conditioner or organic fertilizer supplement for the horticultural and agricultural industry. Co-composting with municipal solid waste is also an option.	• 6a. Composting (Aerated Static Pile and Windrow Composting) or co-composting with Region of Halton
7	Thermal Conversion	Thermal conversion processes evaporate the water and burn the organic matter in dewatered cake using high temperature chemical oxidation reactions. The main advantages of incineration are the reduction in weight and volume of dewatered solids. Another advantage is the potential for energy recovery.	• 7a. Incineration • 7b. Gasification • 7c. Pyrolysis • 7d. Wet Oxidation • 7e. Hydrothermal Liquification

8.3.2 Development of Sludge/ Biosolids Management Design Concepts

Based on the selected treatment technologies and input from the Value Engineering (VE) team, six (6) design concepts were developed as described below. All alternatives include decommissioning of the ash lagoons and storage pond and construction of an ash dewatering facility. While developing these alternatives, the operational limitations and remaining service life of the existing incineration facility was considered, along with potential phasing of the solids management improvements, and the long-term vision for solids management at the G.E. Booth WRRF.

8.3.2.1 Design Concept 1: Expand Incineration

There are four (4) fluidized bed incinerators at the G.E. Booth WRRF which can meet the capacity requirements within the 20-year planning horizon. However, they do not have sufficient capacity at the expanded design flow of 550 MLD. This alternative involves constructing two (2) additional incinerators to allow the G.E. Booth WRRF to operate four (4) incinerators with two (2) as standby. The ash from incineration will be either beneficially used or landfilled. Continuing with incineration would require replacement of the four existing incinerators at their end of their respective service life. The process flow diagram for Design Concept 1 is presented as **Figure 8-6**.

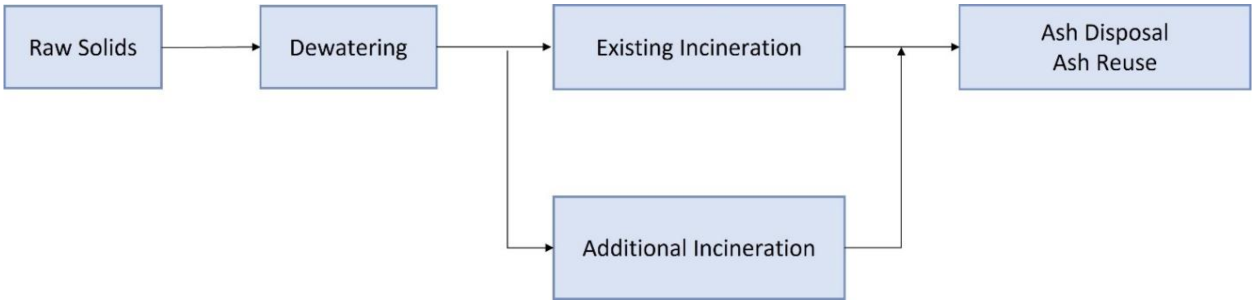


Figure 8-6 Process Flow Diagram for Design Concept 1

8.3.2.2 Design Concept 2: Transport Additional Solids Off Site to the Clarkson WRRF for Management

Similar to Design Concept 1, the existing four (4) incinerators can meet the capacity requirements within the 20-year planning horizon. However, they do not have sufficient capacity at the expanded design flow of 550 MLD. For this alternative, solids in excess of the incinerator capacity at 550 MLD would be transported to the Clarkson WRRF for management. The anticipated maximum volume of solids for transport is 20 dt/d which would require an average of ten (10) semi-tank trailers daily. The solids would be transported in liquid form to minimize the potential for odour and discharged to the high strength waste receiving facility at the Clarkson WRRF to be blended with the solids from the Clarkson facility. The ash from incineration will be either beneficially used or landfilled. The process flow diagram for Design Concept 2 is shown as **Figure 8-7**.

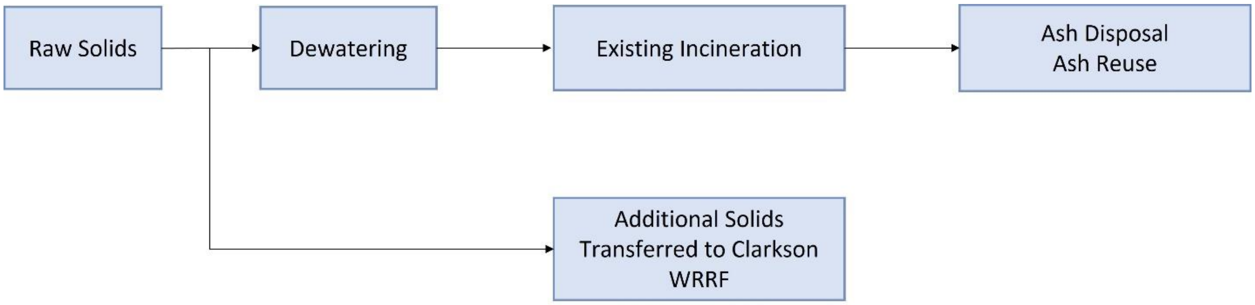


Figure 8-7 Process Flow Diagram Design Concept 2

8.3.2.3 Design Concept 3: Thermal Hydrolysis Process (THP) followed by Anaerobic Digestion prior to Incineration

This alternative involves the construction of a THP and anaerobic digestion system to stabilize a portion of the solids generated at the G.E. Booth WRRF prior to incineration. Digestion would reduce the mass of solids to be incinerated and lower the volatile solids content in the dewatered cake prior to incineration, which would increase the capacity of the incineration units and eliminate the need for their expansion. This option allows the Region to diversify their biosolids management program by transporting digested sludge off-site for management by third-party vendors. Biogas generated during anaerobic digestion would also be collected for beneficial use. The ash from incineration will be either beneficially used or landfilled. The process flow diagram for Design Concept 3 is presented in **Figure 8-8**.

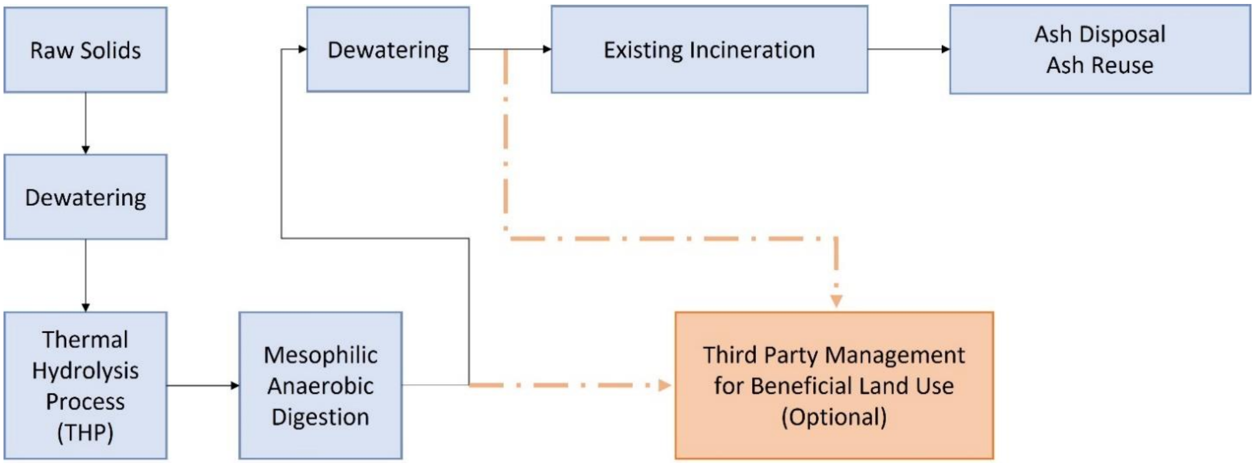


Figure 8-8 Process Flow Diagram Design Concept 3

8.3.2.4 Design Concept 4: Third-Party Management of Additional Solids

Similar to Design Concept 1, the existing four (4) incinerators can meet the capacity requirements within the 20-year planning horizon. However, they do not have sufficient capacity at the expanded design flow of 550 MLD. In this alternative, for solids exceeding the capacity of the existing incineration facility at 550 MLD, third-party biosolids management firms would be contracted to transport and manage the un-stabilized solids. The ash from incineration will be either beneficially used or landfilled. The process flow diagram for Design Concept 4 is presented on **Figure 8-9**.

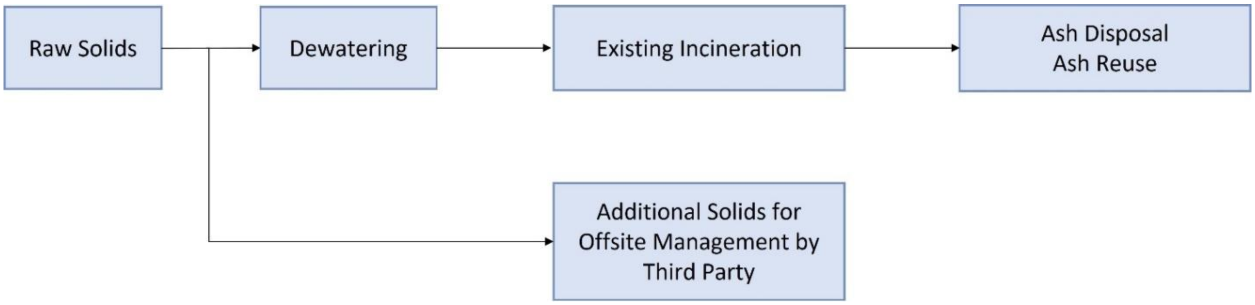


Figure 8-9 Process Flow Diagram Design Concept 4

8.3.2.5 Design Concept 5: Anaerobic Digestion, Dewatering, and Direct Thermal Drying

This alternative moves away from incineration beyond 2041 and includes construction of an anerobic digestion system and direct thermal drying facility. To transition from incineration to drying, eight (8) new digesters, seven (7) duty with one (1) standby, would be constructed to stabilize the solids. Following digestion, the biosolids would be dewatered and dried in a new direct drying facility. On-site storage of the stabilized and dried biosolids would be provided through the construction of two elevated silos. The biosolids product would be beneficially used on agriculture lands as NASM material (digested sludge) or marketed to the public as fertilizer (dried product). The biogas generated during anaerobic digestion would be collected for beneficial use onsite. The process flow diagram for Design Concept 5 is presented on **Figure 8-10**.

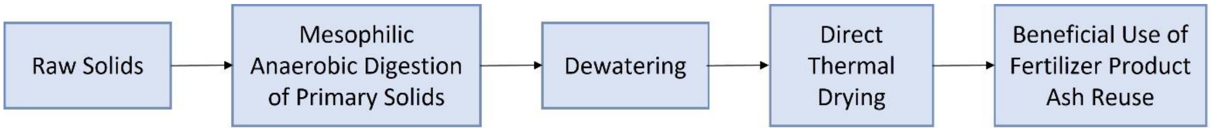


Figure 8-10 Process Flow Diagram Design Concept 5

8.3.2.6 Design Concept 6: Anaerobic Digestion Prior to Incineration

This alternative includes construction of the four (4) new anaerobic digesters, three (3) duty, one (1) standby. Anaerobic digestion would reduce the volatile solids entering the incinerator units which would increase the capacity of the incinerators. This would allow the incinerators to adequately serve the G.E. Booth WRRF within the 20-year planning horizon as well as provide the Region with the time and flexibility to identify a long-term sludge management strategy at 550 MLD that meets the needs of the surrounding community. This concept would allow the G.E. Booth WRRF to continue receiving dewatered biosolids cake from the Clarkson WRRF, resulting in Region-wide biosolids management resiliency and flexibility. The long-term strategy could be a continuation of incineration or implementation of ~~a~~ different technologies, such as drying or THP. This alternative also offers the opportunity to utilize the biogas generated during anaerobic digestion for on-site use, along with exporting the digested biosolids for beneficial use. It also offers the opportunity to continue to receive dewatered sludge from the Clarkson WRRF in the short-term to maximize the use of the incinerator capacity. The process flow diagram for Design Concept 6 is presented on **Figure 8-11.**

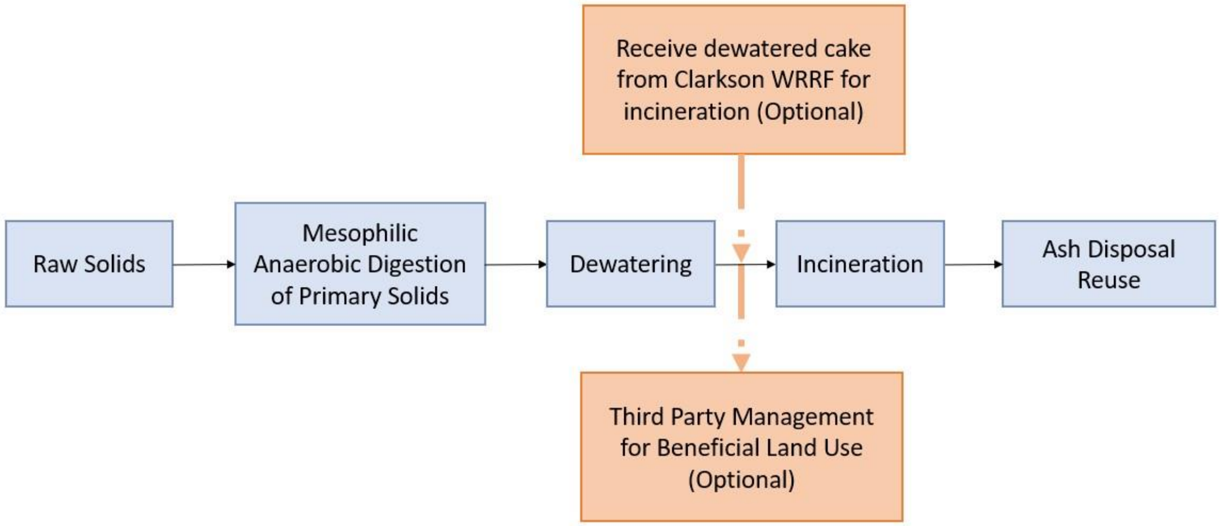


Figure 8-11 Process Flow Diagram Design Concept 6

8.3.3 Evaluation of Alternatives and Selection of the Preferred Design Concept

The six (6) biosolid management design concepts were evaluated using the criteria and approach outlined in Section 8.1. The evaluation matrix in **Volume 3, Appendix M** provides details on the impacts of the alternative design concepts on the natural, social/cultural, technical, and cost environments, while **Table 8-10** and **Table 8-11** provide a summary of the impacts.

All six (6) design concepts for biosolids management produced similar scores, with Design Concept 6 (Anaerobic Digestion prior to Incineration) scoring slightly higher than the other alternatives. This is primarily due to its ease of operation, long-term sustainability, resiliency, and opportunities for energy recovery. The design concept allows the digested sludge to be beneficially land applied. The Region is also exploring beneficial reuse options for incinerator ash, including use of the ash in the production of concrete, asphalt, and bricks.

A review of the alternatives against the Region's key priorities (see **Table 8-12**) indicates that **Design Concept 6: Digestion and Incineration** also aligns best with Region's objectives of sustainability, community acceptability and fiscal responsibility.

Table 8-10 Evaluation of Sludge/Biosolids Management Design Concepts - Natural Environment, Social/Cultural Environment, and Technical Considerations

Criteria Category	Design Concept 1: Expand Incineration; Design Concept 2: Transport Additional Solids to Clarkson WRRF; Design Concept 3: THP, Digestion, and Incineration; Design Concept 4: Third-Party Management of Biosolids; Design Concept 5: Digestion, Dewatering, and Drying; Design Concept 6: Digestion and Incineration	Evaluation Outcome
Natural Environment	Improvements for all alternatives would be located within the site boundary and in areas that are currently used for solids handling and ash storage. All alternatives would be designed to mitigate surface and groundwater impacts. Stormwater management plans would be developed, as well as shoring and dewatering plans. The design concepts with the highest volume of solids incinerated were ranked the lowest for air quality, followed by the design concepts with the greatest volume of solids exported off-site. Air emissions at the G.E. Booth WRRF meets MECP requirements and any expansion would include controls to limit air emissions such that the WRRF continues to meet MECP requirements. All alternatives would be designed to include emission control and treatment to ensure air quality standards are met and impacts would be mitigated. In terms of GHG emissions, the design concepts with the highest volume of solids incinerated ranked the lowest due to the energy requirements. The design concepts with the highest volume of solids that could be used in agriculture and horticulture ranked the highest.	Design Concept 5 (Digestion, Dewatering, and Drying) ranked the highest in overall natural environment scoring, as it has the advantage of lower GHG emissions and the potential for improved air quality.
Social/Cultural Environment	G.E. Booth WRRF is bordered by residential areas to the north, residential planned for the west, and recreational areas to the east and south. Thus, none of the alternatives are compatible with adjacent existing and future planned land uses. However, noise and odour controls and visual site improvements would be implemented to mitigate impacts to neighbouring areas for all alternatives. Design Concepts 2 and 4 were rated slightly lower than the others, due to the need to truck liquid sludge. All design concepts would include odour control and treatment such that all air quality standards are met, and impacts mitigated. Design Concepts 2 and 4 would transport unstabilized dewatered cake and would have the highest odour potential. All alternatives would be designed to mitigate noise / vibration to meet the applicable requirements at the nearest receptors. All alternatives involve eliminating the ash lagoons. The design concept that phases out incineration in the long-term was ranked the highest for visual aesthetics. All alternatives would involve some level of truck traffic to transport incinerator ash, solids between WRRFs, or biosolids product. The design concepts were ranked based on the anticipated vehicle trips. All alternatives would pose some amount of disruption during construction. Other than construction workers coming to site, and the delivery and removal of equipment and material, the disruption would be limited to on the WRRF property. Design Concepts 2 and 4 would have less on-site construction than the other options and were ranked higher. All alternatives would be designed to meet air quality criteria and effluent quality requirements to protect human health and the environment. Design Concept 5 creates a biosolids product that would meet all beneficial use guidelines. All alternatives would be located in the disturbed area of the site with has been cleared of having archaeological potential; no impacts anticipated.	Design Concepts 1, 3, 5, and 6 ranked similarly and the highest, based on not trucking liquid sludge, phasing out incineration (some alternatives), and creation of a biosolids product (some alternatives).
Technical Considerations	While all alternatives have some complexity in operation, Design Concepts 1, 2, 3, 4, and 6 maintain incineration at the G.E. Booth WRRF which has lower complexity. Design Concepts 3 and 5 involve THP and drying, respectively, which would add operational complexity; specifically THP, which requires specially trained operators (stationary engineers), in addition to wastewater operators, and would be the most complex to operate. Alternatives with digestion create the most biogas that can be used for other plant processes and therefore improves energy recovery. Thermal drying (Design Concept 5) uses the most energy. Climate change is not anticipated to have a significant impact of the biosolids management alternatives however Design Concept 5 has the greatest flexibility in terms of end use options and would have more potential for adapting to climate change. Alternatives with significant transportation requirements were ranked the lowest. In terms of obtaining permits and approvals, Design Concept 1 increases the incineration capacity but remains below the 400 dt/d ECA rated capacity for the system therefore additional permitting would be minimized. Additional permitting is anticipated for Design Concepts 3 and 5.	The alternatives ranked similarly, although Design Concept 6 (Digestion and Incineration) ranked the highest due to ease of operation and long-term operational flexibility.

Table 8-11 Evaluation of Sludge/Biosolids Management Design Concepts - Economic Considerations

Criteria Category	**Design Concept 1:** Expand Incineration	**Design Concept 2:** Transport Solids to Clarkson WRRF	**Design Concept 3:** THP, Digestion, and Incineration	**Design Concept 4**: Third-Party Management of Biosolids	**Design Concept 5**: Digestion, Dewatering, and Drying	**Design Concept 6**: Digestion and Incineration	Evaluation Outcome
Capital Cost	$416 M	$258 M	$405 M	$256 M	$417 M	$436 M	Design Concepts 1, 3, 5, and 6 have similar capital costs and life cycle costs. Similarly, Design Concepts 2 and 4 have similar capital costs and life cycle costs.
Annual Operating and Maintenance (O&M) Costs at 550 MLD	$8.7 M	$7.6 M	$8.3 M	$7.7 M	$9.0 M	$7.0 M	
30-Year Life Cycle Costs (2032-2054)	$586 M	$407 M	$569 M	$410 M	$598 M	$569 M	

Table 8-12 Alternative Sludge/Biosolids Management Design Concept's Ability to Meet the Key Study Objectives

Region's Key Objectives	Review Outcome
Long-term sustainability	All alternatives would be designed to meet current needs, while not compromising the ability to meet future needs. However, Design Concept 6 allows Peel to continuously make use of their existing investments, while allowing flexibility to adapt to changing technologies, market conditions, and regulations.
Resiliency	Alternatives with anaerobic digestion have more resiliency as they offer more flexibility in end use markets.
Environmental Protection	All alternatives would be designed, constructed, and operated to protect the environment and meet regulations.
Community Acceptability	Implementing anaerobic digestion prior to incineration allows flexibility in the future to consider alternate technologies that meet the needs of the community. Design Concept 6 therefore best aligns with the Community Acceptability objective.
Ease of Operations	Incineration is the existing process at the G.E. Booth WRRF and is therefore easy to continue. Anaerobic digestion is a proven process already operating in Peel at the Clarkson WRRF.
Energy Efficiency	Design Concept 6 use digestion which allows Peel to reduce current and future energy use at the G.E. Booth WRRF from incineration. It also allows for flexibility to explore alternative treatment technologies in the future which may further reduce energy use and allow for more energy recovery.
Fiscally Responsible	Design Concept 6 is the most fiscally responsible as it takes advantage of the existing infrastructure investments, while maintaining future flexibility. Design Concept 6 also delays the need for large capital expenditures until approximately 2041 and beyond.

8.4 Outfall

The effluent from the G.E. Booth WRRF is currently discharged to Lake Ontario through a 3.65-m diameter and 1,400-m-long outfall with discharge port diffusers in the last 212 m section. The existing outfall has a rated peak capacity of 1,523 MLD per the approved ECA; however, it can only handle flows of approximately 1,200 MLD before flooding of the secondary clarifier launders. As such, the existing outfall would not meet future needs and a new outfall would be designed to meet long-term future needs and minimize the risks of flooding the secondary weirs. The following sections provide an overview of the site-specific constraints, design alternatives and evaluation, and the recommended design concept for the new outfall at the G.E. Booth WRRF.

8.4.1 Outfall Shaft

The development of locations for the outfall shaft considers several factors to establish feasible and reasonable alternatives:

- Site requirements: Spatial requirements for the plant outlet / outfall shaft are based on the footprint of the outfall shaft as well as site staging and laydown areas to facilitate construction. It was estimated that the approximate construction area needed for the outfall tunnel and shaft is 16,500 m^2.
- Proximity to existing connections: The plant outlet / outfall shaft would need to receive flows from the effluent conduits for each treatment train.
- Coordination with nearby facilities: Several nearby existing or proposed facilities, both internal and external of the G.E. Booth WRRF property, need to be considered in siting the outfall shaft. Specifically, the alternative locations must avoid the new effluent pumping station currently under construction and the JTLCA property. In addition, the future District Energy Centre (DEC) in the future Lakeview development is anticipated to draw effluent from the outfall, extract energy, and then return cooler effluent for discharge. The outfall shaft location must be conducive to this potential connection.

8.4.1.1 Alternative Shaft Locations

Three (3) alternative locations for the outfall shaft, along with respective staging area requirements, are identified on **Figure 8-12** and described below. Conceptual shaft arrangements are provided based on experience from similar scale projects with space provided for the shaft construction, storage for tunnel segments and tunnel utilities, an excavated material stockpile, field offices, and tunnel supporting structures such as grout plant, air compressor, sediment tanks, etc. (refer to **Figure 8-13**).

Figure 8-12 Alternative Outfall Shaft Locations and Staging Areas

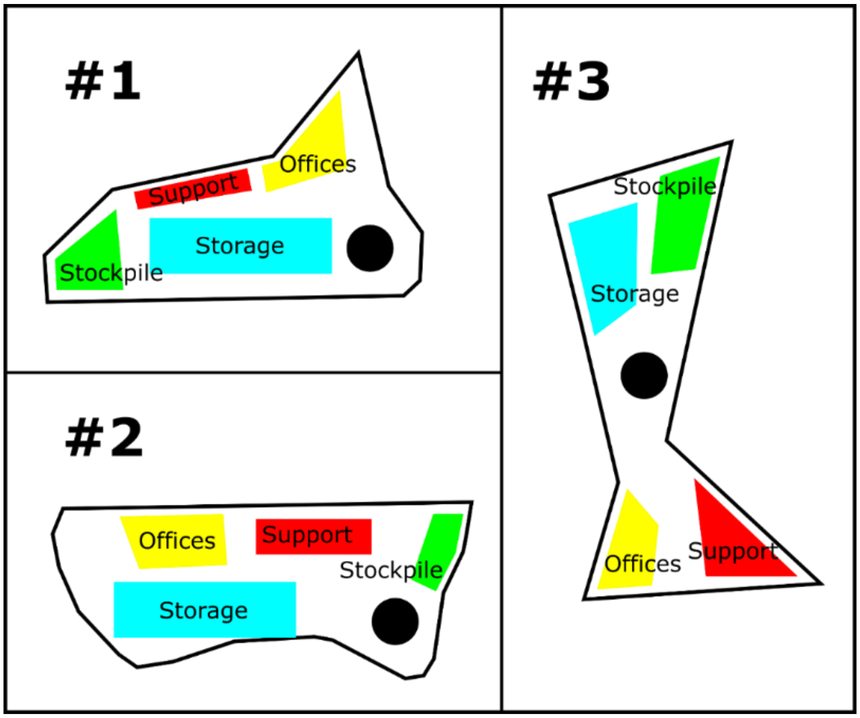


Figure 8-13 Site Staging Requirements

Alternative 1: This alternative is located east of the existing disinfection building, between the existing ash storage pond and the JTLCA. The proposed shaft location is located within the ridge running on the southeast side of the plant and has an approximately 4 m elevation difference from the nearest road surface which would require re-grading. The site can be accessed by a facility road (East Drive); however, the road is also used to facilitate plant operation and construction traffic. The Alternative 1 location is close (~170 m) to the existing outfall shaft and other utilities. This location provides an opportunity to connect to the existing outfall and diversion structures and existing utilities with relatively short lengths of conduit constructed within the East Drive road allowance. The area is relatively spacious with potential use of the east-most ash storage ponds once re-claimed to facilitate the outfall tunnel construction without logistical constraints.

Alternative 2: This alternative is located southeast of the existing ash storage pond. Similar to Alternative 1, the proposed shaft is located within the ridge along the southeast side of the plant and has a 6 to 7 m elevation difference from the nearest road surface which would require re-grading. Access to the area requires navigating around the ash storage ponds. Development of the site would require an additional 170 m of road to be constructed from the nearest plant access road. This location is 350 m away from the existing outfall shaft and 220 m away from the nearest existing utilities. With grading, the area would provide sufficient space to facilitate the outfall tunnel construction without logistical constraints.

Alternative 3: This alternative is located adjacent to the existing outfall shaft near Plant 3. The ground elevation at this location matches the nearest road surface and can be accessed by a facility road (East Drive) therefore minimal re-grading would be needed. The proposed construction site for Alternative 3 overlaps the existing outfall shaft location, therefore this location is the closest to the effluent conduits that need to be connected to allow for diversion. However, it is located furthest from the future DEC. In addition, this location is limited in space with little to no expansion opportunities into the surrounding area as it is enclosed by existing structures critical to plant operation. Construction of the outfall tunnel from the Alternative 3 location would have logistical constraints and challenges which would impact the capital cost and schedule of construction.

8.4.1.2 Evaluation of Alternatives and Selection of the Preferred Shaft Location

The three (3) alternative shaft locations for the new outfall were evaluated using the evaluation approach and criteria outlined in Section 8.1.2. The evaluation matrix in **Volume 3, Appendix N** provides details on the impacts of the alternative shaft locations on the natural, social/cultural, technical, and cost environments, while **Table 8-13** provides a summary of the impacts.

Alternative 1 scored more favourably than or similar to Alternatives 2 and 3 for all categories. Therefore, the recommended location for the new outfall shaft is Alternative 1.

Table 8-13 Evaluation of Alternative Outfall Shaft Locations - Natural Environment, Social/Cultural Environment, Technical Considerations, and Economic Considerations

Criteria Category	Alternative Outfall Shaft Locations 1, 2, and 3	Evaluation Outcome
Natural Environment	• All alternatives would have the potential to impact terrestrial features or species and impacts must be mitigated. Alternative 3; however, has more potential to encroach on JTLCA lands. • Impacts to aquatic systems are expected to be low and would be mitigated. However, Alternative 3 has more potential to encroach on the JTLCA lands and therefore potentially poses a greater risk to aquatic systems.	Alternatives 1 and 2 scored the highest based on the potential impact of Alternative 3 on the JTLCA lands.
Social/Cultural Environment	• All alternatives would have the potential to impact users of JTLCA during construction and all impacts must be mitigated. Alternative 3; however, has more potential to encroach on JTLCA lands. • Construction of alternatives has potential to impact Lakeview Development, however they would be short-term and would be mitigated. • Based on the Stage 1 Archaeological Assessment, the area has been previously assessed and found to have very little risk of archaeological resources. No further Archaeological Assessments are recommended in the area of all shaft locations.	All of the alternatives scored similarly for social / cultural impacts.
Technical Considerations	• Alternative 1 is close to an existing access road (East Dr.) and to the existing outfall and conduits. Site grading is required. Alternative 2 requires new roads to access the shaft and the distance to the existing outfall and conduits can make their connections difficult. Alternative 3 is the most challenging to implement given is configuration and size constraints. • Geotechnical and hydrogeologic conditions would be similar for all three alternative shaft locations. Alternative 2 requires the most material removal and grading. Alternative 3 would require the longest tunnel, as well as more constructability challenges given its configuration and size. • Alternatives 1 and 3 are closest to the existing shaft locations, with Alternative 2 requiring construction of the conduit under and/or around the ash storage ponds. Alternative 2 is closest to the DEC, followed closely by Alternative 1. Alternative 3 is the furthest from the DEC which poses challenges for a connection. Overall, Alternative 1 is the most central with the most advantages for connecting to all infrastructure.	Alternative 1 scored the highest based on its central location, ease of ability to connect to existing infrastructure, and minimized construction challenges.
Economic Considerations	• The location of Alternative 1 would incur the least capital costs and require the shortest construction duration to complete the project. The location of Alternative 3 would have the highest capital costs given the longer length of outfall, constructability challenges, and the distance to connect to the DEC.	Alternative 1 scored the highest based on the anticipated lower capital costs.

8.4.2 Outfall Pipe and Diffusers

Outfall alignment alternatives depend on the plant outlet location and bathymetry. The plant outlet location provides a starting point for the various corridor alternatives, while bathymetry provides an indication of the different potential locations where the outfall would extend into Lake Ontario. Generally, bathymetry influences the length required to reach deep waters efficiently, necessitating shorter supply pipe length and providing greater dilution volumes closer to shore. Based on the results from the RWIA, it the new outfall tunnel will be 6 m in diameter and 3,000 m long with the diffusers located along the last 1,000 m (beginning 2,000 m offshore)

8.4.2.1 Alternative Outfall Alignments

When considering the outlet location, bathymetry data, and a length of 3,000 metres, four (4) alignment corridors alternatives were identified, as described below.

- Outfall Alignment Alternative A: North Alignment, located generally parallel to shore.
- Outfall Alignment Alternative B: Central Alignment, aligned east and perpendicular to shore, located parallel to the alignment of the existing outfall.
- Outfall Alignment Alternative C: Central Alignment, aligned east and perpendicular to shore, but offset further from existing outfall, located parallel to existing outfall.
- Outfall Alignment Alternative D: South Alignment, generally perpendicular to shore, albeit less perpendicular than the central alignments.

The alternative outfall alignments are identified in **Figure 8-14** below.

Figure 8-14 Outfall Alignment Alternatives

8.4.2.2 Evaluation of Alternatives and Selection of the Preferred Outfall Alignment

The four (4) alternative pipe alignments for the new outfall were evaluated using the criteria and approach outlined in Section 8.1.2. The evaluation matrix in **Volume 3, Appendix N** provides details on the impacts of the alternative pipe alignments on the natural, social/cultural, technical, and cost environments, while **Table 8-14** provides a summary of the impacts.

Table 8-14 valuation of Alternative Alignment Corridors - Natural Environment, Social/Cultural Environment, Technical Considerations, and Economic Considerations

Criteria Category	Alignment Alternative A (North), Alignment Alternative B (Central, Parallel to Existing Outfall), Alignment Alternative C (Central, South of Alternative B), Alignment Alternative D (South)
Natural Environment	• Although there no significant aquatic habitats that have been identified in the study area, DFO's No Net Loss Policy must be met. For all alternative alignments, outfall construction would be done through tunneling to minimize impacts to aquatic fish species or habitat, and to the natural features in the JTLCA. Other measures would be implemented through construction to mitigate impacts and meet DFO requirements. • Mitigation measures would be put in place to reduce the risks of construction on Lake Ontario water quality for all alternatives. The outfall and diffusers would be designed to meet dilution and Provincial Water Quality Objectives (PWQO) such that water quality in Lake Ontario is not adversely affected.
Social/Cultural Environment	• Alternatives A and D are closest to the IPZ-1 boundaries, thereby increasing the risk of plumes entering the respective zones, while Alternatives B and C are located more centrally. Therefore, Alternatives A and D were less preferable compared to B and C. Alternative D is closest to IPZ 1. • Construction may temporarily affect users of the JTLCA. Measures to mitigate impacts to the extent possible would be implemented. The outfall and diffusers would be designed to meet dilution and PWQO such that water quality in Lake Ontario is not adversely affected and shoreline water uses and users are protected. However, Alternative A would be closer to the shoreline and potentially result in the plume impinging on the shoreline on more occasions. • No marine archaeological resources have been identified in the area.
Technical Considerations	• Geotechnical conditions are anticipated to be similar for all alternatives. Existing geotechnical information indicates that sound bedrock is anticipated in the entire area and tunneling methods can be used for construction. Additional geotechnical investigations would be required to confirm conditions to support design and construction. • Alternatives B and D reach greater water depths at a shorter distance than Alternatives A and C, thereby reducing the potential length of the outfall and diffuser. Alternative A has the shallowest water depth and as such would require the longest outfall.

Criteria Category	Alignment Alternative A (North), Alignment Alternative B (Central, Parallel to Existing Outfall), Alignment Alternative C (Central, South of Alternative B), Alignment Alternative D (South)
	• Currents are predominantly east to west, moving parallel to shore. Alternatives B, C, and D are generally perpendicular to current direction, yielding optimal diffuser direction compared to Alternative A, which is the least preferred.
Economic Considerations	• Minor cost savings and shorter schedules may be anticipated with Alternatives B and D as the outfall length would be potentially shorter. • Alternatives A and D are closer to the existing IPZ so these alternatives may be more difficult to approve, adding time and potentially cost, to the schedule.

Outfall Alignment Alternative B (Central, Parallel to Existing Outfall) scored more favourably than or similar to the remaining alternatives for all categories. Therefore, the recommended outfall alignment is **Alternative B**.

Alternative B is located centrally and generally parallel to the existing outfall. Alternative B is located most favourably with respect to current direction and bathymetry and located centrally from the IPZ 1 areas for both the A.P. Kennedy and R.L. Clark WTPs. The conceptual layout of the recommended outfall alignment is shown in **Figure 8-15.**

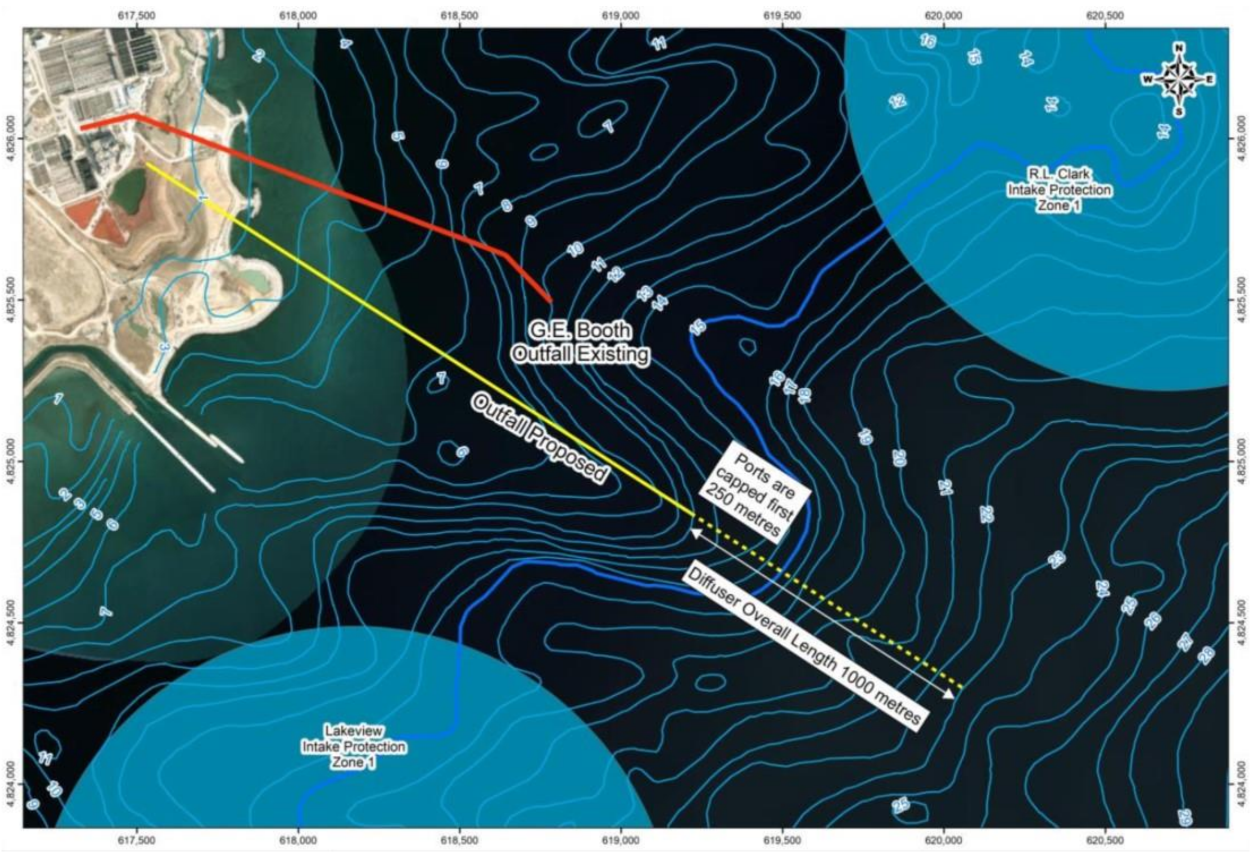


Figure 8-15 Recommended Outfall Pipe Alignment

8.5 Summary of Overall Preferred Design Concept

The wastewater treatment design concept identified as the preferred solution for the G.E. Booth WRRF expansion is the Expansion using CAS Optimized with RTC, which includes the following components:

- Full build-out of Plant 1 (two (2) new primary tanks, three (3) new secondary tanks, and three (3) new aeration tanks);
- Expansion of Plant 3 secondary clarifier No.11;
- New UV disinfection system (sized for reduced peak hourly flows); and
- New outfall.

The biosolids management design concept identified as the preferred solution for the G.E. Booth WRRF expansion includes the following components:

- Take advantage of the existing investments Peel has made by using the incinerators until the end of their service life (approximately 2041);
- Construct an anaerobic digestion system to digest a portion of the solids at the G.E. Booth WRRF. This would reduce the total mass and the volatile solids of the sludge that is incinerated;
- Monitor changes in technologies and regulations, market demand, and shifting regulation trends in order to re-assess biosolids management options by approximately 2031. Maintaining incineration until 2041 would allow the Region the flexibility to select a technology that best meets the needs of the Peel and the surrounding community at the time; and
- Based on the re-assessment, design and construct the recommended long-term solution. This solution could include expansion of the existing incinerators, construction of additional digesters, or construction of new THP or dryer facilities.

The preferred design concept for the new outfall at the G.E. Booth WRRF includes the following components:

- Outfall shaft to be located on east side of property as the optimal location for connection to Plants 1, 2, and 3;
- Outfall pipe alignment to be generally parallel to the existing outfall pipe. New outfall to include a 2,000 m length supply pipe and a 1,000 m length diffuser pipe for a total length of 3,000 m; and
- Existing 1,435 m length outfall to be maintained for redundancy purposes.

Further information on the preferred design concept for the G.E. Booth WRRF expansion is provided in the following section.

9.0 Preferred Design Concept

As described in Section 8.0, the following design components are proposed to expand the G.E. Booth WRRF from its existing rated average day flow capacity of 518 MLD to 550 MLD:

- Expansion of wastewater treatment process using Conventional Activated Sludge (CAS) technology;
- A new UV system to replace the existing chlorination/dechlorination disinfection system;
- New anaerobic digestion upstream of incineration; and
- A new outfall.

RTC is also being implemented in the collection system leveraging available storage and peak attenuation capacity in the sewer system. This would reduce the peak wet weather flows to the plant and mitigate the need for expanded headworks and additional primary and secondary treatment facilities.

This section describes the design basis for conceptual design development, the site layout, and the facilities required for the G.E. Booth WRRF expansion. It also provides an overview of the RTC system to be implemented in the collection system.

9.1 Design Basis

9.1.1 Design Flows

The proposed design flows for the expanded G.E. Booth WRRF are presented in **Table 9-1** below. The peaking factors adopted reflect the use of RTC in the collection system. The proposed rated capacity of 550 MLD accounts for future growth in the plant's catchment and for flows diverted from the G.E. Booth WRRF catchment to the Clarkson WRRF catchment as part of the East-West Diversion Project. A total average day flow diversion of 150 MLD is planned, with an initial diversion of 80 MLD in 2026 and an additional 70 MLD planned for 2031.

Table 9-1 Proposed Design Flows

Parameter	Design Flow	Existing Peaking Factor	Peaking Factor [1]
Average Day Flow	550 MLD		-
Peak Day Flow	935 MLD	1.7	1.7
Peak Hour Flow	1,210 MLD	2.4	2.2
Peak Instantaneous Flow	1,500 MLD	3.0	2.7

The proposed diurnal peaking factors for G.E. Booth WRRF are presented below in **Table 9-2.** They were determined using a diurnal flow chart of the G.E. Booth WRRF flows.

Table 9-2 Proposed Average Day Design Diurnal Peaking Factors

Parameter	Peaking Factor
Minimum Diurnal	0.75
Maximum Diurnal	1.15

The existing G.E. Booth WRRF consists of three (3) parallel conventional activated sludge facilities with wet weather chemically enhanced primary treatment (CEPT) known as Plant 1, 2 and 3. Together, the three (3) plants have a rated average daily flow capacity of 518 MLD. There is an ongoing construction program at the G.E. Booth WRRF to address capacity deficiencies including replacing the existing Plant 1 with two new 40 MLD Plant 1 trains and the addition of two (2) new Plant 3 primary clarifiers. For the purposes of this Class EA, the baseline for developing the expansion alternatives anticipates that these upgrades are in place and fully commissioned.

A capacity assessment was completed using the proposed design basis for the future expansion including the additional capacity resulting from the ongoing upgrades. It was determined that there is a capacity shortfall within the existing secondary clarifiers at the proposed design peak hourly flows and peak daily flows. There are also capacity limitations in the aeration tanks during average daily flow conditions.

A summary of the original design basis as well as the proposed flow between individual plants is presented below in **Table 9-3**.

Table 9-3 Summary of the Original and Proposed Flow Split

Parameter	Flow	Existing Design Basis[1]	Proposed Rated Capacity[2, 3]
New Plant 1	ADF	80 MLD	170 MLD
	PDF	128 MLD	290 MLD
	PHF	176 MLD	390 MLD
Plant 2	ADF	80 MLD	80 MLD
	PDF	128 MLD	140 MLD
	PHF	164 MLD	160 MLD
Plant 3	ADF	358 MLD	300 MLD
	PDF	573 MLD	510 MLD
	PHF	625 MLD	660 MLD
Total	**ADF**	**518 MLD**	**550 MLD**
	PDF	**829 MLD**	**935 MLD**
	PHF	**965 MLD**	**1,210 MLD**

Notes:
[1]Based on flow split defined in G.E. Booth WRRF Contract 3 - New Plant 1, Project No. 17-2926 design basis.
[2]Flow split adjusted to accommodate shortfalls in the existing secondary clarifiers (determined in the capacity assessment in Phase 2) to treat projected PHF.
[3]Based on new peaking factors of 1.7 for PDF and 2.2 for PHF (secondary)

9.1.2 Design Loadings

The proposed design concentrations and loadings at 550 MLD are presented in **Table 9-4** below.

Table 9-4 Proposed Design Concentrations and Loadings

Parameter	Concentration	Average Day Loading	Peak Month Loading	Peak Month Factor
$cBOD_5$	266 mg/L	146,300 kg/d	171,170 kg/d	1.17
TSS	314 mg/L	172,700 kg/d	214,150 kg/d	1.24
TKN	29 mg/L	15,950 kg/d	18,340 kg/d	1.15
TP	4.8 mg/L	2,640 kg/d	3,010 kg/d	1.14

Other design parameters considered in the design are presented in **Table 9-5** below.

Table 9-5 Proposed Design Temperature and Alkalinity

Parameter	Design Value
Minimum Month Wastewater Temperature	12 °C
Alkalinity	233 mg/L as $CaCO_3$

9.1.3 Effluent Quality

Effluent limits and objectives have been defined as part of the RWIA provided in Appendix B, Volume 2. The effluent criteria are based on the following requirements:

- $cBOD_5$ and TSS limits consistent with secondary level of treatment,
- Total Ammonia Nitrogen (TAN) limits and objectives based on achieving a maximum 0.2 milligrams per litre (mg/L) unionized ammonia at the 75th percentile effluent pH and typical seasonal temperatures, and
- The phosphorus concentration limit set to maintain existing ECA approved loading limits of 350 kg/d at the expanded plant capacity.

The proposed effluent limits and objectives are achievable through secondary treatment without the need for tertiary filtration. The proposed effluent objectives and limits are presented in **Table 9-6** below.

Table 9-6 Proposed Design Effluent Limits and Objectives

Parameter	Proposed Effluent Limits [1]	Proposed Effluent Objectives [1]
$cBOD_5$	25 mg/L	15 mg/L
TSS	25 mg/L	15 mg/L
TAN[2]	13.2 mg/L (May 1 – May 31) 6.6 mg/L (June 1 – Sept 30) 13.2 mg/L (Oct 1 - Oct 31) 28.0 mg/L (Nov 1 - Apr 30)	6.6 mg/L (May 1 – May 31) 4.9 mg/L (June 1 – Sept 30) 6.6 mg/L (Oct 1 - Oct 31) 14.0 mg/L (Nov 1 - Apr 30)
TP	0.75 mg/L	0.65 mg/L
E. Coli	200 organisms per 100 mL	150 organism per 100 mL
pH	6.5 – 8.5 inclusive	6.5 – 8.5 inclusive

[1]Effluent limits and objectives to be confirmed upon approval of the Receiving Water Impact Study by the MECP.

A facility wide BioWin® model was developed and applied to simulate the treatment processes to develop preliminary sizing for the process components.

9.1.4 Biosolids Generation

The BioWin® model was run for the Average Day and the Maximum Month Conditions to estimate sludge and biosolids generation amounts. **Table 9-7** summarizes the projected sludge and biosolids generation rates.

Table 9-7 Projected Sludge Generation Rate

Parameter	Average Day Solids Generation	Maximum Month Sludge Generation
Primary Sludge	122,000 kg/d	142,000 kg/d
Waste Activated Sludge	86,000 kg/d	100,000 kg/d

Error! Reference source not found. provides a site plan showing the WRRF design components required to expand the G.E. Booth WRRF to a 550 MLD average day flow rated capacity. The key features of the expansion include:

- Wastewater Treatment Process Components:
  - New Plant 1 primary and secondary treatment facilities,
  - Expansion of the Plant 1 odour control system,
  - Expansion of Plant 3 secondary clarification, and
  - A new UV disinfection facility.
- Sludge Treatment Process Components:
  - New anerobic digesters with biosolids exportation,
  - Biogas storage and utilization, and
  - A new ash dewatering facility.

- New Outfall including:
    - An on-site outfall shaft,
    - Outfall pipe that extends deeper into Lake Ontario, and
    - Outfall diffusers.
- New Energy Centre to provide normal and emergency power to all buildings and processes on site.
- New Administration building at the north-portion of the property.

The facility layout shown in **Figure 9-1** is one overall concept to utilize the site space, provide flexibility for future improvements to the facility, and ensure compatibility with existing plant process, and to minimize community and natural environment impacts. An optimized site plan should be developed prior to the deign of the new infrastructure to consider constructability, integration into the existing facility and site, allowance for future expansion, and to minimize community and natural environment impacts.

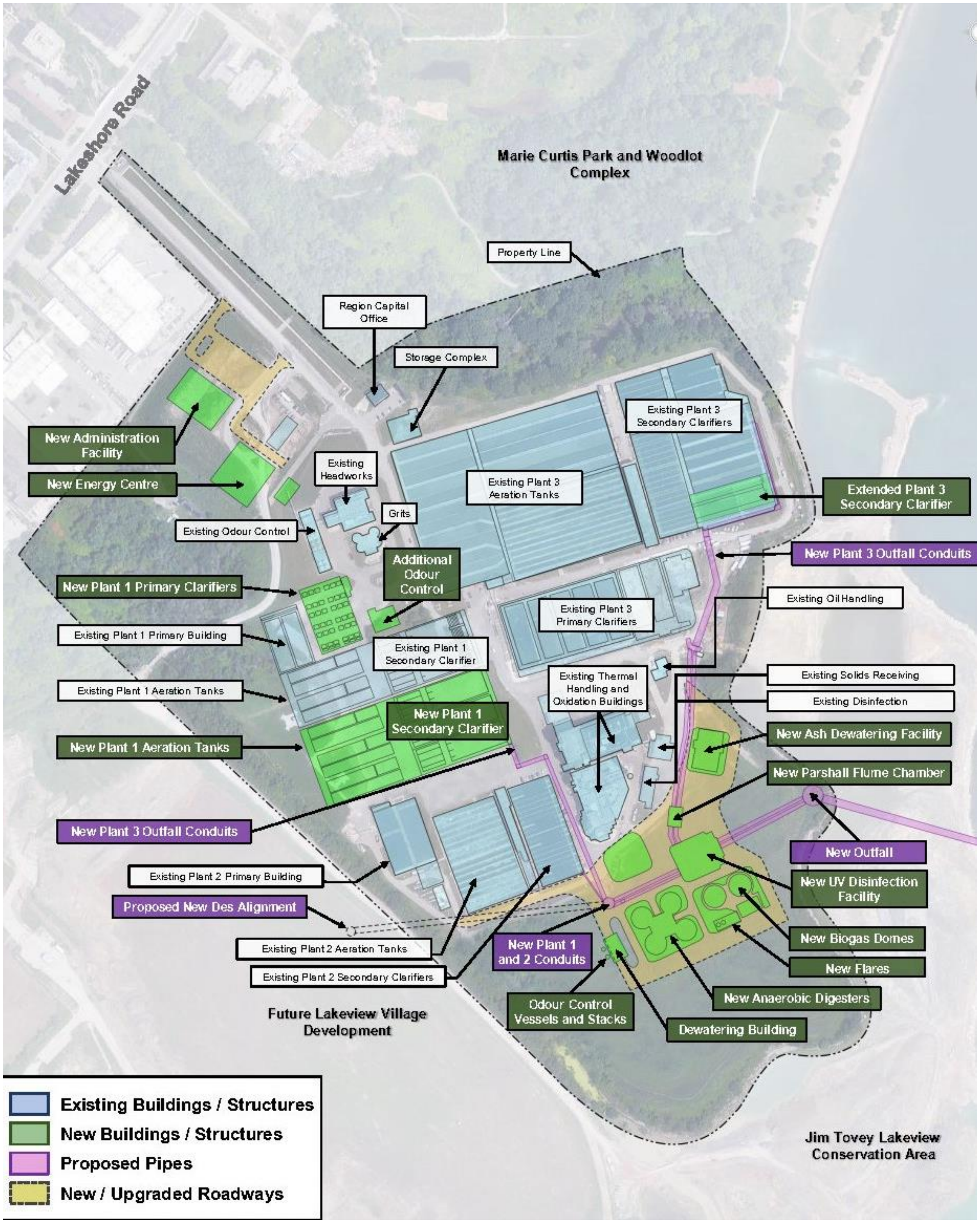


Figure 9-1 G.E. Booth WRRF Design Components

9.2 Wastewater Treatment Components

9.2.1 New Plant 1

As indicated in Section 8.0, the wastewater treatment processes would be expanded using the same process being used at the existing plant – CAS. The capacity of the Plant 1 would be expanded from 80 MLD ADF to 170 MLD ADF, as indicated on **Table 9-3**. The works required to for the new Plant 1 are described in the following subsections.

9.2.1.1 Primary Treatment

Primary treatment for the Plant 1 expansion would consist of two (2) identical rectangular primary clarifier tanks each designed with three (3) passes, for a total of four (4) primary clarifiers in Plant 1. Three (3) primary clarifiers would provide the required capacity based on surface overflow rates at average daily and peak daily flow. The fourth tank would provide redundancy.

The primary clarifiers would be equipped with sludge and scum collection mechanisms. Due to proximity to the future Lakeview Development, the tanks would be covered to provide odour control similar to Primary Clarifier 1 and 2. The conceptual design includes provision for polymer and metal salt addition to the primary influent for phosphorus removal and to enhance sludge settling.

9.2.1.2 Aeration Tanks

Three (3) new rectangular aeration tanks are proposed for the Plant 1 expansion each designed with two passes. Therefore, once expanded, Plant 1 would have a total of five aeration tanks. Four aeration tanks would provide the required capacity. The fifth tank would provide redundancy. Aeration would be provided by fine bubble diffusers along the tank floors.

Each tank would include a swing anoxic selector zone for nitrification and filamentous bacteria mitigation. The provision of a swing anoxic zone has the benefit of reducing aeration requirements and improving sludge settleability. The tanks would also have step feed functionality; meaning the influent wastewater can be distributed to each pass of the aeration tank. The benefit of step feed functionality is flexibility in operation, allowing the ability to change the distribution of wastewater to suit operating conditions such as wet weather events.

9.2.1.3 Aeration Channels

Channel aeration would be provided within the Plant 1 primary inlet channels, aeration tank inlet and step feed channel, and the secondary clarifier influent channel. Channel aeration is already provided for the Plant 1 primary inlet conduit and effluent channel as part of the New Plant 1 project. Coarse bubble diffusion would be installed to prevent solid settling in the channels. The primary clarifiers and primary clarifier inlet channels would be covered to allow for odourous air to be captured in an odour control unit.

9.2.1.4 Secondary Tanks

Secondary clarification in the Plant 1 expansion would consist of three (3) new identical rectangular secondary clarifiers and designed with four (4) passes. Once expanded, Plant 1 would have a total of five (5) secondary clarifiers. Four (4) tanks would provide the required capacity. The fifth tank would provide redundancy. The driving factor for sizing the secondary clarifiers is the solids loading rates (SLRs) at peak daily flows.

Each tank would be fitted with a sludge and scum collection mechanism to remove floating or settled solids, respectively. The sludge and scum would be collected in separate hoppers. Scum would be conveyed along with WAS to the existing Solids Handling Facility. Settled activated sludge would be recycled to the aeration tanks. There would be two (2) WAS pumps per clarifier with one (1) acting as duty and one (1) as standby. There would be two (2) secondary scum pumps per clarifier with one (1) acting as duty and one (1) standby. There would be three (3) RAS pumps for two (2) of the new clarifiers in a two (2) duty, one (1) standby configuration, and two (2) RAS pumps for the third new clarifier in a one (1) duty, one (1) standby configuration.

9.2.2 Plant 3 Secondary Clarifier Expansion

Secondary Clarifier No. 11 would be expanded to provide additional capacity at peak flows. The effluent end of the tank would be extended but the internal configuration of the tank would remain the same. To mitigate impacts from increased headlosses in the system at peak flows, a third secondary effluent channel would be constructed in Plant 3 and the existing Parshall Flume would be removed. Two (2) new Parshall Flumes would be installed downstream within the new twin Plant 3 outfall conduits. A new sludge and scum collection system would be required to accommodate the expanded tank.

9.2.3 UV Disinfection Facility

The existing chlorination/dechlorination disinfection system would be replaced with a new UV disinfection facility. The new UV disinfection facility would house an influent chamber, seven (7) UV channels, and all associated electrical equipment. Five (5) channels would operate as duty and two (2) would be used as standby. Each channel would consist of two (2) banks of UV lamps. Each channel would be equipped with an inlet and effluent weir gate to keep the UV lamps submerged.

The UV disinfection facility would be a two (2)-storey building with a basement. The basement would contain the secondary effluent collection chamber and the UV effluent chamber. The ground floor would provide access to the UV channels and the associated electrical equipment. The second floor would consist of a mezzanine and a mechanical room.

9.2.4 Odour Control

Odourous air would be collected from the following process areas:

- New Plant 1 primary clarifier influent channels,
- New Plant 1 covered primary clarifiers,
- New Plant 1 primary effluent and aeration inlet channels,

- New Plant 1 step feed channels, and
- New Plant 1 secondary clarifier influent channels.

The new channels and primary clarifiers would be covered to minimize the odourous air being released into the environment. The existing Plant 1 Primary Building would be expanded to cover the new tanks to manage odours during maintenance periods when the tank covers are removed. Channel mixing would be provided within the channels in Plant 1 to prevent the deposition of solids and reduce the potential for odour generation.

Two (2) additional odour control trains would be installed within the existing Plant 1 odour control facility to treat the additional odourous air from the expansion of Plant 1. Each odour control train would consist of a pre-filter, fan, a bio-trickling filter (BTF), a polishing granular activated carbon (GAC) filter, an exhaust stack, and associated auxiliary equipment.

9.3 Solids Process Components

9.3.1 Anaerobic Digestion

The recommended biosolids management approach at G.E. Booth WRRF includes the construction of anaerobic digestion and the continued use of the existing incineration system. This strategy provides flexibility for biosolids management and takes advantage of the remaining life of the incineration system.

Four (4) egg-shaped digesters would be provided as part of this expansion to stabilize a portion of the solids generated at G.E. Booth WRRF prior to incineration. Egg-shaped digesters are recommended for G.E. Booth WRRF since they have a smaller footprint than traditional cylindrical digesters and are more efficient due to improved mixing. Each of the four (4) new egg-shaped digesters would be approximately 25 m in diameter at the waist and 21.3 m at the skirt. The top of each digester would be approximately 19.2 m above grade, while the top of the parapet would be approximately 22.7 m above grade.

The digested primary sludge can be mixed with the remaining undigested primary sludge and TWAS prior to dewatering. Thus, digestion of a portion of primary sludge would reduce the amount of solids entering the incinerators. Digestion would also reduce the volatile solids concentration entering the incinerators. Lowering the concentration of volatile solids would allow the incinerators to operate more efficiently at lower temperatures, thereby improving their performance and increasing their operating capacity.

Anaerobic digestion would also produce stabilized biosolids that the Region can beneficially use in an agricultural program as per NASM or as a feed stock to an advanced stabilization process to produce fertilizers. This concept would provide flexibility for the Region to have diversified outlets for biosolids management at the G.E. Booth WRRF.

9.3.2 Biogas Storage and Utilization

The anaerobic digesters would produce biogas which can be used on the WRRF site to supply energy to operate boilers, internal combustion engines, and/or heat drying equipment (if selected as the long-term biosolids management approach after reassessing the biosolids strategy by approximately 2031). The biogas can also be upgraded to produce renewable natural gas (RNG).

For the G.E. Booth WRRF, a biogas storage facility would be required to allow consumption by different appliances onsite. The detailed selection of biogas utilization methods should be determined during the design of the digesters, with consideration of the energy price, RNG market values, and regulatory changes.

Two (2) enclosed burner flares would be installed as part of the anaerobic digestion facility. The enclosed design allows for the combustion of waste gas without the flame being visible outside of the unit.

9.3.3 Ash Dewatering

A new ash dewatering facility would be constructed to allow the decommissioning of the existing ash lagoons. Following incineration and scrubbing, the ash slurry would be conveyed by gravity to the four existing ash slurry holding tanks. The existing ash slurry pumps would be utilized to pump the ash slurry to the new ash dewatering facility. The ash dewatering facility would consist of four lamella plate gravity settlers to thicken with ash slurry with the aid of polymer addition. The thickened ash slurry would be dewatered via four new rotary drum vacuum filters. The dewatered cake would then be conveyed by motorized screw conveyors to storage trailers for intermittent haulage off-site.

9.4 Outfall

9.4.1 Design Basis

The new outfall would be designed to allow treated effluent to flow by gravity from the plant and be dispersed into the lake via the diffuser risers and ports. The outfall design basis and specifications assumed at the conceptual design stage are presented in **Table 9-8** and **Table 9-9**, respectively.

Table 9-8 Outfall Design Basis

Parameter	Value
Future Peak Flow[1]	2,100 MLD
Projected Water Level at Lake Ontario	76.00 m
Distance of Diffusers from Shore	2,000 m

Note: The outfall was conservatively sized for 2,100 MLD to allow the Region flexibility to meet longer term needs and adapt to future conditions such as climate change.

Table 9-9 Outfall Design Specifications

Outfall Design	Parameter	Value
Outfall Shaft	Diameter	20 m
Outfall Tunnel	Diameter	6 m
Outfall Tunnel	Total Length	3,000 m
Outfall Tunnel	Diffuser Length	1,000 m (starting 2,000 m from shore, first 250 m of diffusers to be capped)
Diffusers	Number of Diffusers	68 (first 250 m of diffusers to be capped)
Diffusers	Nozzle Diameter	500 mm
Diffusers	Diffuser Spacing	15 m
Diffusers	Port Height	Varies

As indicated in **Table 9-8 and Table 9-9**, it is assumed that the new outfall tunnel would be approximately 3,000 metre long, and about 6 metres in diameter. The diffusers would begin approximately 2,000 metres offshore, with a total of 68 diffuser ports, spaced 15 metres apart along a length of 1,000 metres. Initially, the first 250 metres of diffuser ports would be capped providing a peak flow capacity of 2,100 MLD. The capped ports would be opened as required to provide additional peak flow capacity beyond 2,100 MLD in the future. This higher peak capacity allows the Region flexibility to meet longer term needs during the lifespan of the outfall (i.e., 75 to 100 years), as well as adapt to future conditions relating to climate change.

The outfall tunnel would be connected to a new 20 metre diameter onshore outfall shaft which would receive disinfected effluent from the new UV disinfection facility.

9.4.2 Outfall Tunnel

9.4.2.1 Plan and Profile

The outfall tunnel alignment was selected from various corridor alternatives based on preferred plant outlet location and lake bathymetry as described in Section 8.0. The recommended alignment was selected to protect WTP intakes and shoreline uses, and to optimize the mixing and dispersion of the effluent at the shortest tunnel length possible. The outfall tunnel alignment is located between the IPZs of both Arthur P. Kennedy WTP and R.L. Clark WTP. It is also parallel to the existing outfall location. **Figure 9-2** and **Figure 9-3** below show the recommended outfall tunnel alignment plan and profile, respectively.

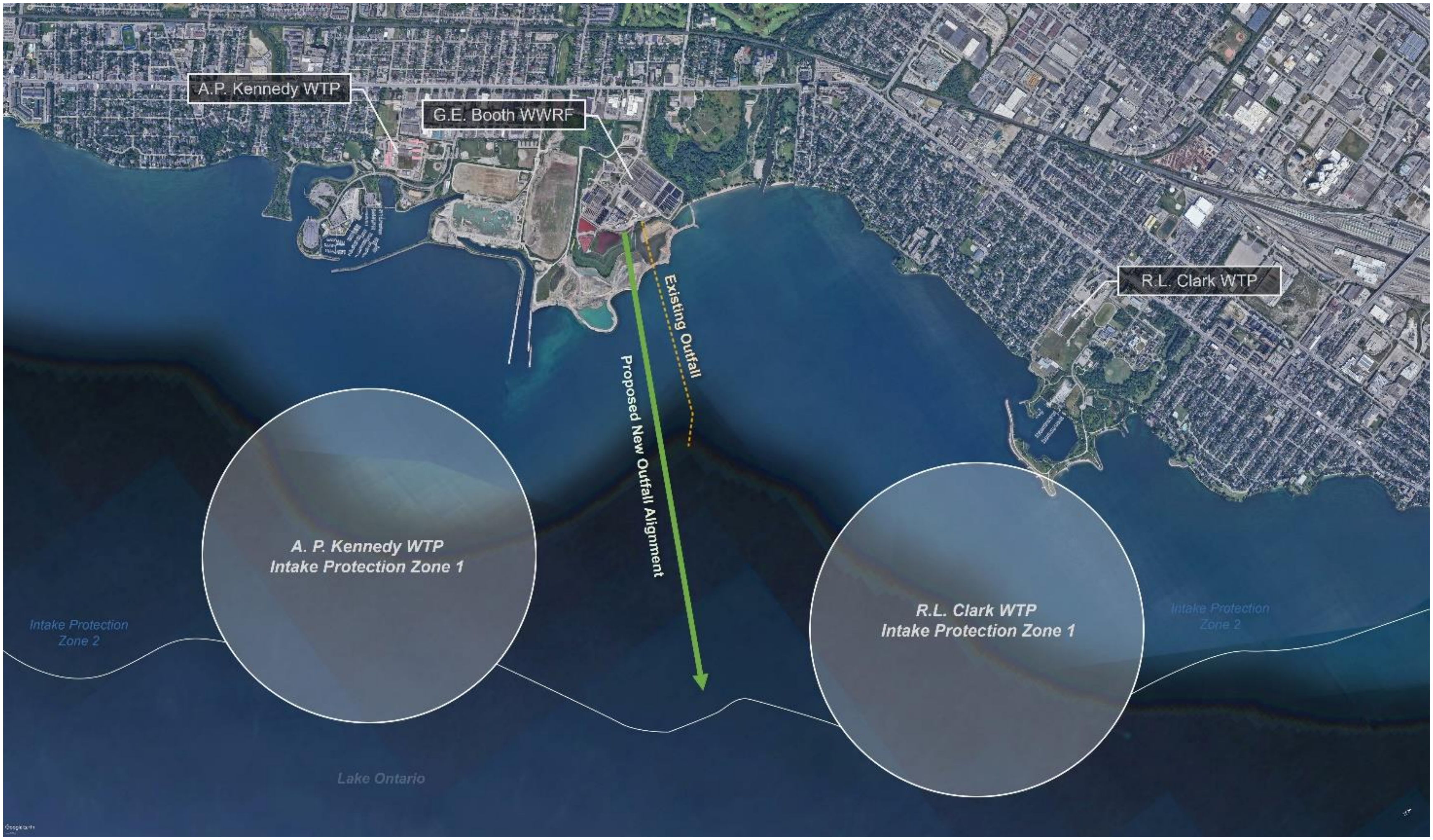


Figure 9-2 Recommended Outfall Tunnel Alignment - Plan View

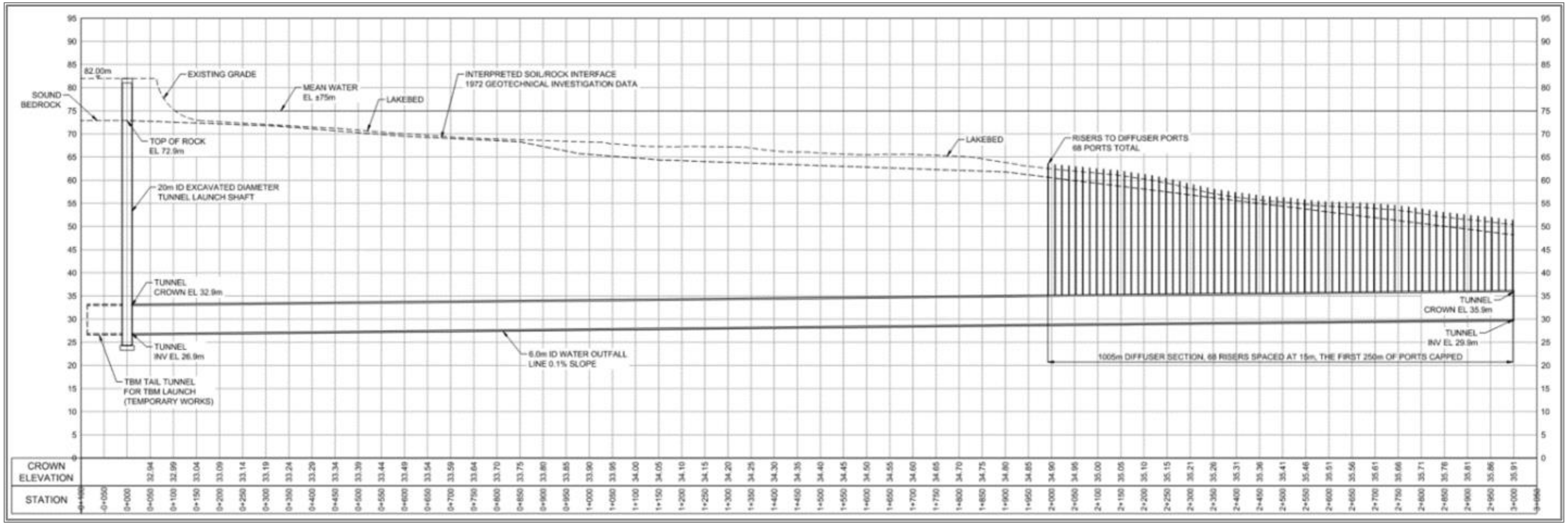


Figure 9-3 Recommended Outfall Tunnel Alignment - Profile View

9.4.2.2 Construction Method

Based on the tunnel diameter, depth, and subsurface conditions (geologic and hydrogeologic characteristics) along tunnel alignment, a single shield Tunnel Boring Machine (TBM) is identified as the preferred tunnel excavation method. A TBM is used for full-face excavation in various rock and ground conditions. A typical TBM consists of a rotating cutter head assembly mounted on a frame that can travel horizontally a short distance, typically 1.5 to 2 m, as determined by the length of the hydraulic cylinders. Scoops around the perimeter pick up and deposit the chips onto a conveyor behind the cutterhead that transports the chips to the muck handling system at the tail end of the TBM. This method addresses the following key aspects:

- Safety: concerns associated with tunnel collapse/slabbing are greatly reduced when using a single shield TBM as it allows for the final lining, precast segments, to be installed concurrently with the tunnel excavation.
- Rock competency: The tunnel is expected to be constructed within the anticipated Georgian Bay Formation bedrock at a depth of approximately 43 m below the ground level. The tunnel is therefore expected to be covered by a minimum of 12m (2 times the tunnel diameter) of bedrock.
- Water inflow: The tunnel is expected to be excavated in rock of relatively low permeability. A single shield TBM therefore appears to be the most suitable method as it only requires low to moderate water inflow control while also being cost-effective.

Precast segmental lining (single pass method) is recommended for the G.E. Booth WRRF outfall tunnel lining. The rationale behind this recommendation is that the precast segmental lining generally has superior quality and reduced overall construction duration compared to cast-in-place concrete lining. Precast segmental lining also provides better risk mitigation compared to cast-in-place lining especially for risks related to life safety, anticipated subsurface conditions and quality. Based on recent market trends, precast segmental lining cost is becoming more competitive and is therefore expected to be comparable to the cast-in-place concrete lining option.

The recommended tunnel excavation method will be reviewed and validated upon completion and receipt of site specific geotechnical and hydrogeological investigation results.

9.4.3 Outfall Shaft

The shaft is the primary access point for tunnel construction. The shaft would be used to set up and launch the TBM, transport materials and equipment into the tunnel, and to remove the tunnel spoil and waste material during excavation. The shaft should be sizable enough to allow space for the conveyor belt storage. The shaft has been sized conceptually at 20 m diameter to facilitate this operation. After excavation of the tunnel, the TBM would be disassembled and retrieved. As presented in Section **Error! Reference source not found.**, alternative on-site locations for the outfall shaft were assessed, and a preferred location was selected considering constructability, potential impacts on natural features, ability to connect to existing infrastructure and the DEC, and costs.

The recommended shaft excavation method in both overburden and rock material is excavators, while circular secant pile walls are recommended for shaft initial lining through the overburden material. The initial support system recommended for the shaft portion excavated in rock consists of rock bolts around the shaft perimeter and shotcrete with welded wire mesh. As final lining, cast-in-place concrete would be poured against the secant piles and temporary rock support once tunnel construction is complete.

9.4.4 Existing Outfall

The existing outfall, although not sufficient size and length to meet future needs, is structurally sound and therefore would remain in place and be used during maintenance or emergency situations, as required.

9.5 New Energy Centre

The preferred approach to power distribution in support of the G.E. Booth WRRF expansion includes a new centrally located power generation facility (i.e., New Energy Centre) to manage the supply of normal and emergency power to the existing 27.6 kV power distribution system loop. The proposed Energy Centre would provide normal and emergency standby power to all buildings and processes on-site. The Energy Center would be connected to the two existing utility feeders which supply power to the plant. Four 3 MW standby power generator units would be installed to provide the required power capacity to support the operational load of the expanded plant. The existing 27.6 kV power distribution loop would be modified as required to service the expansion at the south end of the facility.

9.6 Administration Building

The new administration facility building would be a two (2)-storey above-grade structure near the main entrance to the site, off Lakeshore Road West. The building would also consist of a below-grade single-level parking structure as well as above ground parking to ensure an adequate amount of parking spaces are provided. The parking area would also have a bus loading area and electric vehicle charging stations. The location near the entrance of the plant would allow for easy access and parking for external visitors without having to enter the plant process areas.

The main floor would have a large lobby area, a training center, a meeting/training rooms, open office space, and unisex locker rooms. There would also be a laundry room. The main entrance would enter an open lobby area designated for visitors with informative displays for public engagement and education. This area would be separated from the rest of the main floor which would be reserved mainly for internal staff. There would be a lab room and area with an overhead crane and equipment modules for training. This area would have a truck loading bay access. There would be an additional entrance to the side of the building away from the main area to allow for easy and direct lab access for pickups and deliveries.

The second floor would consist of additional open office space, a SCADA room, a library/records room, a control room, and a lunchroom with adjacent patio area.

9.7 Conceptual Rendering

Architectural features would be incorporated into the above-grade buildings and would be designed to have a long service life with minimal maintenance requirements. As part of the design process, contextual consideration would be taken for the proposed buildings, ensuring they complement the aesthetics of the existing built environment with light precast concrete panels and metal siding. Additionally, sustainable building materials would be considered for this project as they can potentially help save on utility and maintenance costs, while contributing to the sustainability of the Region's infrastructure facilities. New and upgraded roads are also part of the design to allow for easy access to new facilities. Facilities were located on site to ensure compatibility with existing plant process, and to minimize community and natural environment impacts.

Figure 9-4 and **Figure 9-5** provide conceptual renderings of the current facility and facility after expansion, respectively. As shown in the renderings the expanded facility would be designed to be compatible with surrounding land uses. Any additional concepts and/or renders developed during the detailed design stage would adhere to the Region's design standards.

Figure 9-4 Existing G.E. Booth WRRF

Figure 9-5 Proposed Expansion of G.E. Booth WRRF

9.8 Real Time Control

The Region plans to implement RTC based on the recommendations of their recently completed study: *Real Time Control Implementation – Assessment of Existing Sanitary Trunk and Collection System (Stantec, October 2022)*. The study identified numerous flow control sites where RTC can be integrated into the sewer system to manage peak wet weather flows. The implementation is proposed to be done in stages to minimize implementation risks and provide greater assurances of the long-term sustainability of the strategy. Its implementation would provide the following benefits to the Region:

- Opportunity to attain an enhanced level of service and system performance relative to the Region’s minimum design objectives,
- Added operational visibility and flexibility for both collection system and treatment system operators,
- Added flexibility for managing and adapting to changing growth, climate conditions and servicing requirements, and
- Opportunity to realize significant cost savings in planned capacity upgrades and expansions to the Region’s WRRFs.

The Phase 3 assessment presented in Section 8.0 indicated that the preferred solution for the G.E. Booth WRRF includes RTC as it eliminates the need to expand the headworks and reduces the need for an additional treatment train.

10.0 Impacts and Mitigation

Several assessments were completed on the preferred design concepts to better understand the potential impacts of the proposed facility expansion (**Volume 2 – Supporting Technical Reports**). The following section provides a description of the potential impacts of the preferred design concept, and the associated mitigation and monitoring measures required during detailed design and construction. **Table 10-2** and **Table 10-3** provide summaries of the impacts and mitigation measures of the proposed facility expansion and new outfall, respectively.

10.1 Natural Environment

10.1.1 Terrestrial and Aquatic Features and Habitats

10.1.1.1 WRRF Capacity Expansion

A combination of secondary source information and targeted ecological field investigations were completed to determine the presence and extent of natural heritage features and their associated function within and adjacent to the G.E. Booth WRRF (refer to **Volume 2, Appendix A**). The documented provincially significant natural heritage features within or immediately adjacent to the G.E. Booth plant are as follows:

- Fish habitat (Applewood Creek and Serson Creek);
- Confirmed and candidate Significant Woodlands;
- Wetland (SWD2-2);
- Candidate and Confirmed Significant Wildlife Habitat (SWH):
  - Candidate Turtle Wintering Areas (Applewood Creek);
  - Candidate Bat Maternity Colonies;
  - Candidate Habitat for Special Concern and Species of Conservation Concern (Purple Martin, Monarch, Snapping Turtle);
  - Confirmed Habitat for Species of Conservation Concern (Barn Swallow); and,
- Candidate habitat for endangered and threatened species (Blanding's Turtle, Little Brown Myotis, Northern Myotis, Tricolored Bat, Butternut, and American Eel).

Significant natural areas and Natural Green Spaces were also identified in the northwest wooded portion of the site and immediately east of the site, per the City's OP. One Special Management Area is also associated with the northwestern cultural meadow vegetation community. Under the Region's OP, one Core Area was identified along Applewood Creek which is part of a larger woodland complex (off-site) in Marie Curtis Park.

An impact assessment was completed to determine whether any potential impacts to existing natural heritage features would occur as a result of the proposed facility expansion. The majority of the natural heritage features will be avoided; however, some alteration is proposed within or adjacent to fish habitat

(Serson Creek), SWH (Barn Swallow), and significant woodland. Measures to mitigate impacts to these natural features will include:

- Preparation and adherence to a frac-out contingency plan for the trenchless installation of the DEC piping under Serson Creek;
- Erosion and Sediment Control (ESC) and spill prevention measures during construction;
- Mitigation of temporary construction dewatering to minimize impacts to surface and/or groundwater quality;
- Barn Swallow nests were identified on Blower Building 1 which is immediately adjacent to an expansion area. Care should be taken to not harass or harm nesting Barn Swallows during construction;
- Where possible, construction activities should be timed outside of the nighttime and early morning periods during the bat and bird breeding seasons (April 1st to September 30th);
- New lighting should be directed away from the existing woodlands to avoid impact to wildlife activities. Consideration should be given to installing fencing along the boundary of the existing facility to discourage human interaction with the adjacent woodlands;
- While isolated, where tree removals are proposed the following measured should be considered:
  - Tree removals to occur outside of the active bat roosting window (April 1st to September 30th) and Migratory Bird window (early April to end of August);
  - To reduce the spread of invasive species, all trees should be disposed of locally.
- While there are no specific development setbacks for new buildings and structures on the G.E. Booth WRRF from the JTLCA, through the detailed design process, new facilities should be located as far as feasibly possible from the JTLCA to minimize impacts to natural areas from noise, light, bird collisions, etc.

Although the ash lagoon is not considered a natural heritage feature, it is proposed for removal and, (while not encountered during the ecological investigations), there is a possibility for fish, amphibian, or turtle migration to the ash lagoon prior to its removal. Consequently, an ecologist will undertake an onsite investigation during design to screen for: turtles, amphibians, and fish, and if species are found, the Region will ensure proper removal and/or relocation of species. Scientific Collector Permits will be obtained from the MNRF to collect fish and wildlife ahead of alteration within the ash lagoons, as necessary. Likewise, a 'Wildlife Scientific Collector's Authorization' will be required from the MNRF, to remove and relocate species. Amphibians and reptiles would be relocated to adjacent habitats (likely within the JTLCA or Applewood Creek); however, this would need to be determined with the MNRF through the permitting process.

There will be limited natural heritage feature removal as a result of the proposed G.E. Booth WRRF expansion, and where alteration is proposed within or adjacent to natural features the mitigation measures described above will be implemented. The proposed expansion of the G.E. Booth WRRF therefore can be completed without negative impacts to the natural heritage features and associated functions both within the property and to adjacent features, provided the appropriate mitigated measures are enacted and monitored. Landscaping and site restoration following construction will also occur, and opportunities to plant buffer plantings surrounding the vegetation to the east, west, and south will also be explored during detailed design.

10.1.1.2 New Outfall

The preferred location of the outfall shaft was selected to avoid the JTLCA and is situated within a disturbed area of the G.E. Booth WRRF classified as Cultural Meadow with bush, grass, and shrub species. Throughout the detailed design stage, CVC should be consulted on the design of the new outfall shaft, specifically with respect to its impact on the natural environment but also to maintain CVC's access to the JTLCA and associated staging areas. As shown in **Figure 10-1**, the CVC is developing conceptual layouts of the JTLCA, along with the Operations Compound and associated access road, which should be considered throughout the detailed design of the plant expansion.

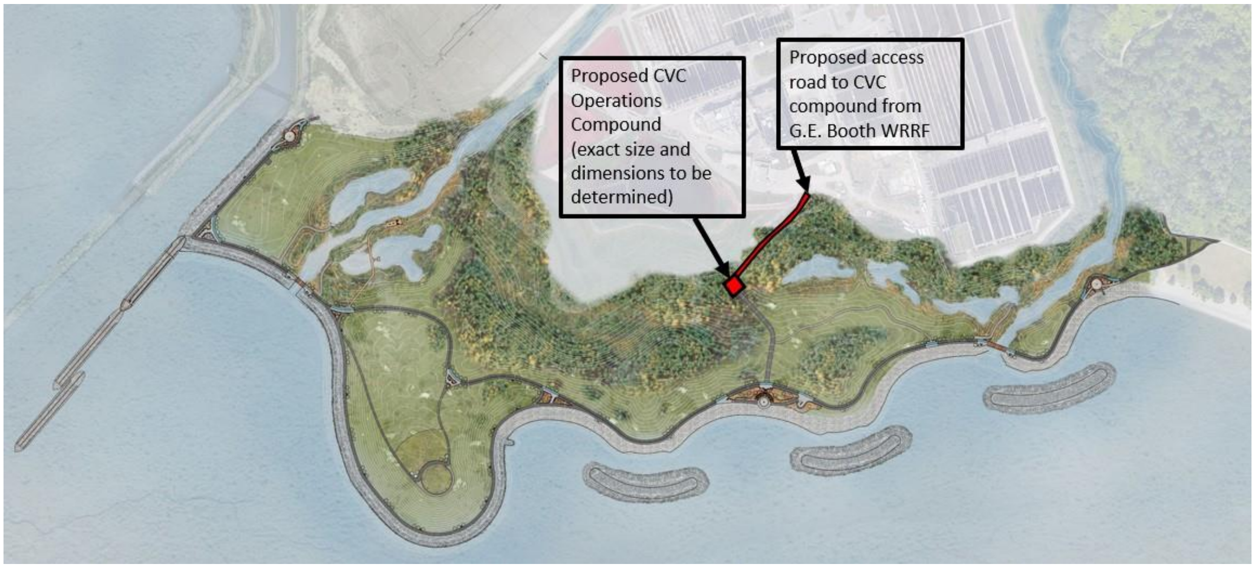


Figure 10-1 Conceptual Access Road Location within JTLCA

Protecting the JTLCA is an important component of the Region's mitigation strategy and any impacts to natural features during construction will be mitigated though techniques described above.

With respect to the outfall/diffuser construction, the Lake Ontario shoreline at the G.E. Booth WRRF has been degraded over time with little suitable fish habitat in the area. Regardless of the lack of fish habitat, any potential in-water impacts will be identified, mitigated, or avoided through the use of tunneled construction and other construction timing and methodologies that limit impacts to the environment. Furthermore, while shoreline impacts related to the outfall construction are not anticipated, any shoreline impacts anticipated throughout the detailed design stage will need to be reviewed with CVC and approved by the DFO. During design it is recommended that detailed habitat mapping, benthic and mussel sampling, and targeted fish community sampling be undertaken to confirm aquatic habitats and species along the tunnel alignment, particular the diffuser area. Based on the results of these investigations, mitigation measures to protect fish habitat during the outfall construction should be identified.

10.1.2 Stormwater Management Plan

The proposed facility expansion will require the completion of a SWM plan during the detailed design stage. The additional buildings and facilities required for the plant expansion will increase the imperviousness of the property and could potentially increase runoff, impact water quality, and decrease infiltration. Overall, the site-wide drainage conditions must be maintained to pre-development conditions therefore a hydrologic analysis will be conducted and presented within the SWM report. In addition, the SWM report will include a detailed drainage plan that will identify the contributing catchment areas to the various drainage features in the existing and proposed conditions. Of note, the SWM report should complete a hydrologic review of the existing SWD2-2 community (refer to Figure 3 of the Natural Heritage Characterization Report in **Volume 2 Appendix A**) during detailed design to confirm that the proposed expansion will not negatively impact the feature. SWM controls will be recommended to maintain the water quantity and quality to pre-development levels throughout the expansion areas of the G.E. Booth facility. The SWM will be a combination of site regrading and conveyance of stormwater across the site towards Lake Ontario.

10.1.3 Flood Protection

The proposed facility expansion is required to avoid or mitigate the erosion and flooding hazards associated with adjacent water bodies and watercourses which includes Lake Ontario, Applewood Creek, and the newly re-constructed Serson Creek. The G.E. Booth facility, including the expansion areas, remain outside of the erosion and floodplain hazard limits of Lake Ontario and Applewood Creek. Serson Creek was re-constructed immediately west of the G.E. Booth facility with a berm located between the creek and the plant however CVC does not consider this berm to provide flood protection for the plant. **Volume 4, Appendix T2** includes floodplain mapping for Applewood Creek and Serson Creek, which details that while the Serson Creek floodline does not enter the G.E. Booth facility, a spill condition exists and therefore the Regulatory floodplain is undefined in the G.E. Booth facility. Therefore, as part of the expansion, the Region will need to provide reasonable flood protection for expansion areas. This can be accomplished by ensuring a minimum of 0.3 metres of freeboard from the Serson Creek flood elevations for finished floor elevations of buildings in expansion areas. Where this option is impractical, opportunities to flood-proof buildings should be examined. During the detailed design stage, it is recommended that the design team contact the CVC for any updated information on the regulatory flood elevation(s) relevant to the G.E. Booth WRRF and the flood-proofing requirements for the new buildings within the floodplain associated with Serson Creek. The plant upgrades will need to consider these flood mitigation measures where applicable. In addition, it is recommended that the design team contact the CVC for the as-built condition of Serson Creek which will have the delineated erosion hazard limit and appropriate setbacks for the plant expansion design.

10.1.4 Lake Ontario Water Quality

To continue to protect Lake Ontario water quality at the expanded flows, Peel will reduce the limits and objectives for TP concentrations so the total loadings to Lake Ontario do not increase as flows increase. The RWIA indicated that the proposed diffuser concept identified for the new outfall exceeds the target dilutions less than 100 m away from the diffuser, which corresponds to a reduced mixing zone. The RWIA also indicated that PWQOs would also continue to be met and have been accepted by the MECP. The RWIA is presented in **Volume 2, Appendix B** and is further summarized in Section 8.0 of this ESR.

10.1.5 Source Water Protection

Ontario's Clean Water Act (2006) provides a framework for the development and implementation of Source Protection Plans to protect sources of drinking water across Ontario. The MECP issued updated Technical Rules (2021) that must be followed in the development of Source Protection Plans. The G.E. Booth and Clarkson WRRFs are located within the CVSPA, which is grouped within the larger Credit Valley, Toronto and Region, & Central Lake Ontario (CTC) Source Protection Region (SPR). As mandated by the 2006 Clean Water Act, a Source Protection Plan must be prepared for each SPR. The CTC Source Protection Plan came into effect on December 31, 2015.

The Technical Rules require the development of an Assessment Report to evaluate intake vulnerability, risks to water quality, and threats to the water system. The Assessment Report is a technical document that provides the scientific information used to develop the Source Protection Plan. The Approved Updated Assessment Report: Credit Valley Source Protection Area came into effect on December 5, 2019.

Based on the 2019 Approved Update Assessment Report and additional event modelling undertaken as part of this Class EA, as presented in **Volume 2, Appendix H**, the study indicated that a disinfection failure at the G.E. Booth WRRF was determined to be a significant threat to the Burlington, Burloak, Oakville, Lorne Park, Lakeview (now A.P. Kennedy), and R.L. Clark water systems in the CVSPA. Peel minimizes the risk of disinfection failures by providing adequate system redundancy and stand-by power, as well as applying best management practices during operation and maintenance. Spill prevention and response plans and training procedures are in place and updated as required as additional measures to mitigate risks.

As the G.E. Booth WRRF is situated between the A.P. Kennedy WTP and R.L. Clark WTP, the IPZs of these plants was taken into consideration when determining the preferred corridor alignment for the new outfall. The preferred corridor alignment was generally equidistance between each IPZ, thereby minimizing source water protection risk to both WTPs.

10.1.6 Greenhouse Gas Emission Control

The Region's Energy Policy aims to achieve net-zero GHG emissions at their WRRFs by 2050. The following opportunities for GHG emission reduction at the G.E. Booth WRRF are available:

- **Implementation of Ammonia-Based Aeration Control (ABAC):** This initiative is being implemented in Plant 2 and 3 as part of the Plant 2 and 3 Blower Upgrades project. The expansion of Plant 1 will be interconnected with the existing Plant 1 aeration system, which was not design for ABAC, but it is anticipated that Plant 1 will include ABAC control in the future.
- **Implementation of nitrous oxide (N2O) monitoring:** N2O accounts for up to 90% of the GHG emissions produced at WRRFs and real-time monitoring could be integrated into the facility's

SCADA system thereby enabling operators to identify N2O emissions and optimize conditions via air supply or dissolved oxygen to reduce the N2O emissions produced.

- **Anaerobic digestion:** The anaerobic digesters will produce biogas which can be used on the WRRF site to supply energy to operate boilers, and internal combustion engines The biogas can also be upgraded to produce renewable natural gas (RNG).   As part of the preferred solution, a biogas storage facility will be constructed.

In addition, to the above, the G.E. Booth WRRF will help provide energy to the Lakeview Village Development through the DEC.

10.2 Social and Cultural Environment

10.2.1 Cultural Heritage

As a result of past military uses in the area, there are designated heritage properties within the G.E. Booth WRRF, including the Long Branch Indoor and Outdoor Rifle Ranges. The new administration facility is in the vicinity of these heritage properties, as illustrated in **Figure 10-2**. Although construction activities are planned to avoid impacts to these identified cultural heritage resources, a qualified heritage consultant should be contracted during detailed design (when the features and location of the Administration Facility are more fully defined) to complete a Cultural Heritage Assessment Report (CHER) and confirm that the proposed works do not impact cultural heritage resources. If the expansion is determined to potentially affect or alter cultural heritage value a qualified person will then undertake a Heritage Impact Assessment (HIA) to assess and avoid, eliminate, or mitigate impacts.

Figure 10-2 Cultural Heritage Resources within G.E. Booth WRRF

10.2.2 Air Emission and Odour Control

An Air Quality Impact Assessment (AQIA) report has been prepared (and is included in **Volume 3, Appendix C**) in support of the proposed facility expansion. The AQIA provides an analysis of the existing facility compared to the upgraded and expanded facility. The results of the AQIA confirm that the control measures underway and planned at the G.E. Booth WRRF for both the existing and expanded WRRF will reduce odour and air emissions from current levels. The odour control measures associated with the expansion and the upgrades at the facility include:

- Decommissioning of the original Plant 1 facilities and construction of a new Plant 1 that included covered primary clarifiers and inlet channels complete with two-stage odour control (BTG and GAC).
- Covering of the Plant 2 inlet channels and primary clarifiers with two-stage odour control.
- Covering of the Plant 3 inlet channels and primary clarifiers and providing GAC based odour control.
- Upgrading of the existing Headworks and inlet sewer BTF odour control facility with two-stage odour control (i.e., add GAC polishing) together with an extended dispersion stack.
- Following the facility odour monitoring protocol during operations to confirm that odour emissions are effectively managed.

Key findings of the AQIA are:

- The assessment determined that the modelled concentrations of all air pollutants were below the respective ambient air quality criteria, even with consideration of the existing background air concentrations.
- For all air pollutants assessed, the predicted cumulative concentrations were found to be less than the respective criteria at all locations beyond the G.E. Booth WRRF property boundary and at all sensitive receptors.
- The odour impacts at identified sensitive receptors proximate to the G.E. Booth WRRF plant are expected to reduce significantly as a result of the planned upgrades and installation of the additional odour control equipment.
- The expanded facility has the ability to comply with O. Reg. 419/05 applicable standards and criteria in order to obtain an Amended Environmental Compliance Approval (ECA) - Air.

It is noted that construction of the plant expansion may result in temporary increases to emission levels at individual receptors. Activities that could result in increased dust levels will be subject to watering activities on unpaved roads (if any) at the G.E. Booth WRRF. The construction site entrance will also need to be swept periodically to minimize any dirt build-up.

10.2.3 Noise and Vibration Control

An Acoustic Assessment Report (AAR) has been completed in support of the conceptual design of the proposed facility expansion (**Volume 2, Appendix D**). The AAR identified the compliance of the existing facility and evaluated the cumulative impact of the additional noise sources due to the expansion against the applicable MECP NPC-300 limits. Several representative Points of Reception (PORs) were identified, which included multiple accessible vacant lot receptors in the planned Lakeview Village development area.

The noise impacts at PORs associated with daily operations with the inclusion of additional sources part of the proposed capacity expansion were assessed through predictive acoustic modelling. The MECP exclusionary sound level limits were used as the criteria to assess the compliance of the facility expansion. The sound levels at the receptors reported represent the worst-case impact assuming all significant sound sources are operating simultaneously during daytime/evening and night-time hours.

Under the predicable worst-case noise emission scenarios, the G.E. Booth WRRF is expected to be compliant with the MECP NPC-300 limits in both its existing condition and also after the proposed capacity expansion given that the noise measures specified are implemented by the Region of Peel throughout the development phase of the expansion.

As part of detailed design and construction, the resonance of pumps, generators, and similar vibration producing equipment will be checked against the natural frequency of the supporting concrete slabs. The natural frequency of suspended concrete slabs subjected to vibration will be designed such that the natural frequency of the slab with respect to the operating frequency from the equipment will be less than 0.5 and greater than 1.5. Vibration studies of critical equipment are to be completed during detailed design to confirm slab design.

10.2.4 Community and Traffic Impacts

During the detailed design phase, a detailed Traffic Management Plan (TMP) will be completed to identify the required measures to mitigate temporary construction impacts. The Region will coordinate with the City of Mississauga regarding the preparation of the TMP with additional consultation and coordination potentially required for the following additional items:

- Completion of a Tree Preservation/Replacement Plan. The mitigation measures will be further refined during detailed design;
- Completion of a Construction Noise and Vibration Plan during detailed design;
- Completion of a Restoration Plan for all disturbed areas which will outline the restoration of these areas to their original condition or enhanced; and,
- Avoiding obstruction of any stormwater runoff collections points by construction activities.

10.2.5 Navigable Waters

The outfall will extend approximately three (3) kilometres into Lake Ontario, with offshore construction of the diffusers supported from overwater barges and marine vessels. It is important that major works do not interfere with navigation or shipping lanes. During the detailed design phase, a plan for protecting navigable waters and other recreation users during construction will be developed in consultation with Transport Canada. Permits under the Navigable Waters Act will be received.

10.2.6 Visual / Aesthetics

The visual / aesthetic impact of the proposed facility expansion will be mitigated by an increased focus on the architectural design of the proposed above-grade buildings, specifically the ash dewatering facility, UV disinfection building, biogas domes, and anaerobic digestors. As part of the detailed design, contextual consideration will be given for the proposed buildings, ensuring that they complement the aesthetics of the existing built environment. The modern materials and colours of the building elements will be complimentary to the existing Plant 1 primary building and blower building, effluent pumping station, and storage complex in order to establish consistency across the site. Architectural continuity among the buildings aids in creating a coordinated campus at the G.E. Booth WRRF thereby improving the visual aesthetics. In addition, the ash lagoons will be removed, and buffer zones will be provided between the facilities and surrounding area. These improvements are important due to the increased visual exposure of the facility to the public from the adjacent Lakeview Village development and walking paths in the JTLCA.

10.2.7 Archaeological Potential

In support of the G.E. Booth WRRF expansion, a Stage 1 Archaeological Assessment (AA) was completed to identify any areas of potential archaeological significance within the anticipated expansion area within the G.E. Booth WRRF. As outlined in the Stage 1 AA, several previous archaeological assessments were conducted in the G.E. Booth WRRF site. In accordance with the findings from these previous studies, the expansion areas within the G.E. Booth WRRF were determined to no longer retain archaeological potential and/or warrant further investigation.

The Marine AA also cleared the preferred location of the outfall shaft of any archaeological potential. A desktop marine archaeological assessment was completed to understand the archaeological potential of near-shore areas and the extended study area into Lake Ontario which could be used for the new outfall alignment. No known records exist for archaeological resources in the area identified for the proposed outfall alignment.

Upon development of the design concept, the location of a new administration building was established partially beyond the limits of what was previously subjected to archaeological assessment. A second Stage 1 AA was conducted and similarly confirmed that the additional expansion area no longer retained archaeological potential and did not warrant further investigation.

Mississaugas of the Credit First Nation (MCFN) and Huron-Wendat First Nation were involved in the review of the AAs, and their input was considered prior to finalizing.

Should previously undocumented archaeological resources be discovered during construction, the Region of Peel will cease construction until the MCM is contacted, and appropriate mitigation or resource recovery is implemented.

10.3 Technical Considerations

10.3.1 Topographic and Bathymetry Survey

A topographic survey of the G.E. Booth WRRF site was available to identify the surface elevations throughout the property and depict all natural features and elevations. The topographic survey was used to develop the conceptual layout of the proposed plant expansion and will continue to form the basis for the detailed design stage.

Bathymetry of the lake bottom was considered in selecting the preferred outfall alignment and developing the conceptual design. More details on bathymetry will be developed during detailed design.

10.3.2 Subsurface Utility Engineering

As the existing G.E. Booth WRRF facility has extensive below-grade infrastructure throughout the property, a subsurface utility engineering (SUE) investigation will be required to support the detailed design of the proposed expansion. The SUE investigation will identify the nature, depth, location, orientation, and dimensions of buried utilities within the future construction areas which can play a major role in mitigating unanticipated re-designs and/or construction delays. SUE investigations can include a variety of non-destructive geophysical investigation techniques, including ground penetrating radar (GPR) and vacuum excavation trucks and can be completed to various quality levels (A through D). The specific techniques and quality level of the SUE investigation will be confirmed at the detailed design stage.

10.3.3 Geotechnical and Hydrogeological Considerations

The site has been subject to multiple borehole investigations throughout the years as ongoing construction projects required detailed geotechnical and hydrogeological information. The locations and source of the borehole information is provided in **Volume 2, Appendix F.**

As documented in available subsurface investigations and geotechnical and hydrogeological reports previously prepared for the G.E. Booth WRRF, fill over native sandy soils is present throughout the site. Bedrock depths are highly variable and should be reviewed with caution during design. Previous investigations were completed mainly in areas where proposed structures were to be built. Recent investigations have indicated that the soil stratigraphy is highly variable across the site due to soils being disturbed for new underground infrastructure. Additional detailed geotechnical, geochemical, and hydrogeological investigations will be required at the proposed structure locations where no previous borehole information is available to support the detailed design. Based on the results of these investigations, the required foundation systems for each structure can be further developed.

Based on conditions observed elsewhere on the site, it is expected that raft or mat foundations would be suitable to support some tanks and structures with basements. However, rock anchors may be required to resist uplift due to the presence of groundwater. The existing Plant 1 tanks are equipped with an underdrain groundwater relief system to protect against flotations during tank maintenance which could be employed for new tanks as well. During construction of the proposed works, dewatering operations will be necessary to facilitate dry working conditions, and a PTTW may be required.

For temporary dewatering, the volume of water entering the excavation will be based on both ground water infiltration and precipitation events. Based on O.Reg. 63/16, the following dewatering limits and requirements are as follows:

- Construction Dewatering less than 50,000 L/day: The takings of both groundwater and stormwater do not require a hydrogeological report and does not require a PTTW from the MECP.
- Construction Dewatering greater than 50,000 L/day and less than 400,000 L/day: The taking of groundwater and/or stormwater requires a hydrogeological report and registration on the Environmental Activity and Sector Registry (EASR) but does not require a PTTW from the MECP.
- Construction Dewatering greater than 400,000 L/day: The taking of groundwater and/or stormwater requires a hydrogeological report and a PTTW from the MECP.

To advance the outfall tunnel design, additional geotechnical and hydrogeological information will be collected during detailed design to confirm subsurface conditions and validate design and construction assumptions. Below is a list of field investigations and laboratory testing work that will need to be carried out as part of the geotechnical investigation program:

- Soil and rock borehole drilling and analysis;
- Soil, rock, and water sampling with laboratory testing and analysis; and
- Groundwater flow testing and monitoring.

Figure 10-3 below shows potential locations for geotechnical boreholes and test pits, both on-shore and off-shore to facilitate progression of the design to a preliminary level. For detailed design, a more rigorous geotechnical program is recommended.

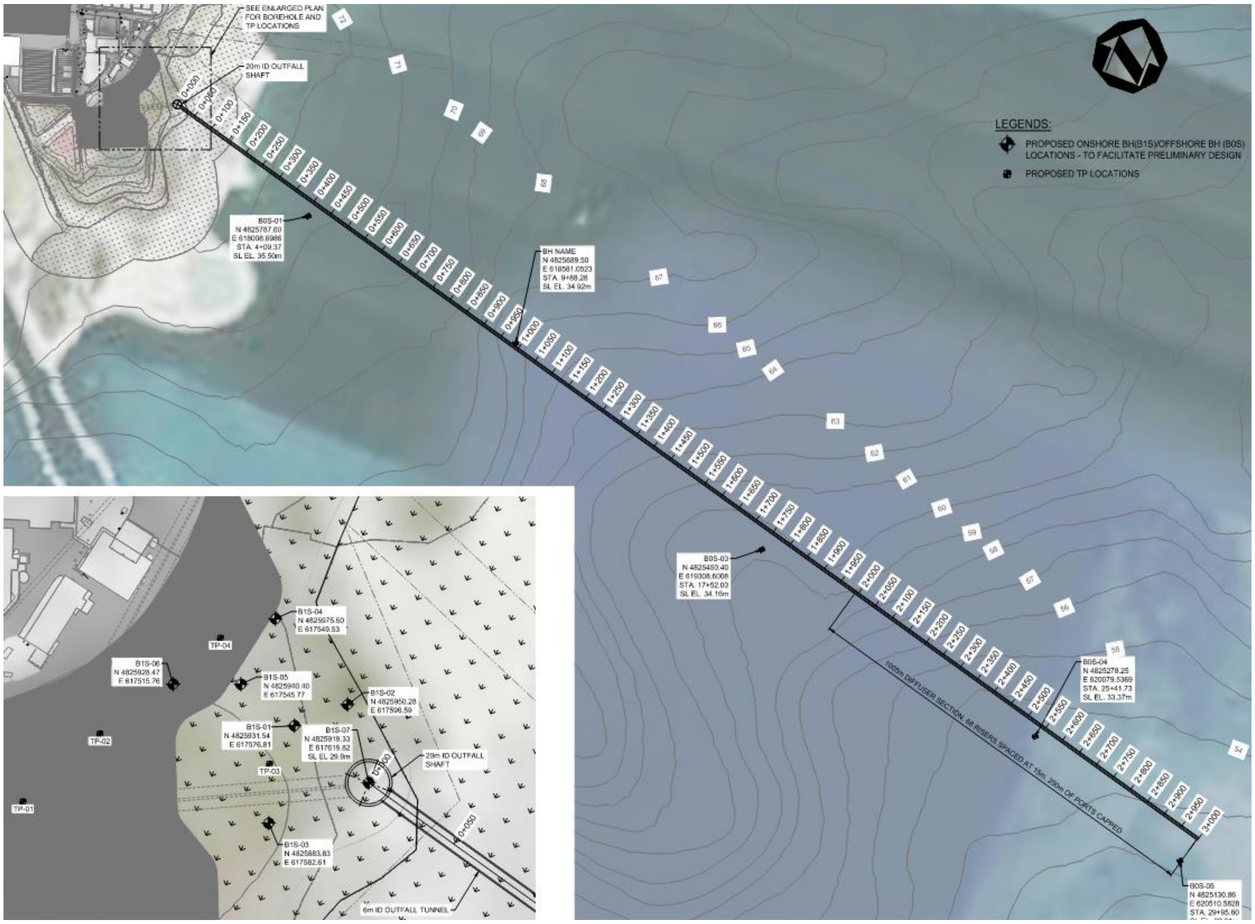


Figure 10-3 Proposed Offshore and Onshore Geotechnical Boreholes

The outfall tunnel is not anticipated to have a consistent or significant water inflow although encountering zones of increased weathering, bedding planes or vertical joints which produce large quantities of water are a risk. The groundwater conditions along the tunnel alignment can significantly influence the tunnel design and the choice of both excavation and lining method. Hence the need for groundwater conditions to be validated based on results from the geotechnical investigation along the outfall alignment.

10.3.4 Environmental Risk Impacts

The Phase One ESA, as completed in Phase 2 of the Class EA and included in **Volume 3, Appendix G**, identified the risk of soil and/or groundwater contamination caused by potentially deleterious fill material, fuel handling and storage, petroleum hydrocarbons (PHCs), metals, polycyclic aromatic hydrocarbons (PAHs), as well as other industrial activities. It also documented the potential for the presence of asbestos, which is a designated substance. Overall, eight (8) APECs were identified at the G.E. Booth WRRF; the locations of which are shown in **Volume 3, Appendix G**. Based on the layout of the proposed facility expansion, there is a potential for the proposed works to coincide with several of the APECs.

During detailed design, additional investigations are recommended if upgrades or expansion works are recommended in any of the on-site APEC areas. The investigations should be carried out in the context of a Phase Two ESA to identify soil and groundwater quality with greater certainty, to support an excess soils management plan, a construction dewatering plan, or to identify potential hazards in areas to be excavated. The management of excavated soils will be in accordance with O.Reg. 406/19: On-site and Excess Soil Management with particular attention paid to the isolation, testing, and removal of previously stockpiled materials. With respect to outfall construction, options to recycle the excavated tunnel rock will be explored.

10.3.5 Climate Change Adaptivity

The Region has prioritized climate resiliency across all services. The implications of climate change on infrastructure can be wide-ranging and encompass numerous aspects of the project. Likewise, infrastructure upgrades, expansions, operations, and maintenance activities may increase GHG emissions thereby impacting air quality and factors related to climate change. The following strategies were incorporated into the development of the preferred solution, and ultimately the conceptual design, of the proposed facility expansion:

- The G.E. Booth WRRF expansion has been designed to be adaptable and accommodate peak flows based on detailed flow analysis and considering wet weather impacts;
- Hydraulic analysis indicates that the new outfall will have sufficient capacity to meet future flows at higher lake levels as predicted as a result of climate change;
- The project’s carbon footprint is decreased by reducing the shipment distances of construction resources and materials where possible;
- Implementation of RTC within the collection system helps manage peak flow events to continually changing wet weather and flow conditions within the system;
- Using energy efficient technologies during construction where possible; and
- Preferred design concept incorporated energy conservation.

10.3.6 Construction Management

Construction Management Plans (CMPs) will be developed during detailed design for on-site (i.e., G.E. Booth WRRF expansion) and marine construction (i.e., new outfall) with input from the relevant contractors on the available equipment to be used for the projects, general sequencing of works, and working hours (including consideration for night work to expedite schedule and resultant community impacts). The CMPs will include methods of controlling construction impacts such as noise, dust, odour, and sedimentation. They will also address the following considerations:

- Haulage and use/disposal of excavated materials;
- Impacts to existing trees;
- Impacts to shoreline;
- Restoration plans;

- Impacts to existing buildings and utilities;
- Impacts to adjacent roadways (sidewalk closures, traffic signals, temporary lane closures, etc.);
- Construction methodologies to mitigate inflow & infiltration, where applicable; and,
- A post-construction monitoring plan will be required during detailed design.

Environmental Management Plans (EMPs) will also be completed during detailed design and enforced throughout construction to ensure environmental supervision and implementation of the required mitigation measures.

Further coordination with and approval from the City and CVC to obtain all necessary permits and approvals will be required prior to construction.

10.4 Economic Considerations

The capital cost estimate for the G.E. Booth WRRF expansion scope of work is summarized in **Table 10-1**.

Table 10-1 Conceptual Capital Cost Estimate

Description	Amount (2023 $)
Yard Works	$52,529,000
Administration Facility	$16,704,000
Primary Clarifiers	$41,819,000
Primary Building	$14,780,000
Aeration Tanks	$29,608,000
Blower Building	$6,628,000
Secondary Clarifiers	$22,259,000
UV Disinfection Facility	$26,395,000
Ash Dewatering Facility	$40,820,000
Anaerobic Digestion with Biosolids Exportation	$152,100,000
Outfall	$209,704,000
Electrical (Incl. New Service and Energy Center)	$32,718,000
SUBTOTAL FOR CONSTRUCTION	**$646,064,000**
Subtotal for Construction (Rounded)	**$646,000,000**
Construction Contingency & Estimating Allowance (30%)	$193,800,000
Engineering (15%)	$96,900,000
General Contractor Overhead, Profit, Mobilization & Bond (15%)	$96,900,000
TOTAL CAPITAL COST ESTIMATE (ROUNDED)	**$1,033,600,000**

Table 10-2 Summary of Impacts and Mitigation Measures from G.E. Booth WRRF Expansion

Potential Impacts	Mitigation Measures	Additional Studies During Detailed Design	Monitoring Requirement	Net Effects
Natural Environment				

Natural Heritage Features	• Preparation and adherence to a frac-out contingency plan for the trenchless installation of the DEC piping under Serson Creek.
	• Barn Swallow nests were identified on Blower Building 1 which is immediately adjacent to an expansion area. Care should be taken to not harass or harm nesting Barn Swallows during construction.
	• Where possible, construction activities should be timed outside of the nighttime and early morning periods during the bat and bird breeding seasons (April 1st to September 30th).
	• New lighting should be directed away from the existing woodlands to avoid impact to wildlife activities.
	• While isolated, where tree removals are proposed the following measured should be considered:
	  • Tree removals to occur outside of the active bat roosting window (April 1st to September 30th) and Migratory Bird window (early April to end of August);
	  • To reduce the spread of invasive species, all trees should be disposed of locally.
	New facilities should be located as far as feasibly possible from the JTLCA to minimize impacts to natural areas from noise, light, bird collisions, etc.
	An ecologist will undertake an onsite investigation of the lagoon prior to removal to screen for: turtles, amphibians, and fish, and if species are found, the Region will ensure proper removal and/or relocation of species.
	Landscaping and site restoration following construction; opportunities to plant buffer plantings surrounding the vegetation to the east, west, and south will also be explored during detailed design.
		Onsite investigation during design to screen for: turtles, amphibians, and fish in the ash lagoon area prior to removal.	Monitoring during construction.	No net effects expected.

Lake Ontario Water Quality	Total phosphorus (TP) concentrations in the final effluent will be reduced so the total loadings to Lake Ontario do not increase as flows increase. The Receiving Water Impact Assessment (RWIA) indicated that Provincial Water Quality Objectives (PWQOs) will continue to be met.	RWIA, including assimilative capacity study has been completed through this EA, and is acceptable to the MECP. New effluent limits and objectives for the expanded plant have been identified and will be included in the new Environmental Compliance Approval (ECA) for Sewage.	Monitoring during operations as per new ECA requirements.	No net effects expected.
Source Water Protection	Water treatment plant intakes within the Credit Valley Source Protection Area (i.e., Burlington, Burloak, Oakville, Lorne Park, A.P. Kennedy, and R.L. Clark water treatment plant intakes) are protected by minimizing the risks of disinfection failure at the G.E. Booth WRRF. Adequate UV disinfection system redundancy and stand-by power will be included as part of the design. To further reduce risk, Peel will continue to apply best management practices during operation and maintenance, including spill prevention and response plans and training procedures.	Treatment redundancy and stand-by power needs will be confirmed through detailed design.	Continue to update Standard Operating Procedures (SOPs), including spill prevention and response plans.	Low risk of net effects.

Potential Impacts	Mitigation Measures	Additional Studies During Detailed Design	Monitoring Requirement	Net Effects
Expansion could potentially increase runoff, impact water quality, and decrease infiltration.	A hydrologic analysis will be conducted and presented within the SWM report to demonstrate that site-wide drainage conditions will be maintained to pre-development conditions. SWM controls will be recommended to maintain the water quantity and quality to pre-development levels. The SWM will be a combination of site regrading and conveyance of stormwater across the site towards Lake Ontario. Site drainage structures will be designed in accordance with Region of Peel and/or City of Mississauga Standards. Potential impacts of increased runoff will be controlled to protect water quality.	Prepare a Stormwater Management Plan. Develop and implement a site-specific spill management plan. Maintain all necessary mitigation measures on-site in the event of a spill.	Additional monitoring requirements to be identified during detailed design.	No net effects expected.
Social/ Cultural Environment				
New administration building has the potential to impact adjacent designated heritage properties.	A qualified heritage consultant should be contracted during design to confirm that the proposed location of the administration building does not impact cultural heritage resources (Long Branch Indoor and Outdoor Rifle Ranges)	Cultural Heritage Evaluation Report (CHER)	N/A	No net effects expected.
New treatment processes have the potential to increase odour and air emissions	Air dispersion modelling has been completed. Odour and air emissions will be reduced from current levels through implementation of the Region's planned odour control measures for the existing and expanded plant. Odour mitigation measures planned include covering the channels and primary clarifiers, along with air emission control systems. In addition, best management practices for the mitigation of air emissions and odour will continue to be implemented.	Detailed design to confirm odour control measures and obtain Amended ECA (Air and Noise).	Additional monitoring requirements to be identified during detailed design and identified in the Amended ECA (Air and Noise).	TBD.
New treatment processes have the potential to increase noise impacts at nearby sensitive receptors.	An Acoustic Assessment Report (AAR) has been prepared. The applicable MECP NPC - 300 limits will be met for the expanded plant.	Detailed design to confirm noise attenuation measures and obtain Amended ECA (Air and Noise).	Additional monitoring requirements to be identified during detailed design and identified in the Amended ECA (Air and Noise).	TBD.
Increased truck traffic during construction. Increased truck traffic during operations to transport ash products for beneficial use.	Truck traffic and truck loading for construction and operations to meet by-law requirements.	Traffic management plan (construction) Traffic management plans to meet Peel and City of Mississauga requirements.	N/A	Low net effects.
Expansion of facilities may change the visual character of the area.	New buildings will be designed to be complimentary to the existing buildings on-site to provide the visual character of a coordinated campus. Removal of ash lagoons, site landscaping and buffers will be part of the design. These improvements are important due to the increased visual exposure of the facility to the public from the adjacent Lakeview Village development and walking paths in the JTLCA.	Architectural features will be confirmed through detailed design.	N/A	Positive net effects.

Potential Impacts	Mitigation Measures	Additional Studies During Detailed Design	Monitoring Requirement	Net Effects
Potential impacts to undiscovered archaeological resources	Two (2) Stage 1 Archaeological Assessments (AAs) were completed. The study area is considered free of further archaeological concern based on both studies.	No additional studies needed.	Should previously undocumented archaeological resources be discovered during construction, the Region of Peel will cease construction until the MCM is contacted, and appropriate mitigation or resource recovery is implemented.	Risks of discovering archaeological resources during construction considered low given AA findings.
Technical Considerations				
Geotechnical and hydrogeological challenges during construction	Based on the preliminary investigations, the geotechnical conditions on the site are suitable to support the proposed structures and substructures. The soil overburden and the bedrock are anticipated to have a relatively lower permeability that will likely preclude the free flow of water, and significant issues with groundwater control during construction are not expected.	Further geotechnical and hydrogeological field investigations are required during detailed design to confirm construction approach, dewatering needs, and approval requirements (PTTW). Bathymetry study recommended to confirm lake topography as part of the geotechnical investigation.	N/A	No net effects expected.
Areas of Potential Environmental Concern (APEC)	Phase 1 Environmental Site Assessment indicated that there are eight (8) APECs on site with potential for designated substances such as asbestos.	During detailed design, additional investigations are recommended for expansion works in any of the on-site APEC areas. The investigations could be carried out in the context of a Phase 2 ESA to identify soil and groundwater quality with greater certainty, such as to support an excess soils management plan or a construction dewatering plan or to identify potential hazards in areas to be excavated.	N/A	No net effects expected.
Climate change adaptability	RTC in collection system helps manage peak flow events. G.E. Booth WRRF is located outside of the Regional Floodplain. Facilities designed with redundancy. Hydraulic analysis indicates that at higher lake levels predicted as a result of climate change, the new outfall will have the capacity to meet needs under design flows.	Process designs to be confirmed through detailed design.	N/A	No net effects expected.

Table 10-3 Summary of Impacts and Mitigation Measures - New Outfall

Potential Impacts	Mitigation Measures	Additional Studies During Detailed Design	Monitoring Requirement	Net Effects
Natural Environment				
Aquatic habitat and species	Measures to mitigate impacts to be developed during detailed design based on further marine investigations, but may include: ○ Protection of shoreline; through shoreline stabilization, if required; ○ Barriers to fish movement; ○ Noise generation to scare fish away from construction area; and, ○ Habitat restoration.	During design it is recommended that the following be completed: • CVC is to be contacted to obtain fish collection records for the area as part of an assessment. • General habitat mapping using underwater UAV's. • Detailed habitat mapping, benthic, and mussel sampling to be undertaken to confirm aquatic habitats and species along the tunnel alignment, particular in the diffuser area. • Targeted fish community sampling to be completed in the Fall and Spring, depending on the type of substrates encountered. • A bathymetry study to confirm lake topography and potential aquatic habitats.	Monitoring during construction by aquatic biologist.	No net effects expected.
Lake Ontario Water Quality	New outfall extending deeper into Lake Ontario allows the Region to better meet PWQO and protect shoreline and sensitive users.	Outfall design and construction method to be discussed with MECP during design to receive ECA approval and approval to construct.	Monitoring plant operations during operations as per new ECA requirements.	No net effects expected.
Source Water Protection	New outfall was located to avoid water treatment plant intake IPZs (i.e., A.P. Kennedy, and R.L. Clark water treatment plant intakes).	Treatment redundancy and stand-by power needs will be confirmed through detailed design.	Continue to update Standard Operating Procedures (SOPs), including spill prevention and response plans.	Low risk of net effects.
Shoreline Protection	The outfall shaft is located north of JTLCA. The construction area will be protected through measures such as limiting work areas, temporary sedimentation fencing, and other sedimentation and erosion control measures to minimize impacts to the JTLCA, fish habitats and the shoreline.	The Region will work with the CVC and City of Mississauga to develop plans to protect the JTLCA and shoreline during detailed design.	Monitoring during construction by environmental specialist.	No net effects expected.
Social/Cultural Environment				
Outfall Construction Related Impacts	Best construction management practices will be implemented to control noise, vibrations, odour, and sedimentation during tunnelling operations. Access to the JTLCA to be maintained for CVC during construction.	Detailed CMP and EMP to be developed during design.	Monitoring during construction by environmental specialist	No net effects expected.
Navigable Waters	Measures to mitigate impacts of outfall construction on navigable waters, may include avoiding shipping lanes where possible, coordinating with Transport Canada regarding shipping and construction schedules, restricting access to construction areas through use mooring buoys or other markers. During operation, mooring buoys or other markers could be used to mark the location of the diffusers.	Permits from Transport Canada to be received during detailed design.	N/A	No net effects expected.

Potential Impacts	Mitigation Measures	Additional Studies During Detailed Design	Monitoring Requirement	Net Effects
Potential impacts to undiscovered archaeological resources	A desktop marine archaeological assessment was conducted for the near-shore areas for the new outfall alignment. No records of archaeological potential were found to exist.	No additional studies needed.	Should previously undocumented marine archaeological resources be discovered during construction, the Region of Peel will cease construction until the MCM is contacted, and appropriate mitigation or resource recovery is implemented.	Risks of discovering marine archaeological resources during construction considered low given AA findings.
Technical Considerations				
Geotechnical and hydrogeological challenges during construction	Based on the tunnel diameter, depth, and subsurface conditions (geologic and hydrogeologic characteristics) along tunnel alignment, a single shield Tunnel Boring Machine (TBM) is identified as the preferred tunnel excavation method. Precast segmental lining (single pass method) is recommended for the G.E. Booth WRRF outfall tunnel lining. The rationale behind this recommendation is that the precast segmental lining generally has superior quality and reduced overall construction duration compared to cast-in-place concrete lining.	Further geotechnical and hydrogeological field investigations are required during detailed design to confirm construction methods. Key components of the geotechnical investigation program: • Soil and rock borehole drilling and analysis. • Soil, rock, and water sampling with laboratory testing and analysis. • Groundwater flow testing and monitoring.	N/A	No net effects expected.
Climate change adaptability	Real Time Control (RTC) in collection system helps manage peak flow events. G.E. Booth WRRF is located outside of the Regional Floodplain. Facilities designed with redundancy. Hydraulic analysis indicates that at higher lake levels predicted as a result of climate change, the new outfall will have the capacity to meet needs under design flows.	Process designs to be confirmed through detailed design.	N/A	No net effects expected.

11.0 Implementation Plan

11.1 Capital Phasing and Procurement Consideration

11.1.1 Ongoing Works

The Region has several capital works projects ongoing at the G.E. Booth WRRF, as presented below in **Table 11-1.**

Table 11-1 Ongoing Works Summary

Project	Scheduled Dates
New Plant 1 – Contract 3	Q2 2022 to Q1 2026
Plant 3 Odour Upgrades Project	Q1 2024 to Q4 2028
District Energy System (DES)	Onsite connection by 2027
Plants 2 & 3 Blower Upgrade Project	Q1 2024 to Q4 2026
Incineration Rehabilitation Projects	Ongoing - 2026

To maintain separation between the ongoing and planned projects and plant operations, the construction of the preferred expansion alternative presented in this Class EA is sequenced such that the working areas minimize risk of time and space overlap with the working limits of the other ongoing contracts.

11.1.2 Capital Phasing Considerations

Given the magnitude and complexity of the expansion, it is recommended that the work be completed as a program consisting of several projects/contracts. It is recommended that the proposed expansion at the G.E. Booth WRRF be packaged into seven (7) separate engineering assignments as follows:

- Engineering Assignment 1: Ash Dewatering, DES, and Old Plant 1 Demolition
- Engineering Assignment 2: Energy Center
- Engineering Assignment 3: Administration Facility
- Engineering Assignment 4: New Digesters and Beneficial Gas Reuse
- Engineering Assignment 5: New Outfall and UV Disinfection Facility
- Engineering Assignment 6: Plant 1 and Plant 3 Expansion
- Engineering Assignment 7: Future Solids Management Solution

The site areas affected by these engineering assignments are shown in **Figure 11-1** and are described further in the sections below. Engineering Assignment 7 is not shown as the preferred solution is to be re-evaluated later in the planning period and a long-term solution selected based on technological and community conditions.

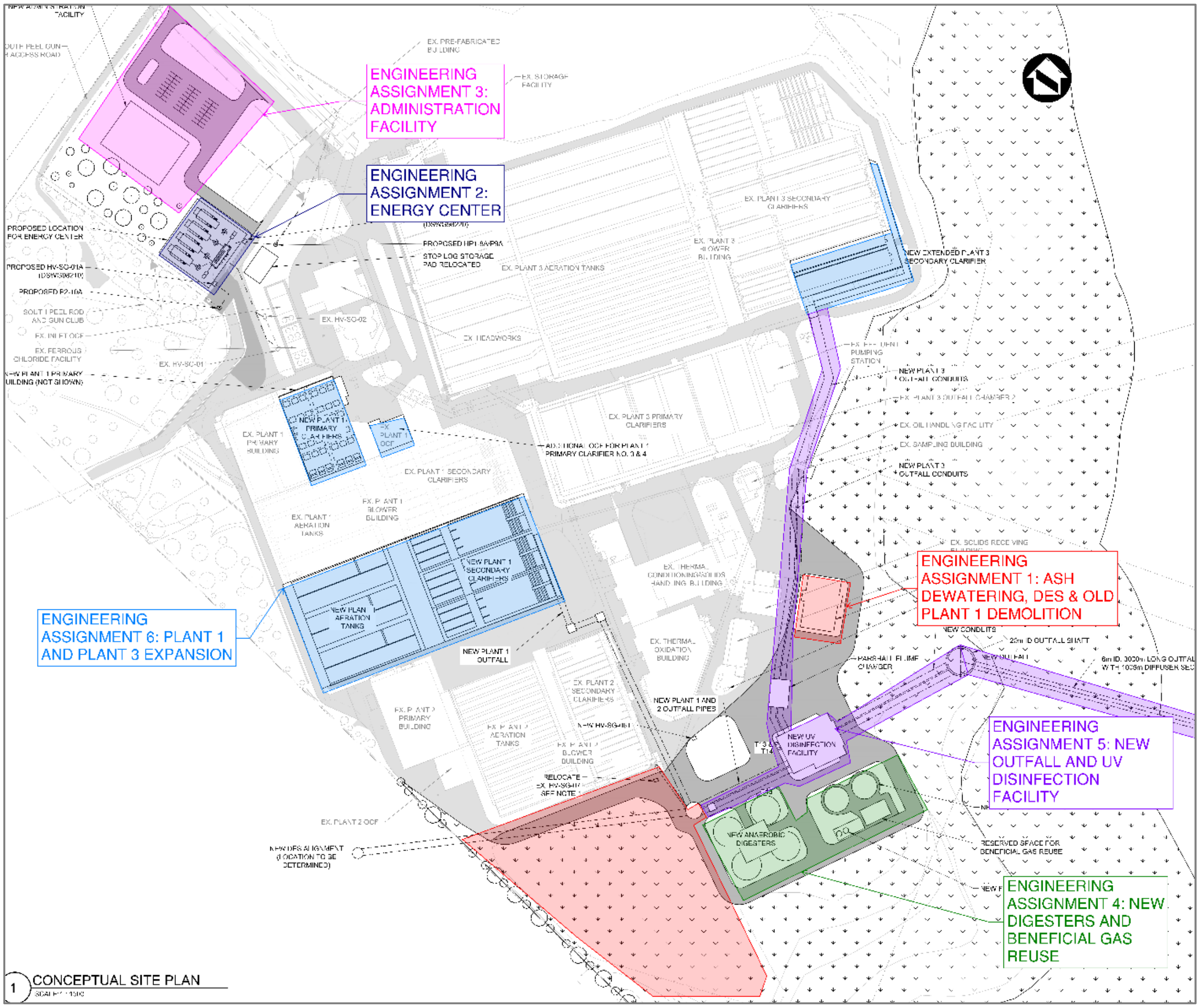


Figure 11-1 G.E. Booth WRRF Engineering Assignments

11.1.2.1 Engineering Assignment 1: Ash Dewatering, DES, and Old Plant 1 Demolition

The ash dewatering, DES, and old Plant 1 demolition identified under Engineering Assignment 1 could be broken up into two (2) different construction contracts as described below.

11.1.2.1.1 Contract 1-1: Ash Dewatering and DES Site Preparation

The ash dewatering facility should be constructed as part of an early contract in 2026. Once the ash dewatering facility is commissioned, the ash lagoons and the SWM pond would be decommissioned and filled as part of the same contract. This contract would create the space for construction of the tie-in infrastructure to the proposed DES, the new Plant 1 and 2 outfall connection, the digesters, and the UV disinfection facility.

Given the necessity for filling in the lagoon prior to constructing the DES connection, it is recommended that the Region consider constructing the on-site connection to the DES within this contract. A new outfall connection from Plant 2 to the DES shaft would be constructed as well as an interim return line from the shaft to the existing Plant 2 outfall. Provisions should be made to the DES shaft in this contract in anticipation of future connections to the Plant 1 outfall pipe as well as the twin Plant 1 and 2 outfall pipes conveying secondary effluent to the UV facility.

11.1.2.1.2 Contract 1-2: Old Plant 1 Demolition

This contract would involve the demolition of the old Plant 1 facility and site preparation of an area for future contracts. Old Plant 1 will remain operational until new Plant 1 is commissioned in 2026; at which time, it will be decommissioned.

11.1.2.2 Engineering Assignment 2: Energy Centre

The new energy centre engineering assignment would be managed as a single construction tender. This contract involves the construction of four (4) emergency generators for standby power with tie-ins to existing equipment occurring in a phased manner to avoid operational disruptions.

Construction of the energy centre would begin in 2027 following the commissioning of New Plant 1 as the area where the energy centre is proposed is currently used for contractor layout for the New Plant 1 project. This contract could occur in parallel with the Ash Dewatering contract but before the construction of the administration facility in order to limit impacts to potential future staff and visitors to the administration facility.

11.1.2.3 Engineering Assignment 3: Administration Facility

The administration facility engineering assignment would also be managed as a single construction tender and does not require specialized civil, mechanical, and electrical contractors. The facility will include office space, training areas, boardrooms, and underground parking. The construction of the administration facility could begin following completion of the energy centre contract. This area is separated from other expansion areas and does not conflict spatially.

11.1.2.4 Engineering Assignment 4: New Digesters and Beneficial Gas Reuse

The new digesters and beneficial gas reuse engineering assignment would also be managed as a single construction tender. Due to space constraints, the digesters, new outfall, and new UV facility cannot be constructed at the same time. If the outfall and the UV facility are delayed, this provides the opportunity to construct the digesters as an earlier contract, which includes four (4) new digesters, a control building, biogas storage spheres, related beneficial gas reuse equipment, and flares.

11.1.2.5 Engineering Assignment 5: New Outfall and UV Disinfection Facility

This engineering assignment would manage a single construction tender for the construction of the new outfall and UV disinfection facility. This contract would include the construction of the new Plant 1 and Plant 2 outfall and the new Plant 3 outfall conduits. The new outfalls from all plants would be connected to the UV facility. The new Plant 1 and Plant 2 outfalls would be tied into the DES connection.

The outfall tunnel construction would begin with the excavation and installation of the launch shaft. From the launch shaft, a starter/tail tunnel would be excavated. Next, the 3,000 m long outfall tunnel would be excavated and lined using a TBM for the excavation. Once the tunnel is constructed, the TBM would be disassembled and extracted, and the final lining of the shaft would be installed. The final steps include connecting the tunnel to the diffusers and final clean up before commissioning.

This contract could commence following the commissioning of the digestion complex in approximately year 2032. This new outfall would need to be online prior to the commissioning of the Plant 1 expansion (Engineering Assignment 6).

11.1.2.6 Engineering Assignment 6: Plant 1 and Plant 3 Expansion

The new Plant 1 and Plant 3 engineering assignment would involve a single construction tender. The contract would include the full build-out of Plant 1 and the extension of secondary clarifier No.11 in Plant 3. The new outfalls constructed as part of Engineering Assignment 5 would be tied into each plant.

11.1.2.7 Engineering Assignment 7: Future Solids Management Solution

As part of the Class EA, a preferred long-term solids management solution was recommended for the G.E. Booth WRRF. It is recommended that the Region conduct a review assessing any changes in technologies, market conditions and regulations to re-evaluate and confirm the preferred long-term solids management approach. It is recommended that the review take place in 2031 to allow sufficient time for construction of the preferred solution.

11.2 Proposed Schedule for Construction

The proposed project schedule is shown in **Figure 11-2.** As illustrated, the expansion would be completed by 2039.

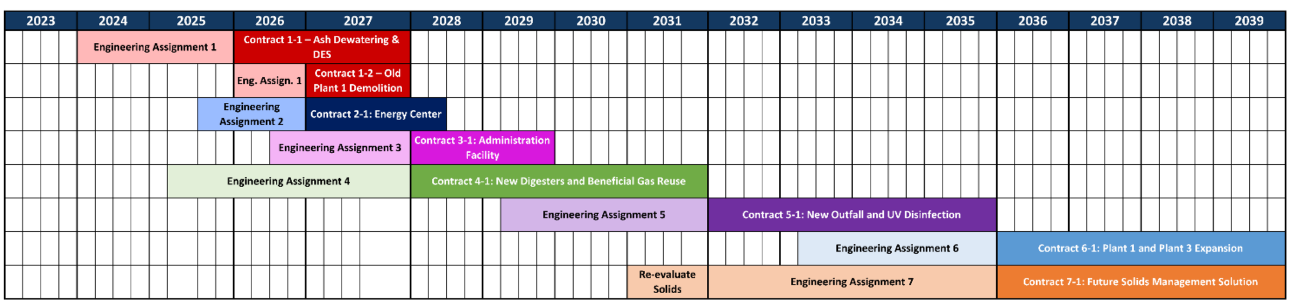


Figure 11-2 Proposed Engineering Assignment and Contract Schedule

11.3 Potential Impacts of Bill 23

During this Class EA process, Bill 23 (More Homes Built Faster Act, 2022) was passed. Although the implications of this Bill are being assessed, it is expected to increase the rate of growth within the Region relative to that forecasted in the 2020 Master Plan. Therefore, while the proposed expansion works would not change, they may be required earlier than anticipated and this would impact the proposed phasing plan presented in Section 11.2. To account for potential changes, the schedule for construction of the outfall at the G.E. Booth WRRF was fast tracked as early as possible, and other works were re-scheduled accordingly. The corresponding phasing changes are presented below. The timing and sequence of the various projects will be subject to further refinement as part of the planned G.E. Booth WRRF Facility Plan to be completed in 2024.

As discussed above, the required plant expansion includes the following key components:

- New outfall and disinfection facilities discharging to Lake Ontario. With early preparatory work required to decommission part of the existing stormwater management pond, this work can proceed without impact to ongoing works.
- New digestion facilities will be located in the existing stormwater pond area. To fully decommission this area, new Ash Dewatering facilities will be required.
- Decommissioning of existing Plant 1 and expansion of New Plant 1 can begin in 2027 following commissioning of the first phase of New Plant 1.
- The new Energy Centre and Administration Building will need to be deferred until 2027 to avoid conflict with the laydown and access areas allocated for the first phase of new Plant 1.

Given the above opportunities and constraints, the implementation of the new outfall and UV Disinfection Facility could be moved forward relative to the phasing outlined in Section **Error! Reference source not found.**. It is recommended to revise the packaging of the work into the following engineering assignments:

- Engineering Assignment 1: Ash Dewatering, New Outfall, New UV Disinfection Facility and New Digestion Complex
- Engineering Assignment 2: Old Plant 1 Demolition and New Plant 1 and Plant 3 Expansion
- Engineering Assignment 3: Energy Center
- Engineering Assignment 4: Administration Facility

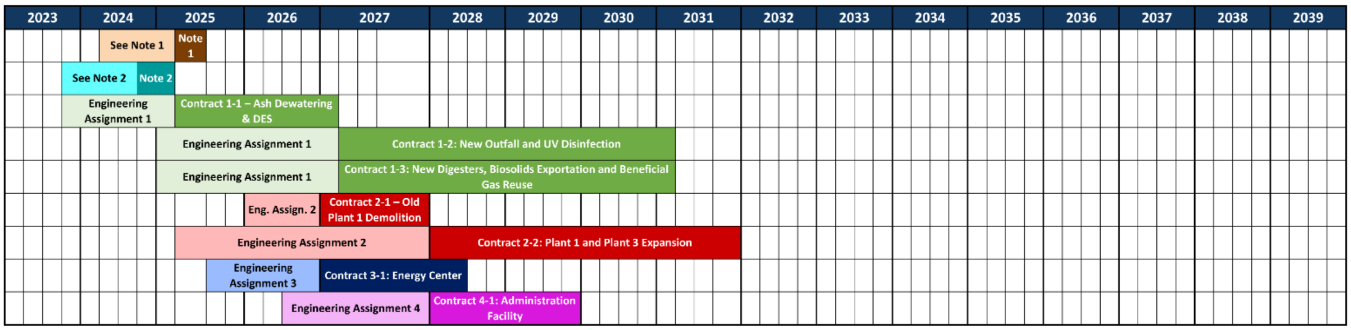
To support the design of the outfall, an offshore geotechnical investigation will be required. Based on recent similar project experience, the permitting process for offshore work can take up to eight months, with the overall geotechnical investigation taking up to two years.

If the geotechnical investigation is initiated immediately, the design of the outfall could be started in 2025 with construction commencing in 2027. The construction of the UV Disinfection Facility needs to be completed in parallel with the construction of the outfall to ensure parallel commissioning to maintain plant compliance as the existing disinfection system operation is tied to the existing outfall.

The phasing plan in Section 11.2 recommends starting construction of the Ash Dewatering Facility in 2026 and the Anaerobic Digestion Complex construction in 2028. Considering the proximity of the new outfall to the UV Disinfection Facility, advancing these projects would increase the risk of the Region becoming the "Constructor" as it would be difficult to maintain separation in space between the various contractors. To advance construction contracts, the Region may consider an alternative delivery approach for the ash dewatering, outfall, and digestion contracts. One of the alternative delivery approaches that can be considered by the Region to advance these projects is the Construction Manager at Risk (CMAR) model.

The expansion of Plant 1 will need to be advanced as well. To expand Plant 1, old Plant 1 will first need to be demolished and the new Plant 1 outfall aligned. Thus, the demolition of old Plant 1 should commence following the commissioning of the first phase of New Plant 1 in 2027.

A conceptual condensed schedule considering the impacts of Bill 23 is presented in **Figure 11-3**. As highlighted above, Engineering Assignment 1 could be considered as an alternative delivery project (CMAR or other) to mitigate construction and timeline risks associated with working in a similar area for the Outfall, Disinfection, Digestion, and Ash Management facilities.



Note 1: Outfall Maintenance and Upgrades Engineering Assignment - occuring at both Clarkson and G.E. Booth WRRF as one contract.
Note 2: Outfall Geotechnical Investigation Assignment

Figure 11-3 Fast-Track Schedule Considering Possible Implications of Bill 23

Although not indicated on this schedule, the future solids management solution at the G.E. Booth WRRF, including whether incineration should be expanded or a new process implemented, will also have to be identified through a separate study prior to 2031.

11.4 Planning for Beyond 2041

Potential requirements for expansion beyond the 2041 planning period were taken into consideration when determining the conceptual site layout. Facilities were located closely together to preserve space for a future expansion. Beyond 2041, Plant 2 would be reaching the end of its useful life and would require replacement. The Region is continuing to monitor future wastewater requirements in their system to identify long-term needs, including space requirements at the G.E. Booth WRRF. Potential areas for future expansion at the G.E. Booth WRRF have been identified south and west of the planned digestion complex as shown in **Figure 11-4**.

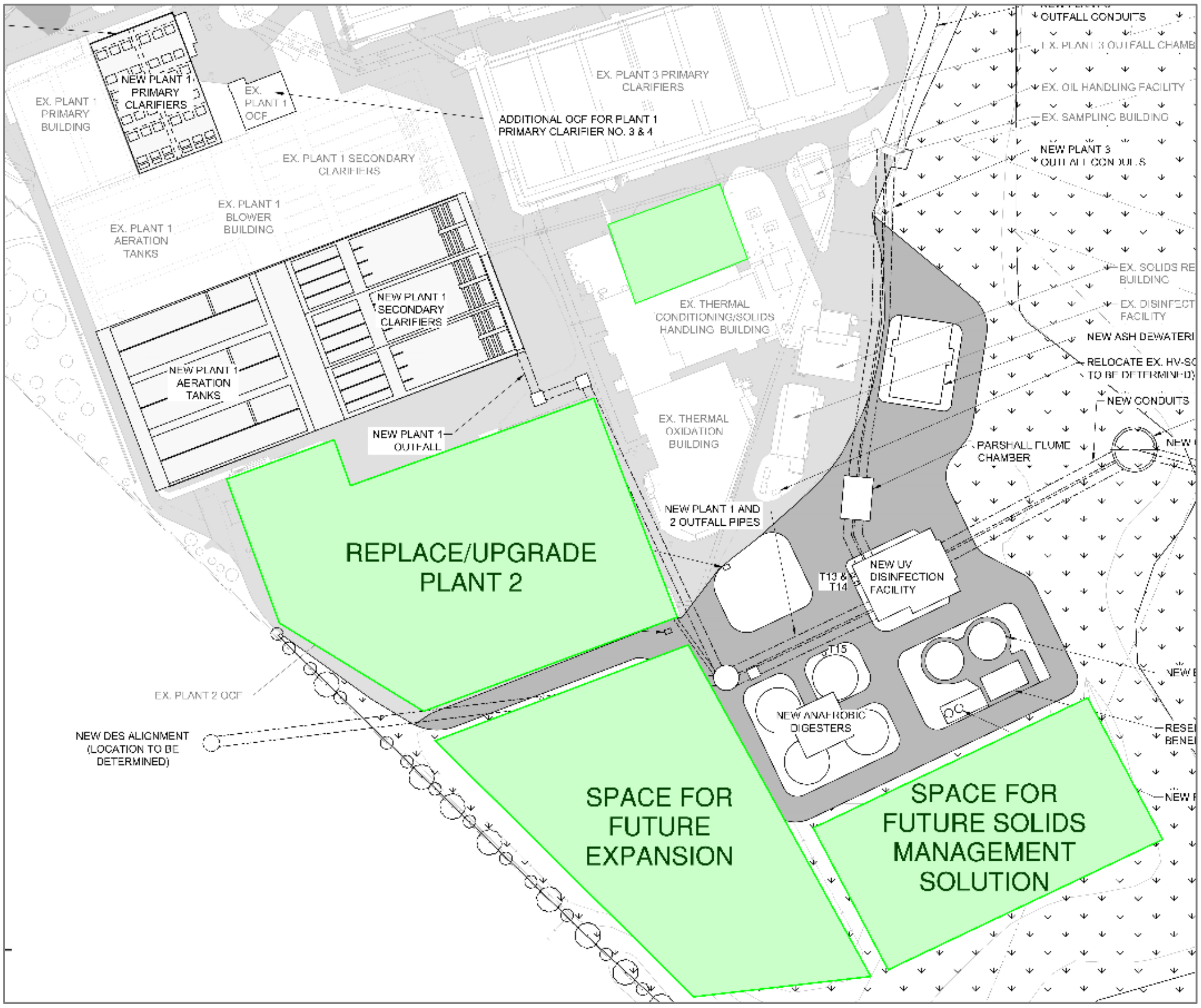


Figure 11-4 Space for Future Expansion Beyond 2041

The long-term solution for solids management at the G.E. Booth WRRF would be confirmed around the year 2031, after the Lakeview Village Development is established. The selection of the long-term solution would consider community expectations at the time, as well as any new technologies, regulatory changes, and biosolids market availability. The preferred design concept for the G.E. Booth WRRF is such that it could accommodate decommissioning of the incinerators and implementation of another technology (such as thermal drying or thermal hydrolysis process (THP), or expansion of the digestion and incineration process in the future. Space is available on site for either option.

11.5 Permits and Approvals

Table 11-2 and **Table 11-3** summarize the permits and approvals that would be required for the G.E. Booth WRRF expansion and the new outfall, respectively. These permits and approvals would be sought during the detailed design of the project.

Table 11-2 Preliminary Approvals and Permitting Requirements for Detailed Design: G.E. Booth WRRF Expansion

Permitting and Approval Agency	Permit / Approval Required	Permit / Approval Description
Ministry of Citizenship and Multiculturalism (MCM)	No further approvals	• Should previously undocumented archaeological resources be discovered during construction, the Region of Peel will cease construction until the MCM is contacted, and appropriate mitigation or resource recovery is implemented.
Ministry of the Environment, Conservation and Parks (MECP)	Environmental Compliance Approval (ECA) Sewage	The design and operating requirements for the expanded G.E. Booth WRRF will be confirmed through the detailed design and form the basis for receiving ECA approval. As part of application, require confirmation of designs, odour, air, noise control measures, and effluent limits and objectives.
Ministry of the Environment, Conservation and Parks (MECP)	Environmental Compliance Approval (ECA) Amendment Air and Noise	• To amend the Air and Noise ECA, confirmation of designs, odour, air, noise control measures will be confirmed, and comply with: ○ O. Reg. 419/05 applicable standards and criteria and will meet the air quality requirements for obtaining a provincial Environmental Compliance Approval for air. ○ MECP NPC - 300 limits for noise. • The Conceptual Design Report, Air Quality Impact Assessment (AQIA), and the Acoustic Assessment Report (AAR) undertaken though this EA will support preparing the ECA amendment.
Ministry of the Environment, Conservation and Parks (MECP)	Permit to Take Water	• During construction of the proposed works, dewatering operations will be necessary to facilitate dry working conditions. • During design, site-specific geotechnical and hydrogeological investigations will be undertaken to confirm dewatering requirements and mitigation measures, and if a Permit to Take Water is required.
Ministry of Natural Resources and Forestry (MNRF)	Scientific Collector Permit and Wildlife Scientific Collector's Authorization	• Scientific Collector and a Wildlife Scientific Collector's Authorization' will be required if species are to be removed and relocated from the ash lagoon.

Permitting and Approval Agency	Permit / Approval Required	Permit / Approval Description
Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA)	Applications under Nutrient Management Act (NMA) for land application approval (by third-party management firms)	• If the Region of Peel decides to use third-party management firms to further treat and/or manage their digested sludge these third-party firms will be responsible for the safe application of the biosolids, through the development of Non-agricultural Source Material (NASM) plans that are approved by OMAFRA. • The digesters will be designed to produce sludge that meets NMA Act requirements.
Credit Valley Conservation Authority	Stormwater Management and Erosion Control Plans	• A stormwater management (SWM) plan and an erosion and sedimentation (ESC) plan will be developed during design stage of the project. • The Region and City of Mississauga will require confirmation from CVC that the site plan SWM and ESC plan addresses CVC's stormwater management criteria including that the site meet the following: 1. Quality Control (Enhanced Level of Protection; 80% TSS Removal) 2. Quantity Control (100-year Post to 2-year Pre control of peak flows) 3. Erosion Control (Retention of the first 5 mm of any given rainfall event) • Consideration should be given for incorporating LIDs and a treatment train approach into the proposed SWM strategy.
City of Mississauga	Tree Preservation Plan and Approval	A tree preservation and restoration plan will be developed during detailed design by a qualified arborist that meets City of Mississauga and CVC permitting requirements.
City of Mississauga	Site Plan Approval	Required to meet policies in Mississauga Official Plan; obtained during detailed design, prior to construction. Key requirements of the site plan will include facility layout and design, landscaping, and stormwater management.
City of Mississauga	Building Permit	• Required to comply with Ontario Building Code Requirements and City of Mississauga Zoning By-Law; obtained during detailed design, prior to construction. • Works involve demolition of existing facilities, such as old Plant 1 and existing diesel tanks. A demolition permit is required under City of Mississauga Demolition Control By-Law.

Permitting and Approval Agency	Permit / Approval Required	Permit / Approval Description
Electrical Safety Authority (ESA) (Responsible for ensuring compliance to Ontario's Electrical Code)	Electrical Permits	Voltage Report completed as part of detailed design to ensure design and construction meet all requirements prior to connection.
Alectra (Local electric company responsible for electrical compliance)	Installation Inspection Compliance	Connection Impact Assessment (CIA) as part of detailed design phase to ensure design and construction meet all requirements prior to connection.
Technical Standards and Safety Authority (TSSA)	Digester and Biosolids Management Modifications Permit	Detailed designs to meet all standards for use of biogas and solids operations.
Underground Utilities (Gas, Telecommunications, Electric)	Clearance	• Subsurface Utility Engineering (SUE) investigation will identify the nature, depth, location, orientation, and dimensions of buried utilities will be conducted. • Clearances will be received where required.

Table 11-3 Preliminary Approvals and Permitting Requirements for Detailed Design: New Outfall

Permitting and Approval Agency	Permit / Approval Required	Permit / Approval Description
Department of Fisheries and Oceans (DFO)	Authorization under the Fisheries Act	• Authorization required to complete geotechnical investigations; program must provide measures to mitigate impacts to fish and fish habitats. • Authorization for shoreline protection and construction of outfall to mitigate impacts to fish and fish habitat.
Transport Canada	Navigable Waters Act	• Authorization to construct in Navigable Waters; shipping zones must be protected.
Ministry of Citizenship and Multiculturalism (MCM)	No further approvals	• A Marine AA was completed as part of this study. No marine archaeological resources were found.
Ministry of the Environment, Conservation and Parks (MECP)	Endangered Species Act	• During design, in-water investigations will be undertaken to confirm habitat and fish communities; If endangered species are in the area of outfall construction permits are required.
MECP	Environmental Compliance Approval (ECA) Sewage	• The design and operating requirements for the new outfall will be confirmed through the detailed design and form the basis for receiving ECA approval. As part of application, require confirmation of size, alignment, and construction methods. • Approval will be based on RWIA results and the need to protect Source Water Quality.
MECP	Permit to Take Water	• During construction of the intake shaft dewatering operations will be necessary to facilitate dry working conditions. • The tunnel is expected to be excavated in rock of relatively low permeability, so dewatering during tunnel construction is unlikely.
Ministry of Natural Resources and Forestry (MNRF)	Application to Purchase Crown Land	• The outfall will extend 3 kilometres into Lake Ontario on Crown Land. A permit is required to purchase Crown Land for permanent lakebed occupation.
MNRF	Permit to conduct in water works under the Public Lands Act	• Permit required to construct the outfall on Crown Lands.
Credit Valley Conservation Authority (CVC)	Shoreline Protection	• The Region and City of Mississauga will require confirmation from CVC that the site plan protects the shoreline, and in particular the newly developed Jim Tovey Lakeview Conservation (JTLC)
City of Mississauga	Permission to Construction	• Approval to construct is required by the City of Mississauga, consider input from CVC and MNRF.

11.6 Stakeholder Communications

The Region will continue to communicate and engage with key stakeholders through the design and construction process. Approval agencies, as identified in **Table 11-2**, will continue to be engaged to receive approvals prior to construction. Construction schedules will also be communicated to the local community.

11.7 Risk Management

From the outset of the study, individual risks were identified, assessed for likelihood and consequence severity, and monitored through each phase of the Class EA process. As the study progressed and additional investigations and consultation were conducted, the overall design concept was developed to minimize risks. Following the Class EA process, pre-identified risks will continue to be monitored and managed as identified in **Table 11-4**.

Table 11-4 G.E. Booth WRRF Preferred Design Concept: Risks Management During Design, Construction, and Operation

Risk Description	Risk Strategy Implementation Plan
Construction	• Detailed on-site geotechnical, hydrogeological, and ESA investigations to be completed during detailed design. • Extensive investigations work will also be carried out for the outfall during detailed design, including geotechnical and hydrogeological, habitat mapping, and benthic, mussel and targeted fish community sampling. • Separate contracts and staging of works.
Operational	• Additional operator training for new UV disinfection facility. • Potential operational complexities associated with integration with the DEC. Additional operating training for the DEC operations.
Long-Term Sustainability	• Continue to monitor long-term wastewater treatment needs to ensure timing of expansion and that adequate space is available at G.E. Booth WRRF to meet long-term needs. • The RTC option is designed for wet weather flow management and will reduce the potential for bypassing at the G.E. Booth WRRF, thereby providing long-term sustainability with respect to climate change. • The outfall is sized taking into consideration the lifespan of the outfall (i.e., 75 to 100 years) and is therefore designed to meet needs well beyond the year 2041.
Compliance	• Treatment process proven reliable in meeting proposed effluent and biosolids quality requirements. • Continue to work with MECP to receive ECA (sewage, air noise) • Ensure appropriate operator training

Risk Description	Risk Strategy Implementation Plan
Procurement	• Planned as seven (7) separate engineering assignments for coordinated delivery of multiple contracts within a congested site.
Biosolids Market Availability	• Several discussions with third-party management firms; all have indicated interest in managing the Region's biosolids products. • There is also an opportunity for the beneficial use of ash.
Schedule	• Liquid expansion is not required until later in the planning period, as diversion through the East-to-West Trunk sewer will alleviate current capacity challenges at the G.E. Booth WRRF. New digestion addition is recommended by around Year 2031 to diversify biosolids management outlets, improve incineration operational capacity and performance, recover energy, and reduce GHG. • Given recent Provincial legislation, schedule may have to be fast-tracked to accommodate growth. • Will require careful monitoring and mitigation plans to reduce schedule risk.
Community Acceptability	• Continue to communicate with local public regarding schedule for construction, as well as input into the long-term biosolids management strategy. • Extensive odour controls are planned and underway, to reduce odours generated at the plant. Likewise, noise impacts will be controlled. • Removal of ash lagoons, site landscaping, and buffer areas are part of the preferred design. • Energy recovery and GHG emission reduction are an important part of the preferred solution. ○ Biogas recovery from anaerobic digestion can be used on the G.E. Booth WRRF site to supply energy to support plant operations. ○ The digested sludge may also be beneficially land applied. ○ Treated effluent will be used in the DEC to support heating and cooling of buildings in the Lakeview Village Development, thereby significantly reducing GHG emissions and the Region of Peel and City of Mississauga's carbon footprint.
Bill 23 Implications	• The Region is currently assessing the Implications of Bill 23 and have developed a preliminary fast-tracked schedule for expansion at the G.E. Booth WRRF as presented in Section 11.3.

12.0 Consultation and Engagement Program

This section provides a compilation of all the relevant documentation related to the public, Indigenous, agency, and stakeholder consultation. It also provides the background support for satisfying public consultation requirements under the approved MEA Class EA Process. The following sections summarize the key components of the consultation strategy; further records are available in **Volume 4: Engagement and Consultation**.

12.1 Goals of the Consultation and Engagement Program

Consultation is an integral component of the Class EA process, enabling the Region to inform the public about the study while eliciting input from interested and affected parties throughout the study process.

The primary goals of the consultation and engagement process were to:

- Present clear and concise information to stakeholders at key stages of the study process,
- Solicit community, Indigenous Community, regulatory, and Region staff input, and,
- Meet and exceed MEA Class EA consultation requirements for Schedule C projects.

To fulfill the consultation requirements of the MEA Class EA and enhance the overall Class EA process, the G.E. Booth WRRF Class EA program was designed to:

- Build on past communication protocols and consultation plans from previous Class EAs and municipal planning initiatives for consistency and continuity;
- Meet and exceed public and agency notification and Schedule C consultation requirements for Phases 1 to 4 of the MEA Municipal Class EA process;
- Allow interested members of the public, Indigenous Community representatives, Region and Municipal councillors, stakeholders, external agencies (including federal and provincial), and special interest groups an opportunity to participate in the study process;
- Provide information to interested and affected stakeholders early and often throughout the study process; and
- Contact external agencies to obtain legislative or regulatory approvals, or to collect pertinent technical information.

The Region of Peel's overall Communications, Consultation, and Engagement Program was driven by five (5) key principles:

- Respect for all parties engaged in the process;
- Clear, consistent communication to allow a broad understanding of easily understood consistent information;
- Demonstrate organizational and community values so that all communications reflect the values of Peel Region as an organization and as a community;
- Transparency so that communication between the project team and stakeholders is always undertaken in an open and honest manner; and

- Flexibility to adapt to the different stakeholders, their level of interest, and their concerns throughout the EA process.

These principles were adhered to when consulting with all interested members of the public, government agencies, and other stakeholders, including engagement with Indigenous Communities throughout the Class EA process. A broad range of methods for interested parties to provide input were employed including meetings and discussions, notices, comment forms at public consultation events and online or virtual consultation opportunities including by email, web page, or virtual meetings.

The Communications and Consultation Plan was developed at the Class EA outset and updated throughout the Class EA process. A copy of the Communications and Consultation Plan is provided in **Volume 4, Appendix N**. Documentation of the Class EA consultation and communication process is summarized in the following sections.

12.2 Contact List / Stakeholder Identification

A Stakeholder Contact List for the study was developed during Phase 1 based on the project team's knowledge of the study area and has been continuously updated throughout the process to include any and all relevant agencies, stakeholders, and interested parties including Indigenous communities, government agencies, utilities, and other special interest groups. The stakeholder list is provided in **Volume 4, Appendix Q**.

All stakeholders were kept informed throughout the study through notices and public information centres (PICs) at key milestones in the Class EA. Meetings and discussions were also held with the following major permitting and approval agencies:

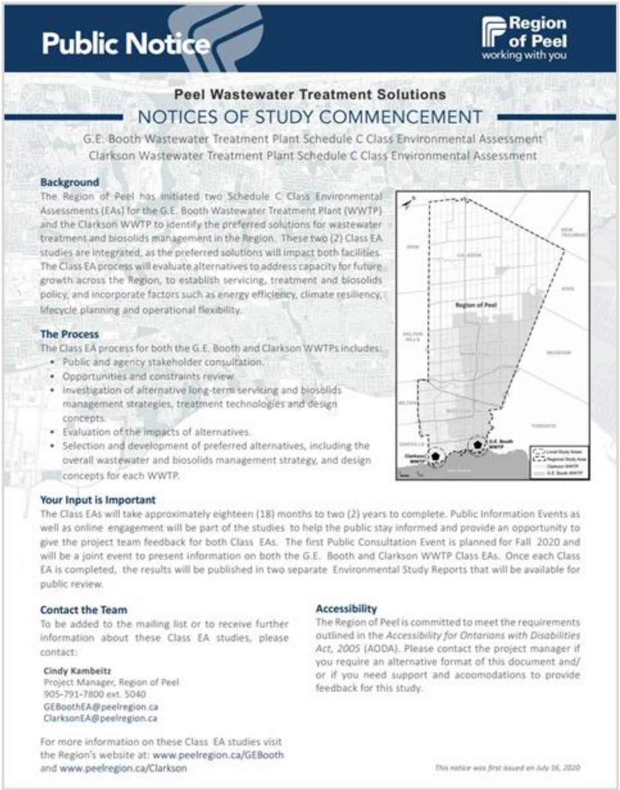
- City of Mississauga
- Credit Valley Conservation (CVC)
- Ministry of Environment, Conservation and Parks (MECP)
- Ministry of Citizenship and Multiculturalism (MCM)

As identified by the MECP at the initiation of the study, the following Indigenous Communities were consulted with and engaged:

- Haudenosaunee Confederacy Chiefs Council
- Huron-Wendat Nation
- Mississaugas of the Credit First Nation
- Six Nations of the Grand River

12.3 Notice of Commencement

The Notice of Study Commencement was issued via mail and email to the stakeholders identified on July 14, 2020. The notice was posted on the project webpages and published in the local Mississauga newspaper, "The Mississauga News". Personalized letters to accompany these notices were prepared for the government agencies and identified Indigenous Communities. Contact information for the Region Project Manager was provided in the notices to allow for interested parties to obtain additional information or request that they be added to the Stakeholder Mailing List. The Notice of Commencement was issued via mail and/or email to 167 contacts, including Indigenous communities, Agencies, and Conservation Authorities. A copy of the Notice of Study Commencement was provided via mail and email to specific contacts, including a personalized letter outlining further study details.


Public Notice

Region of Peel
working with you

Peel Wastewater Treatment Solutions

NOTICES OF STUDY COMMENCEMENT

G.E. Booth Wastewater Treatment Plant Schedule C Class Environmental Assessment
Clarkson Wastewater Treatment Plant Schedule C Class Environmental Assessment

Background

The Region of Peel has initiated two Schedule C Class Environmental Assessments (EAs) for the G.E. Booth Wastewater Treatment Plant (WWTP) and the Clarkson WWTP to identify the preferred solutions for wastewater treatment and biosolids management in the Region. These two (2) Class EA studies are integrated, as the preferred solutions will impact both facilities. The Class EA process will evaluate alternatives to address capacity for future growth across the Region, to establish servicing, treatment and biosolids policy, and incorporate factors such as energy efficiency, climate resiliency, lifecycle planning and operational flexibility.

The Process

The Class EA process for both the G.E. Booth and Clarkson WWTPs includes:

- Public and agency stakeholder consultation.
- Opportunities and constraints review.
- Investigation of alternative long-term servicing and biosolids management strategies, treatment technologies and design concepts.
- Evaluation of the impacts of alternatives.
- Selection and development of preferred alternatives, including the overall wastewater and biosolids management strategy, and design concepts for each WWTP.

Your Input is Important

The Class EAs will take approximately eighteen (18) months to two (2) years to complete. Public Information Events as well as online engagement will be part of the studies to help the public stay informed and provide an opportunity to give the project team feedback for both Class EAs. The first Public Consultation Event is planned for Fall 2020 and will be a joint event to present information on both the G.E. Booth and Clarkson WWTP Class EAs. Once each Class EA is completed, the results will be published in two separate Environmental Study Reports that will be available for public review.

Contact the Team

To be added to the mailing list or to receive further information about these Class EA studies, please contact:

Cindy Kambeitz
Project Manager, Region of Peel
905-791-7800 ext. 5040
GEBoothEA@peelregion.ca
ClarksonEA@peelregion.ca

For more information on these Class EA studies visit the Region's website at: www.peelregion.ca/GEBooth and www.peelregion.ca/Clarkson

Accessibility

The Region of Peel is committed to meet the requirements outlined in the *Accessibility for Ontarians with Disabilities Act, 2005* (AODA). Please contact the project manager if you require an alternative format of this document and/or if you need support and acoomodations to provide feedback for this study.

This notice was first issued on July 16, 2020

The MECP was notified directly through filing the Notice of Study Commencement to elicit important project information such as the identification of key Indigenous Communities in the study area as well as important cultural and archaeological land use considerations. The Notice of Study Commencement can be found in **Volume 4, Appendix R**.

12.4 Website and Social Media Updates

Individual project websites for the G.E. Booth WRRF and Clarkson WRRF Schedule C Class EAs were established in Phase 1, which included publishing the study commencement, study area, and background information, as well as an email contact specific to each EA (GEBooth@peelregion.ca and Clarkson@peelregion.ca). The websites were continually updated with important notices and information. In addition to project notices and milestone updates, information presented during public meetings including PIC display panels which were published on the Region's webpages. In addition to the website, Twitter was also used to notify stakeholders of upcoming PIC events.

12.5 Issues Management and Tracking Forms

During Phase 1, an issues management and tracking form was developed for each Class EA so that all comments, consultation, and communication efforts can be directly linked and stored easily and efficiently. All comments received from the public and stakeholders were addressed and considered in the assessment of alternatives and the development of the overall preferred concept for the G.E. Booth WRRF. A summary of comments received, responses, and how the information influenced the Class EA process is presented in Section 12.10.

12.6 Public Information Centres

PICs were held to elicit input at key milestones of the Class EA process. **Table 12-1** provides an overview of the purpose, format, and dates for these PICs. All comments received were responded to and posted following the PICs.

As Phases 1 and 2 of the Class EA process were undertaken concurrently as an integrated solution for the expansions of the G.E. Booth and Clarkson WRRFs, PIC 1 and PIC 2 were both held to provide updates for both plants. Phase 3 of the Class EA process was completed separately for each plant and therefore PIC 3 was conducted solely to outline the Phase 3 recommendations for the Clarkson WRRF expansion. PIC 4 was conducted solely to outline the Phase 3 recommendations for the G.E. Booth WRRF expansion.

Documentation of the notifications, presentation materials, and comments/responses for each PIC are provided in **Volume 4, Appendix S**, with summaries presented in the following sub-sections.

Table 12-1: Purpose and Objectives of the Public Information Centres

Date of PIC	Purpose and Objectives	Format	Date of Posting of Comments and Responses
October 14, 2020, to October 28, 2020 (Joint G.E. Booth WRRF Class EA and Clarkson WRRF Class EA PIC)	To introduce and receive input on: • Phase 1 of the Class EA (background and opportunity statement); • Regional alternative solutions for treating wastewater and managing biosolids being considered in Phase 2; and, • Draft evaluation criteria for assessing alternative solutions.	Virtual PIC display panels and video presentation	November 25, 2020
March 31, 2021, to April 14, 2021 (Joint G.E. Booth WRRF Class EA and Clarkson WRRF Class EA PIC)	To present and receive input on: • The evaluation of Phase 2 alternatives, including impacts, mitigation measures and net effects; • The recommended Phase 2 regional solution; and, • Phase 3 long list of alternative treatment technologies and evaluation process.	Virtual PIC display panels and video presentation	April 28, 2021
March 15, 2023 to March 30, 2023 (PIC exclusive to G.E. Booth WRRF Class EA)	To present and receive input on: • The evaluation of Phase 3 design concepts • Recommended Design Concept • Measures to mitigate impacts and minimize risks	Virtual PIC display panels and video presentation	April 15, 2023

12.6.1 Virtual Public Information Centre 1 – Phase 1

12.6.1.1 Notice of Virtual Public Information Centre 1

The Notice of PIC 1 was issued via mail and email to the stakeholders identified at the outset of the project, as well as additional stakeholders who requested future notification through the various project communication platforms including the Class EA emails, and webpages. The notice was issued on October 1, 2020. The notice was also posted on the project webpages and published in the local Mississauga newspaper, "The Mississauga News". Contact information for the Region Project Manager was provided in the notices to allow for interested parties to obtain additional information or request that they be added to the Stakeholder Mailing List. The Notice of Virtual PIC 1 was issued via mail and or email to 167 contacts, including Indigenous Communities, Agencies, and Conservation Authorities. A copy of the Notice of Commencement was provided via mail and email to specific contacts, including a personalized letter outlining further study details.

12.6.1.2 Virtual Public Information Centre 1 Event

During the global pandemic caused by COVID-19, the Region of Peel Public Works continued to operate efficiently with their approach to public and stakeholder consultation. Their approach to engagement involved remaining flexible and adjusting all programs to adapt to changing needs. As such, the first PIC was virtual and was designed to provide detailed information on the studies and to allow all interested parties an opportunity to participate. The purpose of the public information event was to provide background information on the studies to stakeholders and the public and to introduce the project team. The event also provided an engagement opportunity through a survey/questionnaire for interested parties to provide comments, submit questions, and identify areas of importance regarding both the G.E. Booth WRRF and Clarkson WRRF EAs within a 2-week window of the PIC. The PIC included panels and a short video presentation, along with a questionnaire. The questionnaire included the following questions:

- How would you rank your understanding of Peel's Wastewater Treatment System on a scale of 1 (no understanding) to 10 (expert)?
- Do you have a good understanding of the need for these studies? If not, please explain why.
- Do you have any additional thoughts, ideas, or considerations for the key components of these studies? (i.e., wastewater treatment, biosolids management, or outfall)
- Do you have any concerns or suggestions regarding the existing Clarkson WRRF site or expanding the treatment facilities at the Clarkson WRRF?
- Do you have any concerns or suggestions regarding the existing G.E. Booth WRRF site or expanding the treatment facilities at the G.E. Booth WRRF?
- In order of priority, which evaluation criteria do you believe is most important (1 – Most Important, 4 – Least Important)? (A list of criteria was provided for evaluation)
- Are there any other criteria that we should consider in assessing alternatives?

- What do you believe are the top three (3) most important outcomes of this study? (A list of options was provided)
- Do you have any additional comments or questions for the Project Team regarding these Environmental Assessments?

The G.E. Booth WRRF and Clarkson WRRF Class EAs' webpages received approximately 300 visits throughout the two-week question period, with approximately 60 visits to the PIC presentation video. A total of 4 comments were received through the PIC questionnaire/survey during the two-week window, with the potential for additional comments to be received regarding the PIC after the question submission period through other methods of contact.

The formal comment response period for the PIC was held from October 14 to October 28, 2020. All comments and questions received were formally responded to through the project webpages on November 25th, 2020, in the form of a "Frequently Asked Questions" handout (refer to **Volume 4 Appendix S**), which included responses to all questions received through the public information event survey, as well as comments and questions received directly through the provided project contact information.

12.6.2 Virtual Public Information Centre 2 – Phase 2

12.6.2.1 Notice of Virtual Public Information Centre 2

The Notice of Virtual PIC 2 was issued via mail and email to the master list of stakeholders used during the first PIC. The master list of stakeholders was updated to remove any stakeholders as requested, as well as include stakeholders who requested future notification after the first PIC through the various project communication platforms. The notice was issued on March 17, 2021. The notice was also posted on the project webpages and published in the local Mississauga newspaper, "The Mississauga News" on March 25, 2021. The Notice of Virtual PIC 2 was issued via mail and/or email to approximately 180 contacts, including Indigenous Communities, Agencies, and Conservation Authorities who were provided copies of the notice via both mail and email.

12.6.2.2 Virtual Public Information Centre 2 Event

As the global pandemic caused by COVID-19 was ongoing, the second PIC event was also held virtually, using lessons learned from the first PIC to ensure active and effective public participation.

The purpose of the public information event was to present the findings of Phase 2 of the Class EA process, which included preliminary recommended solutions for both of the wastewater treatment plants and the evaluation and assessment process used to identify these findings.

In order to provide interested parties with this detailed information, several different resources were created. A short high-level video presentation outlining the project background, evaluation process, preliminary solutions for each plant and next steps for Phase 3, as well as a webpage that hosted similar information in greater detail. In addition to this, two (2) individual handouts were created to present facility site plans of both treatment plants for each of the alternatives considered during Phase 2 as well as the detailed evaluation matrix used to identify the preferred solutions. Each of these resources provided varying levels of detail to suit the needs of individual stakeholders. The event also provided an engagement opportunity through two (2) separate email addresses for the G.E. Booth WRRF and Clarkson WRRF EAs, respectively, where interested parties could provide comments, submit questions, and identify areas of importance regarding both the G.E. Booth and Clarkson WRRF EAs within a 2-week window of the PIC.

The G.E. Booth WRRF and Clarkson WRRF EAs webpages received approximately 143 visits throughout the two (2)-week question period, with approximately 70 visits to the PIC presentation video and 100 visits to the detailed project webpage. Comments were received through the PIC specific emails during the two-week window, with the potential for additional comments to be received regarding the PIC after the question submission period through other methods of contact.

All comments and questions received were formally responded to through the project webpages on April 28, 2021, in the form of a summary handout which is included in **Volume 4, Appendix S**.

12.6.3 Virtual Public Information Centre 4[2]

12.6.3.1 Notice of Virtual Public Information Centre 4

The Notice of Virtual PIC 4 was issued via mail and email to the master list of stakeholders used during the first, second, and third PIC, updated to remove any stakeholders as requested, as well as include stakeholders who requested future notification after the first, second, or third PIC through the various project communication platforms. The notice was issued on February 15, 2023 and identified that PIC 4 would focus solely on the Phase 3 evaluation and recommendations for the G.E. Booth WRRF expansion. The notice was also posted on the project webpages and published in the local Mississauga newspaper, “The Mississauga News”. The Notice of Virtual PIC 4 was issued via mail and/or email to approximately 217 contacts on the master stakeholder list, including Indigenous Communities, Agencies, and Conservation Authorities who were provided copies of the notice via both mail and email. The Virtual PIC was also posted on the Region’s Twitter page on March 14, 2023.

12.6.3.2 Virtual Public Information Centre 4 Event

The fourth PIC was held virtually and was designed to provide detailed information on the G.E. Booth WRRF Class EA. The purpose of PIC #4 was to present the findings of Phase 3 of the Class EA process for the G.E. Booth WRRF Class EA and receive input on the overall design concept and measures to mitigate environmental impacts. Prior to the PIC, individual meetings were also held with key stakeholders including the MECP, CVC, and the City of Mississauga, to receive individual input on the preferred concept. Approximately 40 visits to the website were received during the 2-week question period. The preferred design concept was generally accepted provided that the Region continue to work with the

[2] A Phase 3 PIC was held separately for the Clarkson WRRF and was referred to as PIC 3. The Phase 3 PIC for the G.E. Booth WRRF is referred to as PIC 4.

affected agencies to incorporate measures to control environmental and community impacts into the final design including:

- Odour, noise, and air emissions controls;
- Protection and restoration of natural features;
- Stormwater management controls; and
- Landscaping of the site following construction.

Similar to Virtual PIC 2 and PIC 3, all comments and questions received were formally responded to through the project webpage in the form of a summary handout which is included in **Volume 4 Appendix S.**

12.7 Stakeholder Meetings and Consultation

Key approval agencies were communicated with throughout the Class EA. Details on these communications are provided in the following sections, while documentation of the agency consultations is provided in **Volume 4 Appendix T**.

12.7.1 City of Mississauga

Communication with the City of Mississauga was ongoing throughout the Class EA and involved:

- **Phase 1 Consultation:** Early in the process the City of Mississauga was contacted via phone call to discuss the study on September 21, 2020. A follow up email was sent to the City on October 13, 2020, to summarize the information discussed on the call.
- **Phase 2 Consultation:** Early in Phase 2 a formal meeting was held with the City on November 24, 2020, to provide an overview of the problem definition and the alternatives being considered in Phase 2. The project team provided an overview of the Phase 1 and 2 results to date, and the information was distributed by City representatives to a broader range of City staff to allow for input into the evaluation of Phase 2 solutions.
- **Prior to PIC 2:** The City of Mississauga was contacted on March 23, 2021 and was provided with a summary of the Phase 2 results and invited to discuss these results further. City staff had no further comments at the time.
- **Phase 3 Consultation:** Prior to Virtual PIC 4, the project team contacted the City of Mississauga to inquire if any materials or information on the Phase 3 evaluation and preferred design concept would be required by the City. Several City staff members were also invited to attend Virtual PIC 4. City staff indicated that they did not require any information at that time.
- **Review of Draft ESR:** The City was contacted on May 30, 2023 to discuss the final results and filing of the ESR, along with the natural environment work completed to date. A summary of the ESR findings, along with the preferred design concept, impacts, and measures to mitigate impacts will be provided to City staff for review with any comments received incorporated into the final ESR.

The City of Mississauga is generally supportive of the G.E. Booth WRRF expansion, provided that impacts to adjacent land uses are mitigated and that the Region continue to consult with the City during detailed design to receive site-specific City approvals.

12.7.2 Credit Valley Conservation

In response to the Notice of Commencement, CVC provided detailed comments on the G.E. Booth WRRF site, its characteristics, and consultation and communications requirements with CVC. To address CVC's concerns and approval requirements, the following communication activities were undertaken:

- **Pre-Consultation:** CVC was contacted early in the process (July 31, 2020) to provide relevant background information to undertake the natural environment inventories.
- **Phase 1 Consultation:** CVC provided detailed information on the natural environment at both the Clarkson WRRF and G.E. Booth WRRF sites in response to the pre-consultation requests.
- **Phase 2 Consultation:** CVC was provided with information on Phase 2 of the Class EA on April 14, 2021. Further information was provided to them by the project team on April 27, 2021, in response.
- **Phase 3 Consultation:** Once the Phase 3 evaluation and preferred design concept was selected and more detailed natural feature investigations were undertaken, the project team met with CVC to discuss the impacts, mitigation measures, and restoration measures on February 2, 2023. Based on the information provided to CVC during the meeting, the CVC indicated that they had no further comments at that time.
- **Review of Draft ESR:** The CVC was contacted on May 30, 2023, to request a meeting to discuss the final results and filing of the ESR. This meeting was held for June 29, 2023 with the draft ESR provided in advance on June 13, 2023. Further documentation was requested by the CVC and was provided on July 20, 2023. The minutes from the June 29, 2023 meeting were provided to the CVC on August 22, 2023 and are included in **Volume 4 Appendix T2**. The meeting minutes include action items that were incorporated into the ESR. Further to this meeting, CVC provided comments on the draft ESR on August 16, 2023 which were reviewed and incorporated into the ESR where appropriate.

CVC is generally supportive of the G.E. Booth WRRF expansion, provided that the impacts on natural features are mitigated and that the Region continues to consult with the CVC during detailed design to ensure that the site-specific CVC approvals are obtained.

12.7.3 Ministry of the Environment, Conservation and Parks

At the commencement of the project, the MECP was notified directly through filing of the Notice of Commencement to elicit important project information such as the identification of key Indigenous Communities in the study area as well as important cultural and archaeological land use considerations.

Through the Class EA the following meetings were held with the MECP to receive crucial input on the evaluation and recommended alternatives:

- **October 7, 2020:** The purpose of this meeting was to introduce the Class EAs, their purpose, and background information. Additionally, a walkthrough of the Virtual PIC presentation slides was provided, and comments from the Ministry were considered and acknowledged.
- **April 14, 2021:** The results of Phase 2 of the Class EA were presented, as well as the approach for completing the assimilative capacity study, and early findings.
- **March 1, 2023:** The results of the assimilative capacity study were presented, as well as the proposed effluent quality objectives and limits. A final draft of the assimilative capacity study was prepared based on input received.

A draft of the ESR will be provided to the MECP for their review and comment prior to finalizing and filing of the ESR. Key appendices will also be provided including the RWIA (**Volume 2 Appendix B**), the AQIA (**Volume 2 Appendix C**) and the AIA (**Volume 2 Appendix D**). MECP will continue to be engaged through detailed design to ensure their requirements are met and appropriate approvals received.

12.7.4 Ministry of Citizenship and Multiculturalism (MCM)

The MCM (formerly the Ministry of Heritage, Sport, Tourism, and Culture Industries (MHSTCI)) mandate is to conserve Ontario's cultural heritage, which includes:

- Archaeological resources, including land and marine;
- Built heritage resources, including bridges and monuments; and
- Cultural heritage landscapes.

Project information forms for the Stage 1 AA were completed for the G.E. Booth WRRF. After being reviewed, updated, and accepted by the MCFN and the Huron-Wendat First Nation, the MCM was provided final copies of the Stage 1 AA's and Marine AA for final signoff.

An additional area in the northwest portion of the G.E. Booth WRRF was considered for future expansion and therefore a subsequent Stage 1 AA was completed in April 2023 which also did not indicate the potential for archaeological resources.

If unknown archaeological resources are discovered during construction, the Region will stop construction and consult with MCM regarding measures to mitigate or remove.

It is noted that when this study began the Ministry of Heritage, Sports, Tourism and Cultural Industries (MHSTCI) was the governing agency.

12.8 Indigenous Community Consultation and Engagement

In their response letter to the Notice of Commencement (August 17, 2020), the MECP provided direction as to the Indigenous Communities to engage and the protocols for engaging these Communities. An Indigenous Community Engagement Plan (September 2020) was developed based on these protocols. Personalized letters were also sent to the following Indigenous Communities, as identified by the MECP, upon study initiation:

- Mississaugas of the Credit First Nation (MCFN)
- Huron-Wendat Nation
- Six Nations of the Grand River (SNGR)
- Haudenosaunee Confederacy Chiefs Council, including the Haudenosaunee Development Institute (HDI) department.

To confirm the level of interest, the Region also completed the “Municipal Class EA - Companion Guide (rev 02 – December 10, 2018) A.3.7 First Nations and Aboriginal Peoples - Preliminary Assessment Checklist: First Nation and Métis Community Interest.” (see **Volume 4, Appendix U**). Indigenous Community areas of interest, as per the screening tool, include areas of archaeological and cultural heritage potential within the site, the outfall located on Crown Lands (i.e., the Lakebed), and potential impacts to natural features from the project.

The four Communities listed above were therefore consulted with throughout the Class EA, specifically with respect to identified interests. They continued to receive project updates and notices and were invited to meet and participate in PICs. In addition, the First Nations Communities will be provided the opportunity to comment on the Draft ESR findings, prior to finalizing and submitting for public review. Input received and responses are documented in the following sections. Correspondence with the Indigenous Communities is included in **Volume 4, Appendix U**.

12.8.1 Mississaugas of the Credit First Nation

The MCFN indicated early in the process that they wished to participate in the Class EAs. The MCFN provided agreements regarding their required participation and review of archaeological studies and investigations at both WRRFs. The Region signed the MCFN agreements allowing the MCFN to review draft Stage 1 and Stage 2 AAs, and provide comments, as well as agreements for on-site participation in the Stage 2 AA on-site field investigations.

Through emails and phone conversations, the MCFN were kept up to date on the progress of the G.E. Booth WRRF Class EA, and particularly the results of the AAs. When reviewing the Stage 1 AA and Marine AA for the G.E. Booth WRRF, it was discussed that the expansion areas did not include the potential for archaeological resources and therefore no additional investigations would be required. An additional area in the northwest portion of the G.E. Booth WRRF was considered for future expansion and therefore a subsequent Stage 1 AA was completed in April 2023 which also did not indicate the potential for archaeological resources.

The MCFN were also notified of all PICs, the project websites, and the availability of the Draft ESR for review and comment prior to finalizing and posting for public review.

12.8.2 Huron-Wendat First Nation

The Huron-Wendat First Nation indicated early in the process that they wished to participate in the Class EAs. The Huron-Wendat First Nation requested information regarding the completion and undertaking of any archaeological assessments within the study area and asked that they continue to be kept informed of the Class EA work and findings. An agreement for participation by the Huron-Wendat First Nation in the Stage 1 AA was also provided to the Region. The Huron-Wendat First Nation were also notified of all PICs, the project websites, and the availability of the Draft ESR for review and comment prior to finalizing and posting for public review.

12.8.3 Six Nations of the Grand River

The SNGR were notified of the project commencement via email and mail correspondence on July 16, 2020. The SNGR was also notified of all PICs, the project websites, and the availability of the Draft ESR for review and comment prior to finalizing and posting for public review. No comments from the SNGR were received.

12.8.4 Haudenosaunee Confederacy Chiefs Council

The Haudenosaunee Confederacy Chiefs Council were asked to participate at the project commencement and consulted with throughout the Class EA process (i.e., received notices of PICs, the project websites). In late 2022, the Haudenosaunee Development Institute (HDI) expressed concerns regarding the G.E. Booth WRRF expansion, and other ongoing Peel projects. Senior management at the Region of Peel have worked with HDI to develop an enhanced protocol for consultation on future Peel infrastructure projects, including the updated Water and Wastewater Servicing Master Plan scheduled to begin in mid-2023. Any further engagement and input from HDI regarding the G.E. Booth WRRF EA will be included in the final ESR.

12.9 Comments on the Draft ESR by the Ministry of Environment, Conservation and Parks

The MECP will be circulated a copy of the Draft ESR for review and any comments received will be incorporated into the final ESR. Details on any comments received and the responses will be provided in **Volume 4, Appendix U**.

12.10 Summary of Comments Received and Responses

Table 12-2 provides a summary of comments received during the Class EA and the project team responses. All comments were responded to and incorporated into the ESR document where appropriate.

Table 12-2 Comments and Responses

Stakeholder	Comment/Concern	Response
Government Agencies		
City of Mississauga	Interested in the project background and alternative design concepts. Interested in the concurrent/parallel completion of the G.E. Booth and Clarkson EAs.	A meeting was held with City staff to review the project background. PIC materials were shared with City staff outlining the Phase 2 results and next steps. The project team described that the Region is completing the G.E. Booth and Clarkson WRRF EAs concurrently due to the interrelated nature of the plants.
Credit Valley Conservation (CVC)	CVC's concerns related to ensuring that the WRRF expansion continue to protect property from flooding and erosion, protect natural areas, provide source protection, maintain compatibility with Lakeview Village, coordinate opportunities with the JTLCA, and protect aquatic and natural habitats.	The project team acknowledged the CVC's concerns and indicated that all these items will be considered throughout the Class EA process. Meetings were held with the CVC at key phases of the project to ensure ongoing communication and engagement. The Region will continue to work with the CVC to receive approvals throughout the design process.
Infrastructure Ontario	Infrastructure Ontario requested the verification of any provincial government property within the study area before project continuation.	Provincial lands are not anticipated to be required for the project.
Ministry of Environment, Conservation and Parks (MECP)	MECP's mandate is to protect Ontario's air, land, water, species at risk, and their habitats. Therefore, the MECP were consulted with throughout the study. Several meetings were held with the MECP on the assessment process, the receiving water quality assessment, air quality and odour assessment, noise assessment, and the measures to mitigate impacts. The MECP will be provided with the Draft ESR and supporting studies to review prior to finalization.	The project team worked with the MECP in completing the Assimilative Capacity Study and have incorporated their input into the Study. The proposed effluent limits and objectives were discussed and agreed upon. Draft odour and noise assessments have been completed in accordance with MECP requirements. The expansion is expected to comply with O. Reg. 419/05 as applicable to air quality standards and comply with MECP NPC-300 as applicable to noise control criteria. The draft odour and noise assessment reports will be circulated to the MECP for review and comment and updated to reflect any comments received. Impacts to natural, social, and cultural environments are expected to be minimal and will be mitigated. Breeding bird surveys are being completed in Spring/Summer 2023 in order to finalize ecological mitigation measures for the G.E. Booth WRRF. The Region will continue to work with the MECP during detailed design to obtain the required permits and approvals.
Ministry of Citizenship and Multiculturalism (MCM) (Note: previously administered by the Ministry of Heritage, Sports, Tourism and Cultural Industries - MHSTCI)	MCM is interested in any technical cultural heritage studies being undertaken at each WRRF.	MHSTCI (now administered by MCM) were provided copies of the Stage 1 AAs. The area of expansion has been cleared of archaeological potential. If unknown archaeological resources are discovered during construction, the Region will stop construction and consult with MCM regarding measures to mitigate or remove.

Stakeholder	Comment/Concern	Response
Ministry of Transportation (MTO)	Interested in any proposed works within their permit control limit as this will require MTO review/approval and permits.	MTO properties will not be impacted as a result of the expansion.
Indigenous Communities		
Mississaugas of the Credit First Nations (MCFN)	To preserve the culture and heritage of its Territory, including protection of archaeological materials and human remains.	MCFN were engaged in the review of the Stage 1 AAs. The MCFN indicated that they had no concerns with the contents or recommendations put forward in the Stage 1 AA for the G.E. Booth WRRF and the Background Research Marine AA for the G.E. Booth WRRF.
Huron-Wendat First Nation	To conserve and enhance their heritage, particularly expressed interest in archaeological potential.	Huron-Wendat First Nation were engaged in the review of the Stage 1 AAs. No comments or concerns were identified upon their review of the Stage 1 AAs.
Six Nations of the Grand River.	No comments.	N/A.
Haudenosaunee Confederacy Chiefs Council	Concerns expressed regarding the preferred design concept, its impacts and mitigation measures of the G.E. Booth WRRF and other Peel infrastructure projects.	The Region continues to engage with the HDI and provide them with project reports for review and input as required. Input will be incorporated in the final ESR and considered during the detailed design stage.
Public and Interest Groups		
Local Citizen (PIC 1)	Water Conservation/Efficiency (reducing flows to sewer systems and reducing the need for a plant expansion).	As part of the Region’s overall wastewater management strategy, Water Efficiency and I/I Control Programs have been included as reducing flows to the wastewater collection system and will ultimately delay timing for future expansions.
Local Citizen (PIC 1)	New technologies and odour control considerations	Alternative technologies for treating the wastewater and biosolids were identified and assessed throughout the Class EA. The preferred technologies were selected based on minimizing risks to the environment, while meeting the Region’s overall goals of the study. Various technologies for odour control were also identified and included as part of the overall design concept.

13.0 Summary and Conclusions

The G.E. Booth WRRF Schedule C Class EA has developed a preferred regional solution for managing flows within the lake-based Peel wastewater collection system and a design concept for expanding the G.E. Booth WRRF to meet future wastewater treatment needs to the year 2041. The preferred solution, design concept, and current infrastructure planning and technology principles will help the Region respond to changing regulations and needs well into the future.

Key components of the preferred alternative are:

- **Diversion of Flows**: Diversion of flows through the East-to-West Trunk sewer will alleviate current capacity challenges at the G.E. Booth WRRF, while taking advantage of surplus capacity at the Clarkson WRRF.
- **Real Time Control:** The Region of Peel is committed to implementing RTC in the collection system to manage peak flows to improve system performance, increase operation flexibility, and realize cost savings in planned capacity upgrades and expansions to the Region's WRRFs. Reducing peak flows eliminates the need to expand the headworks and reduces the need for an additional treatment train at the G.E. Booth WRRF.
- **Expansion of G.E. Booth WRRF Capacity:** The G.E. Booth WRRF will be expanded from a rated average flow capacity of 518 MLD to 550 MLD by the year 2041. The G.E. Booth WRRF will be expanded using technology similarly used at the plant (CAS). New Plant 1 primary and secondary facilities are planned, along with expansion of the Plant 3 secondary treatment system are planned to provide the additional treatment capacity.
- **UV Disinfection:** Disinfection at the G.E. Booth WRRF is currently provided through chlorination/dechlorination. The Region plans to replace this existing disinfection system with a new UV disinfection facility sized to handle the expanded flow capacity.
- **Optimization of the Sludge Management System:** The sludge management system at the G.E. Booth WRRF will be optimized and expanded. Four (4) new anaerobic digesters are planned to stabilize a portion of primary sludge to increase the existing incineration operation capacity. The biogas produced by the digesters will be stored and used to supply energy to support operation of the plant. Finally, a new ash dewatering facility is planned to allow the decommissioning of the existing ash lagoons.
- **New Outfall:** A new outfall will be constructed with a diameter of approximately six (6) metres and a length of about 3,000 metres (with the last 1,000 metres being the diffuser).
- **New Energy Centre:** As part of the expansion, a new centrally locate power generation facility is planned to manage the supply of normal and emergency power to all buildings and processes on the G.E. Booth WRRF site.
- **New Administration Building:** A new administration building is planned near the main entrance of the site, off Lakeshore Road West.

Recognizing that the G.E. Booth WRRF is surrounded by sensitive land uses, including Applewood Creek and Marie Curtis Park to the east, the planned Lakeview Village Development to the west, JTLCA immediately to the south, and residential and business to north of the G.E. Booth WRRF, measures to protect the community and the environment are an integral part of the expansion project. Odour will be controlled through containment, collection, and treatment methods, with the goal of reducing odours from the G.E. Booth WRRF. Noise controls will also be implemented to mitigate any noise impacts exceeding applicable guidelines. The expansion facilities will be designed to complement the aesthetics of the existing buildings on site and improve the overall site itself. The ash lagoons will be removed, tanks covered, and the site landscaped to include plantings and buffers. Plans to manage stormwater, dewatering, truck traffic, and excess soils will be established during detailed design.

Water quality will be protected through the construction and operation of the new outfall. The RWIA indicated that PWQOs will continue to be met. The Natural Heritage Characterization and Impact assessments have shown that there are limited natural habitats and species at risk that will be negatively impacted through construction. The expansion has been planned to provide sufficient avoidance and protection of surrounding sensitive areas, including JTLCA, Applewood Creek and Lake Ontario. Stage 1 AA and marine assessments were undertaken as part of the Class EA and have cleared the expansion areas of archaeological potential.

Energy recovery and GHG emission reduction are important goals of the Region of Peel, and the preferred alternative has been developed to align with these goals. Biogas recovery from anaerobic can be used on the G.E. Booth WRRF site to supply energy to support plant operations. The digested sludge may also be beneficially land applied. Most significantly, however, is that the expansion project will support the DEC planned on the Lakeview Development site. By using the treated effluent from the G.E. Booth WRRF to provide heating and cooling to buildings in the Lakeview Village Development, the DEC will significantly reduce GHG emissions and the Region of Peel and City of Mississauga's carbon footprint.

Consultation with the public, government agencies, Indigenous Communities, and other stakeholders was undertaken throughout the course of the Class EA study and to date. Emphasis was placed on consulting and engaging with the MCFN, the Huron-Wendat First Nation, and the HDI as the site is located on their traditional lands. These communities were engaged through the Class EA, including review and input into AAs, and other study information. HDI is also reviewing the draft ESR, and their comments will be considered in finalizing the ESR and the subsequent design stage. No concerns to date have been expressed regarding the Class EA assessment and its results.

Following approval of this Schedule C Class EA Study, the Region of Peel is committed to:

- Continue to consult and coordinate with key review agencies during detailed design including the City of Mississauga, MECP, MNR, and CVC to ensure design, mitigation, and monitoring requirements are reviewed and approved;
- Complete additional investigations as required during detailed design, including geotechnical (on-land and marine), hydrogeological, hydrologic, environmental site assessments (ESAs), and subsurface utility investigations (SUE);
- Complete cultural heritage assessment report if required based on location of Administration Building in relation to existing heritage buildings;
- Continue to consult with the City of Mississauga and CVC during detailed design to ensure the protection of the JTLCA and shoreline during construction and to ensure long-term access to the JTLCA through the G.E. Booth facility for CVC;

- Complete wildlife rescue operations as required during the removal of the ash lagoons;
- Complete marine investigations during detailed design to ensure fish habitat is protected;
- Develop plans to manage stormwater, dewatering, truck traffic, and excess soils during detailed design;
- Obtain Amended Environmental Compliance Approval (ECAs) for Air and Noise;
- Implement the approved mitigation and monitoring measures during design and construction; and,
- Continue to monitor environmental, regulatory, and market trends to effectively plan for meeting wastewater treatment and biosolids management needs beyond the year 2041.