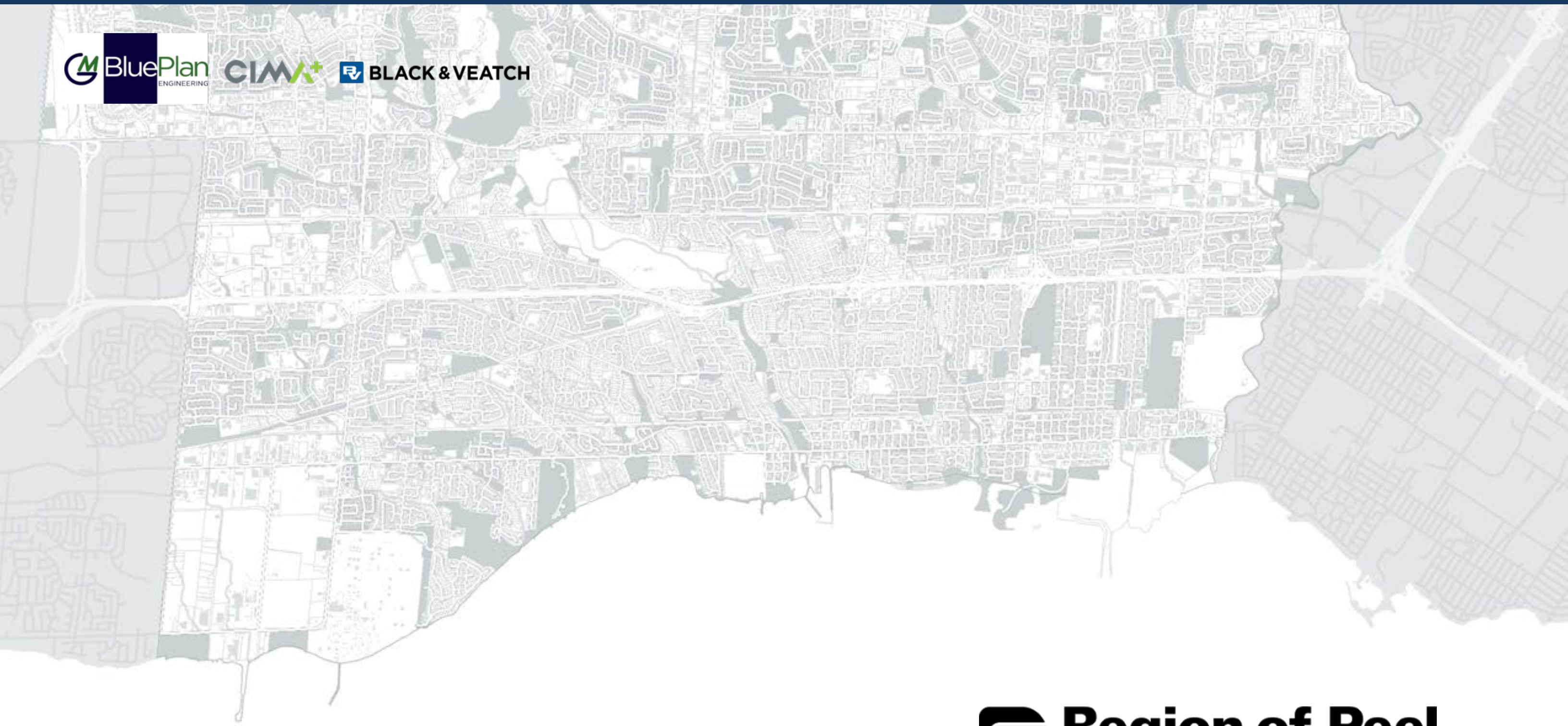

Region of Peel
working with you

Schedule C Municipal Class Environmental Assessment

Clarkson Water Resource Recovery Facility

Volume 1: Environmental Study Report

For Public Review

May 2023

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LIST OF ABBREVIATIONS

Term of Acronym	Definition
AA	Archeological Assessment
ADF	Average Daily Flows
ANSI	Areas of Natural and Scientific Interest
APEC	Area of Potential Environmental Concern
asl	Above Sea Level
BNQ	Bureau de normalization due Quebec
BOD	Biochemical Oxygen Demand
BOD_5	5-Day Biological Oxygen Demand
CBOD	Carbonaceous Biological Oxygen Demand
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
CHP	Combined Heat and Power
CHVI	Cultural Heritage Value or Interest
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
COSSARO	Committee on the Status of Species at Risk in Ontario
CRWNHS	Credit River Watershed Natural Heritage System
CTC	Credit Valley, Toronto and Region, and Central Lake Ontario
CUM	Mineral Cultural Meadow
CVC	Credit Valley Conservation
DFO	Department of Fisheries and Oceans Canada
dT/d	Dry Tonnes per Day
EA(A)	Environmental Assessment (Act)
EASR	Environmental Activity and Sector Registry
ECA	Environmental Compliance Approval
ELC	Environmental Land Classification
EPA	Environmental Protection Act
ESA	Environmental Site Assessment
ESR	Environmental Study Report
FzA	Fertilizers Act
FzR	Fertilizers Regulations
GGH	Greater Golden Horseshoe
GHG	Greenhouse Gas
GLWQA	Great Lakes Water Quality Assessment
ha	Hectare
HCD	Heritage Conservation District

Term of Acronym	Definition
HRT	Hydraulic Retention Time
I/I	Inflow / Infiltration
IJC	International Joint Commission
IPZ	Intake Protection Zone
JTLCA	Jim Tovey Lakeview Conservation Area
km	Kilometer
kW	Kilowatt
LID	Low Impact Development
L/s	Litres per second
M	Millions
m	Metres
m^3	Cubic Metres
MAM	Meadow Marshes
MAM2	Mineral Meadow Marsh
MBCA	Migratory Birds Convention Act
MBL	Multiple Bottom-Line Criteria
MCEA	Municipal Class Environmental Assessment
MCFN	Mississaugas of the Credit First Nation
MEA	Municipal Engineers Association
MECP	Ministry of the Environment, Conservation and Parks
mg/L	Milligrams per Litre
mL	Millilitre
MLD	Megalitres per Day
mm	Millimetre
MNRF	Ministry of Natural Resources and Forestry
MOP	Mississauga Official Plan
MTCS	Ministry of Tourism, Conservation and Parks
MTO	Ministry of Transportation
MW	Megawatt
NAS	Natural Area System
NASM	Non-Agricultural Source Material
NEP	Niagara Escarpment Plan
NHIC	Natural Heritage Information Centre
NHRM	Natural Heritage Reference Material
NH & UFS	Natural Heritage and Urban Forest Strategy
NMA	Nutrient Management Act
NPRI	National Pollutant Release Inventory
NVCA	Nottawasaga Valley Conservation Authority
OCWA	Ontario Clean Water Agency
OGS	Ontario Geologic Survey

Term of Acronym	Definition
OHA	Ontario Heritage Act
OLT	Ontario Land Tribunal
O&M	Operation and Maintenance
OMAFRA	Ontario Ministry of Agriculture, Food, and Rural Affairs
OP	Official Plan
OWES	Ontario Wetland Evaluation System
PCB	Polychlorinated Biphenyls
PCDD	polychlorinated dibenzo-p-dioxins
pH	Potential of Hydrogen
PHF	Peak Hourly Flow
PIC	Public Information Centre
PIF	Peak Instantaneous Flow
PPS	Provincial Policy Statement
PSW	Provincially Significant Wetlands
PTTW	Permit to Take Water
PWQO	Provincial Water Quality Objective
ROP(A)	Regional Official Plan (Amendment)
ROW	Right-Of-Way
RTC	Real Time Control
SAR(A)	Species at Risk (Act)
SPS	Sewage Pumping Station
SWH	Significant Wildlife Habitat
SWP	Source Water Protection
TBM	Tunnel Boring Machine
THP	Thermal Hydrolysis Process
TM	Technical Memorandum
TRCA	Toronto and Region Conservation Authority
V/C Ratio	Volume to Capacity Ratio
WAS	Waste Activated Sludge
WWTP	Wastewater Treatment Plant
WRRF	Water Resource Recovery Facility

1.0 Introduction and Background

1.1 Study Purpose and Objectives

The Regional Municipality of Peel (Region of Peel) lake-based wastewater system consists of two Water Resource Recovery Facilities (WRRFs) (formerly referred to as Wastewater Treatment Plants [WWTPs]): the Clarkson WRRF and the G.E. Booth WRRF, and two 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 million litres per day (MLD) and 518 MLD, respectively. The G.E. Booth WRRF is currently approaching its capacity limits, as the 5-year average day 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 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 loading in their systems. The diversion is a deep gravity tunnelled trunk sewer of 2400 mm diameter that extends 11 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 Peel'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 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 including the beneficial use of biosolids, is required.

Increases in wastewater treatment capacity and management of biosolids require the completion of Schedule C Municipal Class Environmental Assessments (EAs) 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 Clarkson WRRF 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 Clarkson WRRF. The interrelated nature of the Region’s wastewater collection and conveyance systems means that the solution established for the Clarkson WRRF is dependent of the solution selected for the G.E. Booth WRRF. Consequently, this Class EA has been completed in conjunction with the G.E. Booth WRRF Class EA through to the end of Phase 2. The following three 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 expansions.

This Environmental Study Report (ESR) provides details on the Clarkson 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 Clarkson WRRF, including wastewater and biosolids treatment technologies and process 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.

Peel's goal is to provide reliable wastewater collection, treatment, and management now and for the future. The Clarkson WRRF 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 Operation	• Operator acceptability • Proven processes
Energy Efficiency and Reduce Greenhouse Gas (GHG) Emissions	• Support Peel's GHG Reduction Goals • Energy Reduction and Reuse Opportunities
Fiscal Responsibility	• Balance lifecycle costs, while protecting the environment and communities

1.2 Study Area

Two study areas have been defined for this Class EA: the Region 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 G.E. Booth 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 Clarkson WRRF and surrounding area. The Region study area is bound by the service areas for both the Clarkson and G.E. Booth WRRFs, as shown in **Figure 1-1**, to account for interconnections and flow diversion strategies.

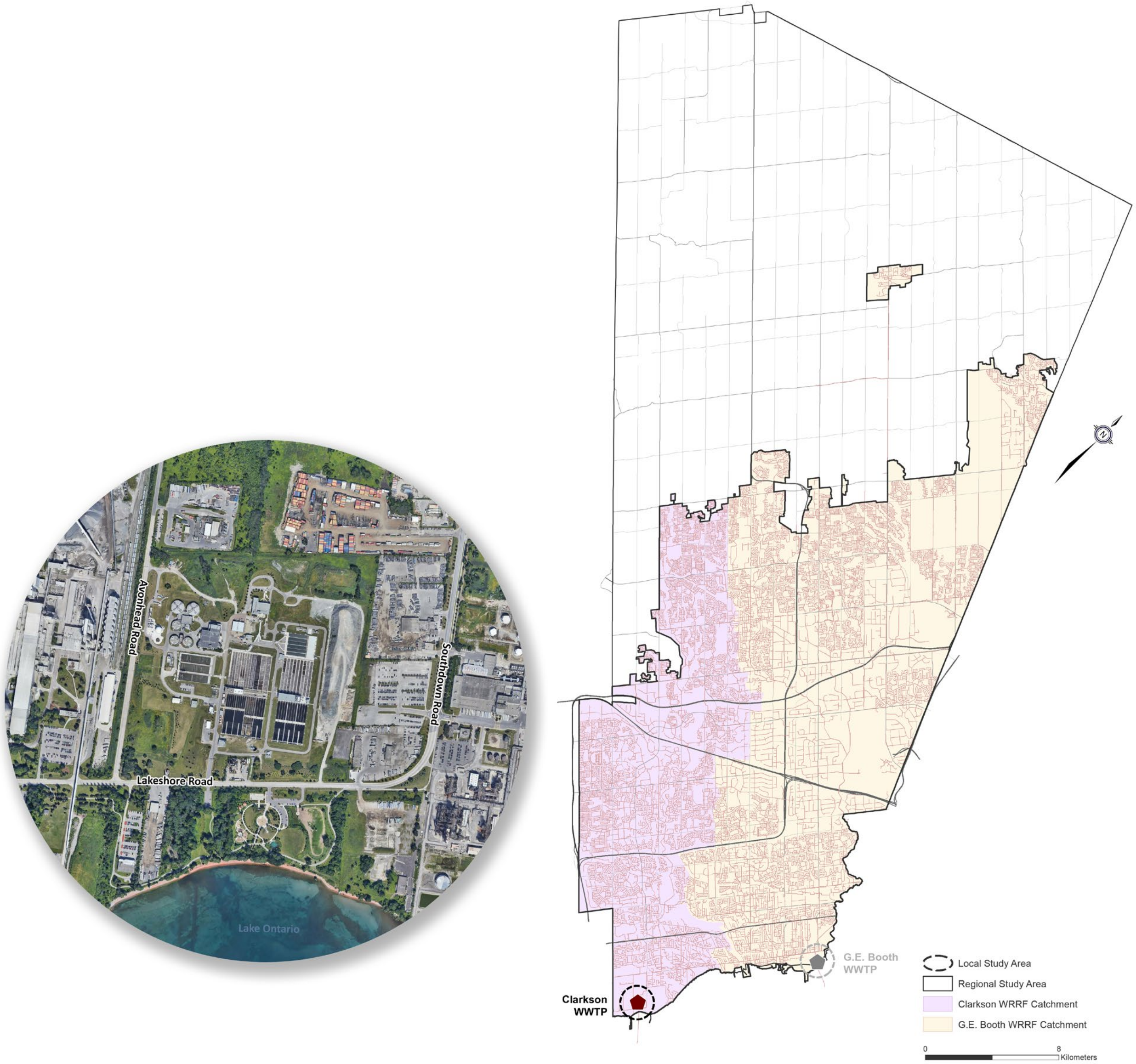


Figure 1-1: Regional and Local Study Area

1.3 Document Purpose and Aim

This document focuses on the Municipal Class EA process, Phases 1 to 5. The purpose of this document is to identify the problem/opportunity statement, describe the existing conditions of the regional and local study areas, identify, and evaluate alternative solutions and design concepts to address the study's problem/opportunity statement.

This ESR for the Clarkson WRRF Class EA documents the comprehensive process and is organized into the following sections:

Section 1: Introduction and Background

This section summarizes the study purpose and objectives, the study areas, and the report outline.

Section 2: Ontario's Environmental Assessment Process

This section provides an overview of the Municipal Class EA process, the principles of environmental planning, and the public review process.

Section 3: 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 Clarkson WRRF Schedule C Class EA.

Section 4: Phase 1 – Existing and Future Treatment Needs and Problem / Opportunity Statement

This section summarizes the projected population and employment growth and details implications on wastewater treatment hydraulic and loading capacity in order to establish the project need.

Section 5: 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 Clarkson WRRF. An overview of the G.E. Booth WRRF is also provided to support the Phase 2 Region-wide alternative solutions' assessment.

Section 6: Baseline Features and Environmental Conditions

A baseline description of the Study Area is provided in this section, highlighting its natural features including terrestrial environment, geotechnical conditions, hydrogeological resources, and aquatic resources. It also provides a baseline of the existing land use, wastewater infrastructure, utilities, transportation network, and social-cultural features. A high-level description of the baseline conditions at and surrounding the G.E. Booth WRRF is also provided to support the Phase 2 regional alternative solutions' assessment.

Section 7: Phase 2 - Alternative Solutions

This section describes the process undertaken to identify the alternative ideas, concepts, and strategies that were considered as part of the study process. It provides the evaluation criteria and an overview of the evaluation of regional alternative solutions, including high-level consideration of construction methodology, potential impacts, and associated mitigation measures. This section concludes with the identification of the preferred solution.

Section 8: Phase 3 – Design Concept Alternatives

Based on the plant expansion and biosolids management strategy for the Clarkson WRRF recommended in Phase 2, alternatives for the treatment of liquids and solids were identified, along with beneficial end uses for biosolids based on a product market assessment. A long list of treatment technologies was identified and screened to develop a short list of alternative design concepts for detailed evaluation. Following evaluation of the short-listed design concepts, a preferred wastewater treatment and biosolids management strategy was recommended.

Section 9: Preferred Design Concept

Section 9 provides an overview of the preferred conceptual design concept for the Clarkson WRRF. It also provides a roadmap of expansion works to the year 2041, including facility expansion requirement and an overall site plan.

Section 10: Impacts and Mitigation Measures

Section 10 provides an overview of the impacts of the proposed works on the natural, social, cultural and physical environment. A detailed summary of the potential impacts and associated mitigation measures associated with the construction of the proposed works is provided. The net effects after mitigation are also described.

Section 11: Implementation

This section details the steps to implement the works, including staging and phasing of the works. It also identifies the various permits and approvals required by the relevant review agencies as part of the design, construction, and implementation process. Finally, it provides a summary of the risks and actions Peel will take moving forward to minimize these risks.

Section 12: Consultation and Engagement

The public and stakeholder consultation and engagement program and its results are summarized in this section, including communications with Indigenous Communities. Details on how input received was incorporated into the EA process are also presented.

Section 13: Summary and Conclusion

This section summarizes the conclusions of the study process and lists the recommendations and commitments following approval of the Class EA study.

1.4 Value Engineering

To provide expert input into the Class EA process before finalizing the recommended design concept, the Region of Peel undertook a Value Engineering (VE) study. Experts in planning, design and construction of wastewater treatment facilities were retained to review study information and provide input. The final recommendations reflect the VE team input.

1.5 Public Review Period and Next Steps

This ESR meets the requirements of a Schedule C Municipal Class EA study. The Draft ESR was reviewed by the MECP, and this Final ESR reflects comments received. Filing of this ESR initiates the 30-day public review period starting May 31, 2023 and ending June 30, 2023. To facilitate public review of this document, an electronic copy is posted on the Region of Peel project website.

For review of a hard copy version of the ESR, please contact the Project Manager at the Region of Peel (contact information available on the Region of Peel project website above).

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 and review agency consultation, identification, and evaluation of wastewater servicing strategy and biosolids management alternatives, 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 Act establishes the overruling requirements for Environmental Assessments, including regulation of Class Environmental Assessments (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 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 functionally different solutions, "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" Environmental Assessments (Class EAs) were approved by the Minister of the Environment in 1987 for municipal projects having predictable and mitigable impacts. The Municipal Class EA process was revised and updated in 1993, 2000, 2007, 2011, 2015 and 2023. 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.
- Responsive to mitigation.

The Municipal Class EA, prepared by the Municipal Engineers Association (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 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.
- **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 "schedules" depending on the extent of the expected impacts. **Figure 2-1** illustrates the Municipal Class EA planning and design process with the phases required for each schedule.

PHASE 1	PHASE 2	PHASE 3	PHASE 4	PHASE 5
Problem or Opportunity	Alternative Solutions	Alternative Design Concepts for Preferred Solution	Environmental Study Report (ESR)	Implementation
Identify Problem and Opportunity	Identify Alternative Solutions to Problem and Opportunity	Identify Alternative Solutions to Problem or Opportunity	Complete Environmental Study Report (ESR)	Complete Contract Drawings and Tender Documents
Discretionary Public Consultation to Review Problem or Opportunity	Inventory Natural, Social, Economic Environment	Detail Inventory Natural, Social, Economic Environment	Environmental Study Report (ESR) Placed on Public Record	Proceed to Construction and Operation
	Identify Impact of Alternative Solutions on the Environment, and Mitigating Measures	Identify Impact of Alternative Designs on Environment, and Mitigating Measures	Notice of Completion to Review Agencies and Public	Monitor for Environmental Provisions and Commitments
	Evaluate Alternative Solutions: Identify Recommended Solutions	Evaluate Alternative Designs: Identify Recommended Design Concepts	Copy of Notice of Completion to MECP-EA Branch	
	Consult Review Agencies and Public. RE: Problem or Opportunity and Alternative Solutions	Consult Review Agencies and Previously Interested and Directly Affected Public	Opportunity to Request Minister Within 30 Days of Notification to Request and Order	
	Select Preferred Solution	Select and Finalize Preferred Design Concept		

Figure 2-1: Class Environmental Assessment Process

Schedule A projects are minor or emergency operational and maintenance activities and are approved without the need for further assessment. These projects are typically smaller in scale and do not have a significant environmental effect.

Schedule A+ projects are also pre-approved; however, the public is to be advised prior to the project implementation. Although projects of this class do not usually have the potential for adverse environmental impacts, they tend to be broader in scale in comparison to Schedule A projects.

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 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 Clarkson Water Recovery Facility is classified as a Schedule C undertaking. Therefore, the Clarkson 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 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 Peel 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 was 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, and 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 Clarkson 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 Great Lakes Water Quality Agreement

The Great Lakes Water Quality Agreement (GLWQA) (2012) 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 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 in order 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.

3.1.2 Canada-Ontario Great Lakes Agreement

The Canadian and Ontario governments have worked together for over 40 years to protect the Great Lakes and associated ecosystems and communities. The Canada-Ontario Great Lakes Agreement (2014) explains how the federal and provincial governments cooperate and coordinate activities to prioritize protecting waters, improving wetlands, beaches, and coastal areas, protecting habitats and species, enhancing understanding and adaptation, and promoting innovation and community engagement. The Agreement helps provide the means by which Canada and Ontario interact to help meet Canada’s obligations under the GLWQA. A scientific based approach was recommended to determine effluent water quality.

3.1.3 The Canadian Environmental Protection Act (CEPA)

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.

3.1.4 Canadian Council of Ministers of the Environment (CCME) Guidelines

The 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 EA are reviewed in the following subsections.

3.1.4.1 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.

3.1.4.2 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 Canada-wide Strategy for the Management of Municipal Wastewater Effluent. 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. National Performance Standards are listed in **Table 3-1** below. Under the WSER, acute lethality testing using rainbow trout needs to be performed monthly beginning January 1, 2015; compliance also comes into effect at the same time.

Table 3-1: WSER Parameter Limits

Parameter	Sample Type	Frequency	Effluent Concentration
Carbonaceous Biochemical Oxygen Demand (CBOD)	Composite	3 days per week but at least 1 day after any other sample	Average ≤ 25 mg/L
Total Suspended Solids (TSS)	Composite	3 days per week but at least 1 day after any other sample	Average ≤ 0.02 mg/L
Total Residual Chlorine (TRC)	Composite	3 days per week but at least 1 day after any other sample	Average ≤ 25 mg/L
Un-Ionized Ammonia as N at 15°C ± 1°C	Composite	3 days per week but at least 1 day after any other sample	Average ≤ 1.25 mg/L

3.1.4.3 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 EA. The Guidance Document for the Beneficial Use of Municipal Biosolids, Municipal Sludge and Treated Septage was developed by the CCME Biosolids Task Group (BTG) 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. The guidance “contains information to assist Canadian regulators and generators to manage these three categories of wastewater residuals in an environmentally beneficial and sustainable manner” (Canadian Council of Ministers of the Environment, 2012).

3.1.4.4 CCME Guidelines for Compost Quality

Although Peel currently does not utilize their biosolids as a compost product, composting is an alternative management strategy considered in this 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 criteria to ensure product safety and quality:

- Foreign matter
- Maturity
- Pathogens and
- Trace Elements

The Guidelines established two 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.

3.1.5 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, Ontario Ministry of the Environment, Conservation and Parks (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.

3.1.6 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.

3.1.7 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.

3.1.8 The Canadian Food Inspection Agency (CIFA) Fertilizers Act (FzA) and Fertilizers Regulations (FzR)

The Canadian Food inspection Agency (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 Fertilizers Act and Regulations 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.

The Fertilizer Trade Memoranda provides product specific information and requirements for fertilizers and supplements regulated under the Fertilizers Act Section T-4-93. The safety standards for fertilizers and supplements, provide a series of metals concentrations that are acceptable in a fertilizer product. Section T-4-93 of the Fertilizers Act also addresses maximum acceptable cumulative additions to soils polychlorinated dibenzo-p-dioxins (dioxins; PCDD) and pathogen reduction in biosolids. Fertilizers, including biosolids products, must be of sufficient quality as to not exceed the maximum acceptable metal, dioxins, PCDD and pathogen concentrations.

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 Provincial Policy Statement

The Provincial Policy Statement sets the policy foundation for land use planning and development in Ontario, providing 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.
- 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 requirement, and
  - Protects human health and the natural environment.
- Promote water conservation and water use efficiency.
- Integrate servicing and land use considerations at all stages of the planning process.

The Greenbelt Plan, the Niagara Escarpment Plan, and the Oak Ridges Moraine Conservation Plan work within the framework set out by the Growth Plan for the Greater Golden Horseshoe for where and how future population and employment growth should be accommodated.

The portion of Peel Region with lake-based municipal wastewater servicing, namely the Cities of Mississauga and Brampton, and the community of Bolton, are located outside of the protected Greenbelt Area.

3.2.2 Growth Plan for the Greater Golden Horseshoe

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 May 16, 2019. 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.

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 Peel Region.

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 specific geographic areas in Ontario. While the Provincial Policy Statement provides for a time horizon of up to 20 years to make enough land available to meet projected needs, the Provincial Policy also suggests that a provincial plan may provide an alternate time horizon for specific areas of the province. The 2019 Growth Plan provides that the applicable time horizon for land use planning is 2041.

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). Under Part III of the OHA, compliance with the Standards and Guidelines for the Conservation of Provincial Heritage Properties is mandatory for provincially owned and administered heritage properties and holds the same authority for ministries and prescribed public bodies as a Management Board or Cabin Directive.

For municipalities, Part IV and Part V of the OHA enables councils to “designate” individual properties (Part IV), or properties within a Heritage Conservation District (HCD) (Part V) as being of “cultural heritage value or interest” (CHVI). Evaluation for CHVI under the OHA is guided by Ontario Regulation 9/06, which prescribes the “criteria for determining cultural heritage value or interest”. If a property meets one or more of these criteria, it may be eligible for designation under Part IV, Section 29 of the OHA. The designation is recognized through municipal by-law, and the property must be included on a “Register” maintained by the municipal clerk. A municipality may also “list” a property on the Register to indicate it as having potential CHVI. Importantly, designation or listing in most cases applies to the entire property, not only individual structures or features.

For provincial properties, evaluation of potential cultural heritage resources must apply Ontario Regulation 10/06 (O. Reg 10/06): Criteria for Determining Cultural Heritage Value or Interest of Provincial Significance. Should a property meet the criteria, consent from the Minister for Tourism, Culture and Sport may be required prior to demolition or disposal.

3.2.4 Endangered Species Act

The Endangered Species Act (ESA) was originally written in 1971 and amended in 2008. Similar to the Federal Species at Risk Act (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.

3.2.5 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

3.2.6 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 Minister of the Environment, Conservation and Parks 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 of Environment, Conservation, and Parks. 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.

3.2.7 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 in order 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.

3.2.8 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 Water Resources Act 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.

The Ontario Water Resources Act 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 from the ground or surface water sources of more than 50,000 liters of water per day are also regulated under the Water Resources Act.

3.2.8.1 Water Management - Policies, Guidelines, Provincial Water Quality Objectives

To support municipalities in meeting the Environmental Protection and Ontario Water Resources Act, the MECP has developed water management guidelines. The two most relevant 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 Provincial Water Quality Objectives (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 Environmental Compliance Approval (ECA) and MECP policy.

Surface waters in Ontario are subject to requirements of the five 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 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.

3.2.9 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 was developed by the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA), and the Ministry of the Environment, Conservation and Parks (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 non-agricultural source material (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 O. Reg. 267/03 of 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.

The NMA regulates biosolids as 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. O. Reg. 267/03 under the 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.

NASM is categorized into three categories (1, 2, and 3) under the NMA, based on material quality. These categories set requirements for material and soil testing and level of approval. Biosolids are a Category 3 NASM. In addition, materials are further sub-categorized into pathogen (CP1 and CP2), odour (OC1, OC2, and OC3), and metal (CM 1 and CM2) categories. Metal and pathogen categories determine setbacks from wells, surface water, groundwater, and bedrock. Setback distances to residential, commercial, community or institutional properties are determined by odour category.

New approvals for land application (NASM Plans) are subject to loading restrictions and must meet beneficial use criteria (demonstrate beneficial use for either organic matter content, nutrients, increase soil pH or irrigation) as well as maximum application rates for nitrogen, phosphorus, regulated metals, and dry matter.

The Act does not apply to the Clarkson WRRF in existing conditions as biosolids are not currently applied on agricultural lands. However, the Act will apply if biosolids management practices are changed in the future as an outcome of this Class EA.

3.2.9.1 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 (Ontario Ministry of the Environment, Waste Management Policy Branch, 2012). The new 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 Environmental Activity and Sector Registry (EASR) registration for transport and ECA for use off-farm or approved NASM Plan for on-farm use. The new standards also align Ontario more closely with those set out in 2005 by the CCME.

3.3 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 per cent of the total area of the Region is managed by either Toronto and Region Conservation Authority (TRCA) or Credit Valley Conservation (CVC). The three other authorities, Conservation Halton (CH), Nottawasaga Valley Conservation Authority (NVCA), and Lake Simcoe Region Conservation Authority (LSRCA), collectively comprise less than 2 per cent of the total area of the Region.

In addition, Conservation Authorities have the delegated responsibility from the Ministries of Natural Resources and Municipal Affairs and Housing to implement Section 3.1 (Natural Hazards) of the Provincial Policy Statement, consistent with the Provincial one-window planning initiative.

TRCA, CVC and Conservation Halton also administer Ontario Regulations 166/06, 160/06, 162/06, respectively, under Section 28 of the Conservation Authorities Act. In general, these regulations prohibit altering a watercourse, wetland, or shoreline and prohibit development in areas adjacent to river and stream valleys, hazardous lands and wetlands, without the prior written approval from the Conservation Authority (i.e., issuance of a permit).

The Conservation Authorities also support approval under the Lakes and Rivers Improvement Act administered by the Ministry of Natural Resources. The Lakes and Rivers 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.

Watercourses and shoreline near the Clarkson WRRFs are regulated by CVC. Permission of the CVC would be required if construction activities at Clarkson WRRF have the potential to impact the Lake Ontario shoreline.

3.4 Regional and Municipal Legislation and Policy

3.4.1 Region of Peel Strategic Plan

The Region's Strategic Plan for 2015-2035 sets the vision to take on more complex challenges and bring bigger ideas to life than is possible over a single term of Council. The 20-year vision for Peel is "Community for Life" which was developed from citizens' feedback to reflect their priorities and hopes for life in the Region of Peel. Community for Life focus on the following areas:

- Living – Advancing community safety and well-being
- Thriving – Building environmental resilience to climate change
- Leading – Improving service and confidence

3.4.2 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 years, and an update is currently awaiting Provincial approval.

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.

3.4.3 City of Mississauga Official Plan

The Mississauga Official Plan 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 MOP is updated to October 21, 2021, which includes Ontario Land Tribunal (OLT) decisions and City Council approved Official Plan Amendments up to this date.

The MOP 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.

3.4.4 Region of Peel Water and Wastewater Policy Review

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

- Reduce corporate emissions by 45% by 2030 relative to 2010 levels
- 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 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 will be integrated into the Clarkson WRRF Expansion Class EA through opportunities to address Climate Change.

Sections below discuss the CCMP’s approach to energy management and greenhouse gas reduction.

3.4.4.1 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.

3.4.4.2 Greenhouse Gas Reduction

A primary outcome of the Region of Peel CCMP is to reduce corporate greenhouse gas (GHG) emissions by 45% by 2031 relative to 2010 levels. The Region achieved 29% reduction in 2016 and will need to reduce emissions by a further 16% to meet the 2031 goal, bringing emissions down to 75 ktCO2e per year. The CCMP describes a “Low-Carbon Pathway”, which considers seven 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.

3.4.5 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 Ontario Water Resources Act.

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 Peel 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.

3.5 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.

3.5.1 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 Water Resource Recovery Facility. 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 locations where sewage flows cross the municipal boundary line between the Region of Peel and the City of Toronto, as listed in **Table 3-2**.

Table 3-2: 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 WWTP

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.

3.5.2 York-Peel Inter-Regional Water and Wastewater Agreement

The Regions of York and 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.

3.6 Relevant Capital Works Projects and Planning Studies

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 these related projects.

3.6.1 2020 Water and Wastewater Master Plan

The 2020 Water and Wastewater Master Plan sets the stage for these Class EAs by establish 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.

3.6.2 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 EA to confirm expansion and diversion requirements and timing.

3.6.3 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 (SPS) to Richards Memorial SPS. This trunk sewer could potentially extend to Clarkson WRRF in the future thus eliminating various pumping stations along the route and allowing Peel more flexibility in the future to divert flows from the east to the west service area.

3.6.4 Real Time Control (RTC) 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 Peel's overall strategy for managing wet weather flows.

3.6.5 Capital Projects Planned at the Clarkson WRRF

3.6.5.1 Primary Sludge Thickening Facility

The project is a recommendation from the Strategic Energy Plan for sludge and energy reduction at the Clarkson WRRF. Design is currently underway and has been considered in the development of the overall conceptual design for expansion of the Clarkson WRRF.

3.6.5.2 Cogeneration Facility and Ammonia Based Aeration Control (ABAC)

Clarkson WRRF digesters are covered to facilitate biogas collection. The collected biogas is conveyed to a cogeneration facility that converts the gas to energy via a Combined Heat and Power (CHP) engine with a capacity of 1.4 MW. The Region has plans to construct a second cogeneration unit to double capacity to 2.8 MW. This project also includes the implementation of ABAC for further energy savings.

3.6.5.3 Instrumentation and Control Process (IPC) Consolidation Project

Peel Region is undertaking a program to upgrade a number of older ICPs at both the Clarkson and G.E. Booth WRRFs in order to meet Peel's current Process Automation and Instrumentation Design Standards (PAIDS), which are the Region's Supervisory Control and Data Acquisition (SCADA) standards. The program is currently underway and will be complete in 2024.

4.0 Project Need

This section summarizes the projected population and employment growth, and the implications this growth will have on the wastewater (liquids and solids) system to establish the project need, and to identify the study's Opportunity Statement. While the subject of this Class EA focuses on needs specific to the Clarkson 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 treatment capacity to meet these needs.

As a first step in developing future wastewater treatment hydraulic and loading estimates, population and employment projections were established. The 2020 Master Plan summarized population and employment projections serviced by the Clarkson and G.E. Booth WRRFs to 2041 and beyond, presented in the **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	539,876	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

** The buildout populations do not have status under Provincial or Municipal legislation. They are used strictly for planning purposes in this Class EA to develop a vision for the long-term.*

4.2 Wastewater (Liquid) Hydraulic Capacity Analysis

4.2.1 Existing Wastewater Treatment Capacity

The rated average flow capacity of the Clarkson WRRF is currently 350 MLD as specified in the facility's Amended ECA (NUMBER 0729-9KBNNY), June 2014. Generally, when 90% of a WRRF's rated capacity is projected to be reached, alternatives for providing additional capacity must be assessed through a Class EA. For the Clarkson WRRF, 90% of its rated capacity is 315 MLD. The Clarkson WRRF currently has average daily flows of approximately 220 MLD. The Clarkson WRRF therefore has excess capacity to treat additional flows.

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), October 2021. With a current average rated flows to the G.E. Booth WRRF being approximately 480 MLD, the G.E. Booth WRRF is near its capacity limits.

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 litres per capita per day (L/cap/d) use based on total equivalent population in **Table 4-3**. The G.E. Booth WRRF also receives flows from the City of Toronto and the Regional Municipality of York. The flows received 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 2051 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*	N/A	N/A	N/A	N/A	303

Notes (*): The rated capacity of the G.E. Booth WWTP is 518 MLD; 90 % of this rated capacity is 446 MLD.

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

Year	Average Daily Flow at the WWRF (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*	N/A	N/A	N/A	260

Notes (*): The rated capacity of the Clarkson WWTP is 350 MLD; 90 % of this rated capacity is 315 MLD.

The per capita use in the G.E. Booth WRRF catchment area is estimated at 303 L/cap/d, while use 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 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 maximum agreement contributions from York Region and the City of Toronto, 53 MLD and 29 MLD, respectively.

G.E. Booth WWRF

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

Clarkson WWRF

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 on **Figure 4-1** for G.E. Booth WRRF and **Figure 4-2** for Clarkson WRRF.

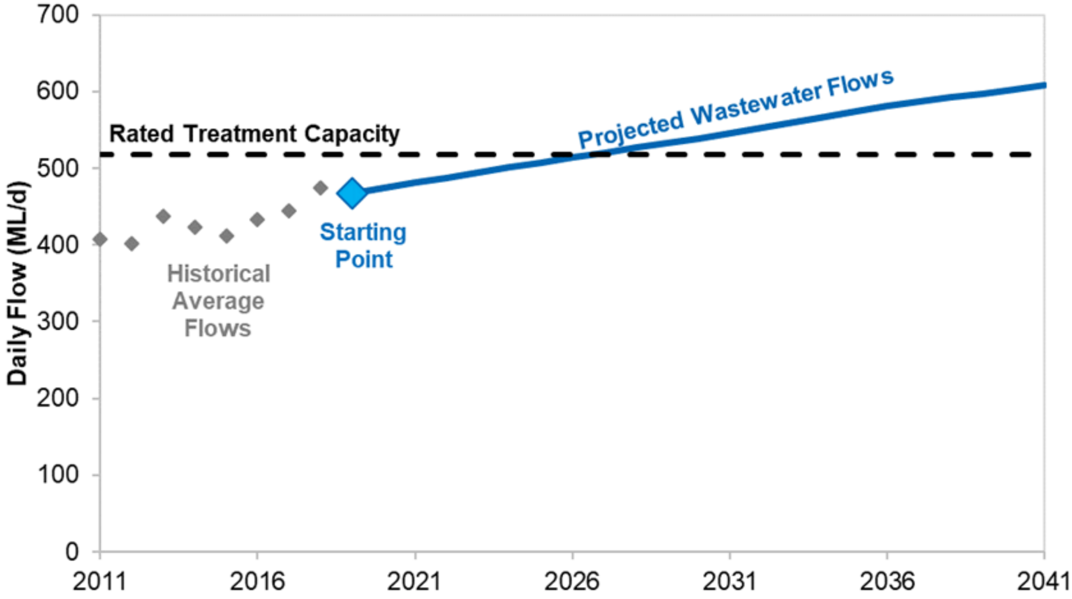


Figure 4-1: G.E. Booth WRRF Flow Projections

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

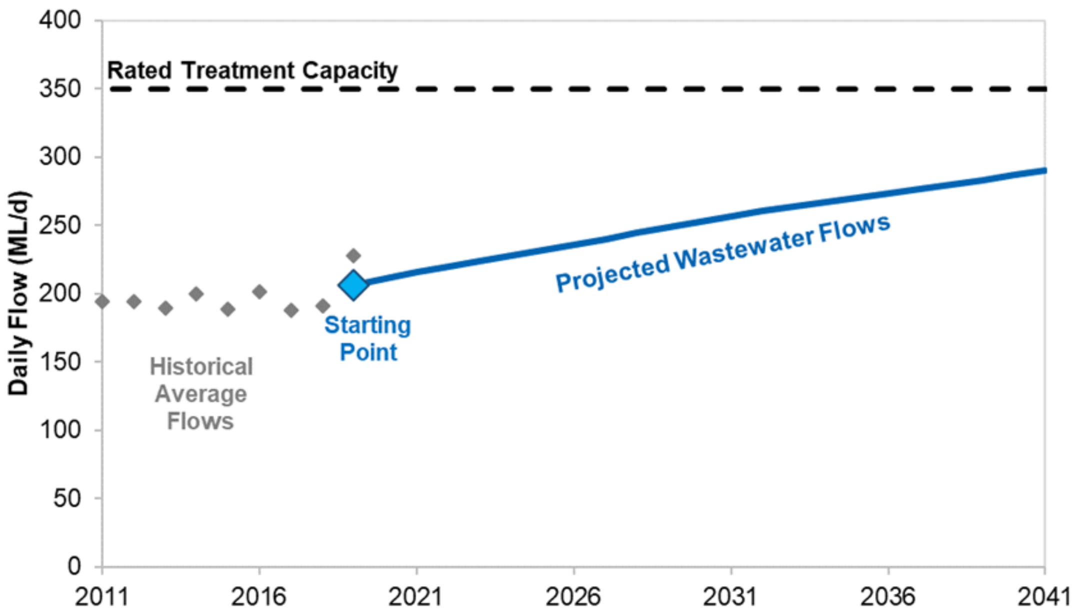


Figure 4-2: Clarkson WRRF Flow Projections

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 existing approved total wastewater treatment capacity in Peel is 868 MLD; which is the combination 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 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. 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, 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 assume that flow forecasts identified for 2041 represent at least 90% of existing rated capacity. This is to allow adequate flexibility to plan for further capacity needs. Under these circumstances, it is prudent to plan for capacities at least 10% above the 898 MLD 2041 flow estimate, i.e., at least 1000 MLD total capacity should be available by 2041, as illustrated on **Figure 4-3**.

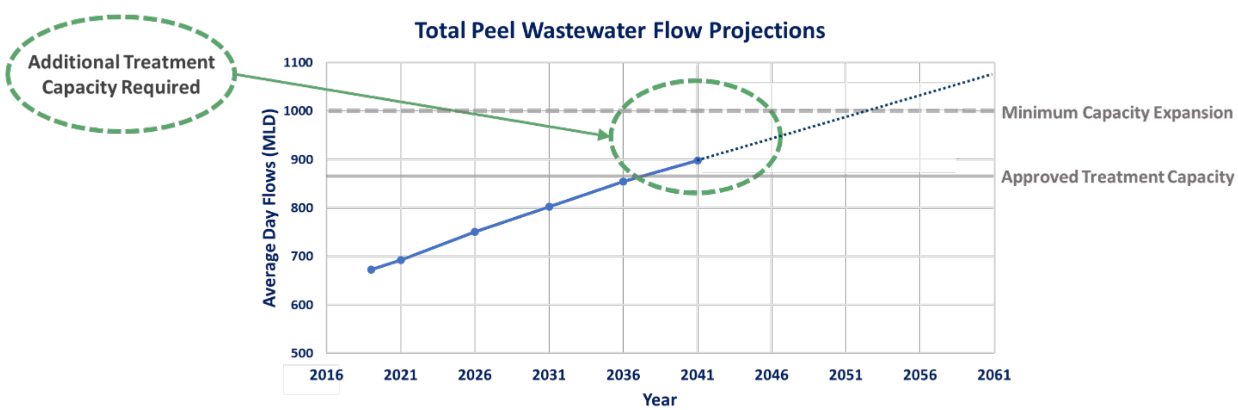


Figure 4-3: Total Peel Wastewater Flow Projections

4.3 Solids Loading Analysis

4.3.1 Existing Solids Capacity

In order to meet effluent design objectives and compliance limits, the G.E. Booth WRRF must also have adequate capacity to treat the solids in the wastewater. Biosolids 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 rated at 100 dT/d, as specified in the facility's Amended ECA (NUMBER 9375-C4RKKZ), October 2021. With a maximum of three units in operation at the same time, the ECA rated capacity is 300 dT/d; However, due to sludge characteristics and operational observations, each incinerator is operated at a peak capacity of 60 dT/d to 80 dT/d. With three units in operation, the actual operating capacity of the incineration facility at the G.E. Booth WRRF is estimated to be 180 to 240 dT/d. For purpose of this Class EA, the maximum operating capacity of the incinerators is assumed to be 210 dT/d.

In 2019, the average daily sludge feed 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 is directly proportional to the influent wastewater load and depends on the characteristics of the wastewater. While solids requirements are generally based on both 5-day biological oxygen demand (BOD_5) and Total Suspended Solids (TSS) in the effluent, BOD_5 was determined to be a reasonable surrogate parameter for solids generation projects 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 Concentrations and Loadings to G.E. Booth and Clarkson WRRF

Year	BOD_5 Concentration (mg/L)		BOD_5 Loads (kg/d)	
	G.E. Booth WRRF	Clarkson WRRF	G.E. Booth WRRF	Clarkson WRRF
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 kg/d was also applied to account for possible additional high strength users 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 Loadings

Parameter	BOD5 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 BOD_5 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 (td/d)
2019	1,432,252	669,082	--	--	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 operating capacity of the incinerators is assumed to be 210 dT/d with three 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 existing outfall at each respective plant is schematically depicted in the **Figure 4-4**. Each outfall includes a tunnel shaft that connects to the outfall tunnel. Risers are installed toward the end of the outfall tunnel connecting the outfall tunnel to just above the lakebed. Diffusers are installed at the end of each riser to allow effluent to mix with 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.

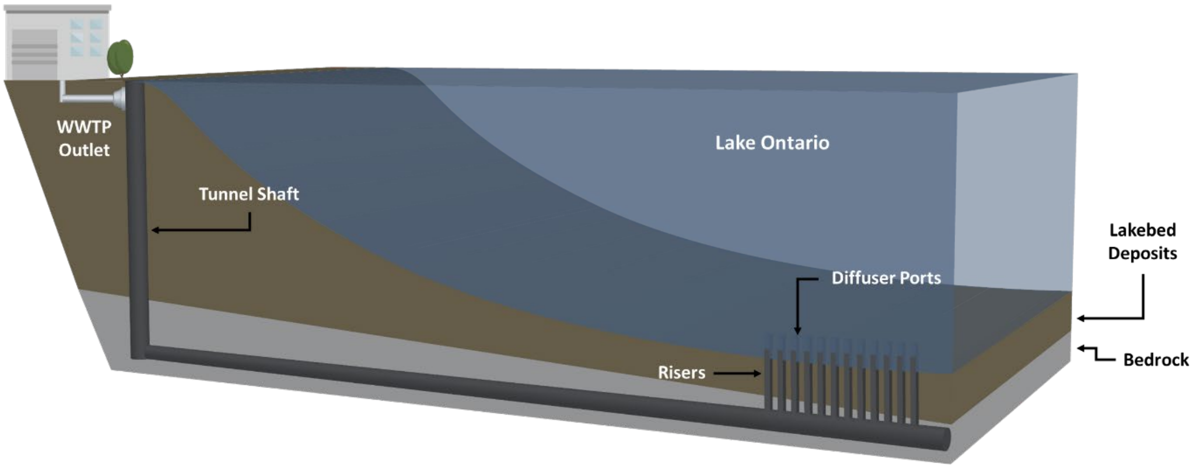


Figure 4-4: Schematic of Outfall Components

The final effluent from the Clarkson WRRF is discharged to Lake Ontario through a 3-metre (3,000 mm) diameter and 2,200-metre-long outfall with eighteen 500 mm diameter dispersion shafts that have 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.

The final effluent from the G.E. Booth WRRF is discharged to Lake Ontario through a 3.65-metre diameter and 1,400-metre-long outfall with discharge port diffusers in the last 200-metre section. The diffusers are an important element of the outfall because they are used to improve mixing by distributing effluent through a larger area and slowly integrate flows into the receiving water. The outfall has a peak approved capacity of 1,523 MLD (17,627 L/s) per the ECA.

There are no outfall capacity challenges at the Clarkson WRRF. However, the G.E. Booth WRRF 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, for emergency situations. Flooding of the weir at the G.E. Booth WRRF has occurred occasionally during high wet-weather flow events.

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)	Climate Model Projections*	
				Mid-Century (2050s)	End of Century (2080s)
Water Level	Lake Ontario Water Level – high scenario (90th percentile), metre IGLD	Increasing	74.77 metres	75.55 metres	76.02 metres

Notes (*): 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 plant operation scenarios:

1. No flooding of the secondary clarifier weirs.
2. Maximum of 100 millimeters 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 **Table 4-11** for each WRRF outfall, and indicate that:

- 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.
- The 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.

Table 4-11: Outfall Capacity WRRFs

Secondary Clarifier Weir Flooding Scenario	High Lake Level (metre)	Clarkson WWTP Total Peak Flow to Outfall Sewer (MLD)	G.E. Booth WWTP Total Peak Flow to Outfall Sewer (MLD)
No Flooding	75.65	1,200	1,500
No Flooding	76.00	1,200	1,500
100-millimetre Flooding	75.65	1,482	1,680
100-millimetre Flooding	76.00	1,482	1,641

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 (liquid), biosolids and outfall treatment capacities are required 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

The Clarkson WRRF Class EA, in conjunction with the G.E. Booth WRRF Class EA, presents the opportunity to develop a preferred 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/noise, water quality, protection of the environment, and aesthetics, and
- Provide greater flexibility and reliability in wastewater and biosolids management.

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 Clarkson WRRF. An overview of the G.E. Booth WRRF is also provided to support the Phase 2 region-wide alternative solutions' assessment.

5.1 Watershed System

The Clarkson WRRF is located in the Credit River watershed, specifically within the Lake Ontario Shoreline West Tributaries sub-watershed, which is located in a larger sub-area known -as the Lower Watershed. The Credit River watershed outlets to Lake Ontario via the Credit River and several associated tributaries and is governed via the Credit Valley Conservation (CVC) Authority. A localized area in the northeast of the service area is in the East Branch Lisgar of the Sixteen Mile Creek watershed, which is under the jurisdiction of Conservation Halton.

The G.E. Booth WRRF is also located in the Credit River Watershed, as well as the western portion of its service area. The eastern portions of the G.E. Booth WRRF service area are located in the Etobicoke Creek watershed, Mimico Creek watershed, and Humber River watershed, all of which are under the jurisdiction of the Toronto and Region Conservation Authority (TRCA).

5.2 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 kilometres of sewers, 36 wastewater pumping stations, and two 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 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 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). Today, the G.E. Booth and Clarkson WRRFs collectively service about 1.4 million customers. Both WRRFs are operated by the Ontario Clean Water Agency (OCWA) under contract to the Region.

The Peel collection system 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 key infrastructure projects for managing wastewater to 2041 and beyond. The 2020 Master Plan also documents expansion of the collection system to accommodate growth in the service areas. The services areas and areas of planned growth and intensification are illustrated in **Figure 5-1**.

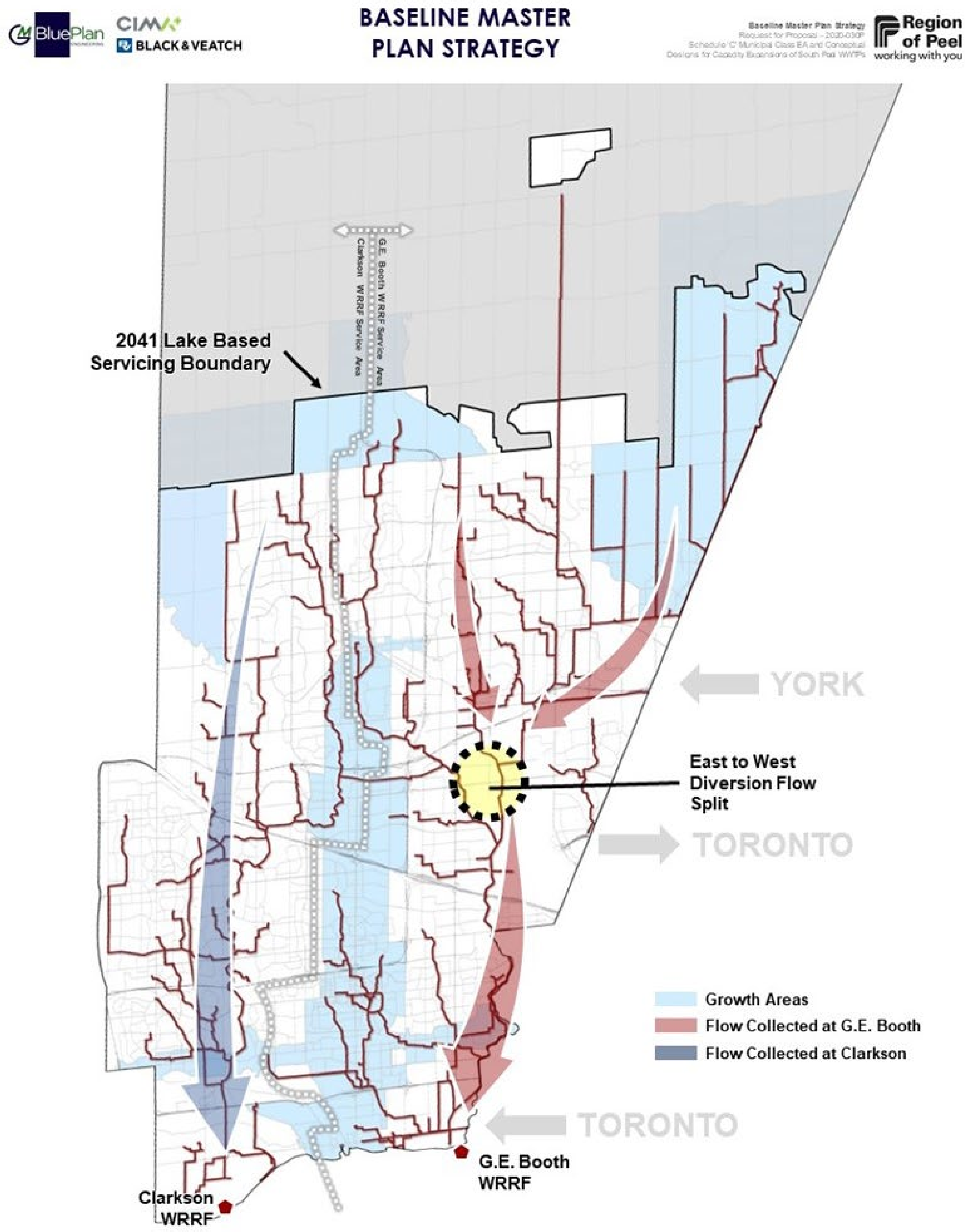


Figure 5-1: Planned Growth and Intensification

5.3 East-to-West Diversion Trunk Sewer

A cornerstone to Peel's system-wide strategy is to maximize the conveyance capacity between the East and West Trunk Systems in order to make use of available capacity in the west trunk system by diverting flows 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 metre 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 kilometres in length and being constructed using trenchless technologies where possible to reduce (or mitigate) impacts. It is planned to be completed by 2026, at which time flows can be diverted from the G.E. Booth WRRF catchment area west to the Clarkson WRRF catchment area. Through the assessment of alternative strategies presented in **Section 7.0**, the flows to be diverted through the East-to-West Diversion to optimize use of existing WRRF infrastructure and plan for future expansions are identified.

5.4 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 5-day biological oxygen demand (BOD5) and Total Suspended Solids (TSS) 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 account for the different 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**.

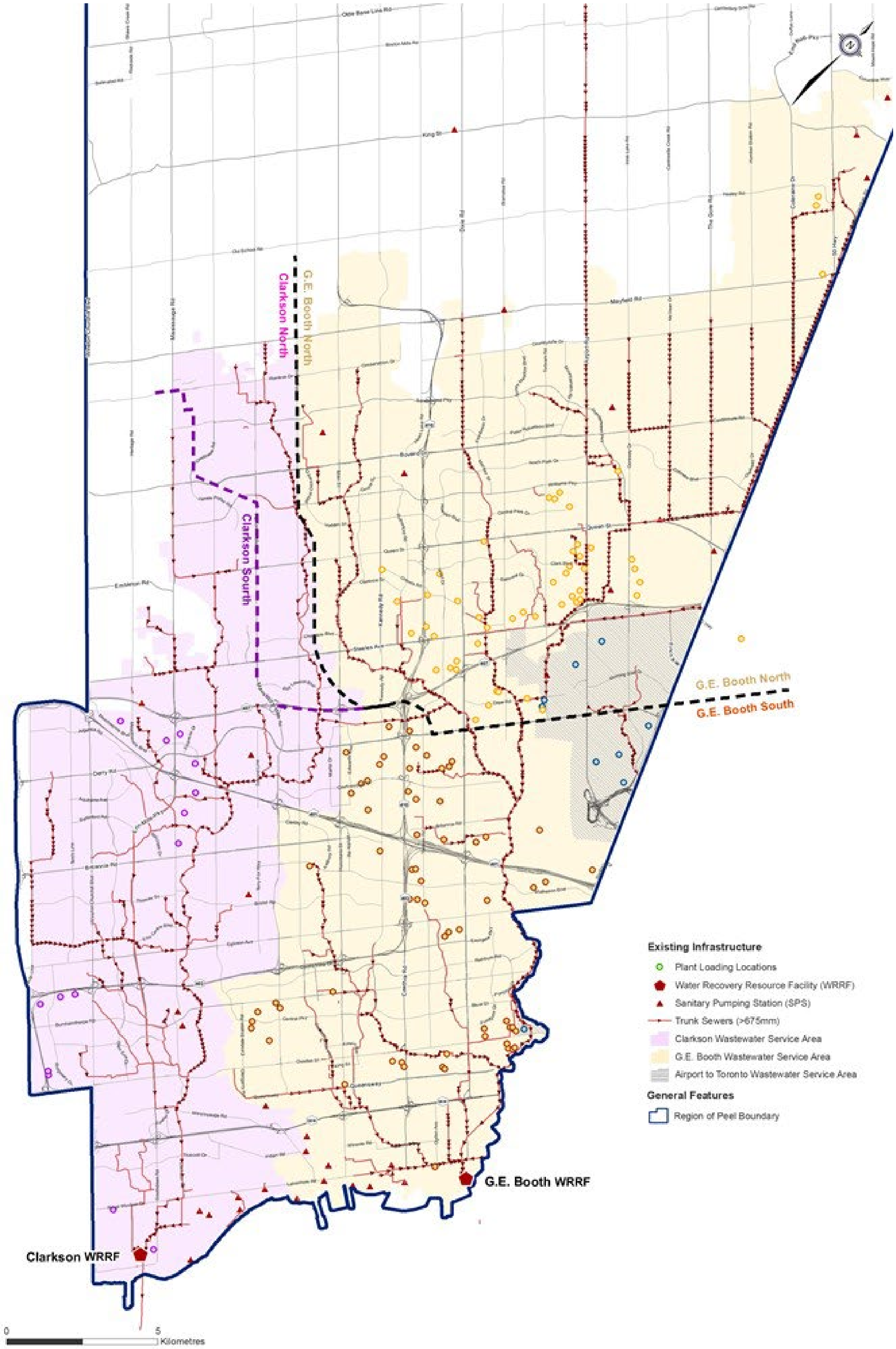


Figure 5-2: Distribution of High Strength Users

5.5 Clarkson Water Resource Recovery Facility

5.5.1 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 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 waste activated sludge (WAS) thickening, anaerobic digestion, and dewatering. Raw sludge from the primary clarifiers and thickened WAS (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 trucks (40m3 capacity) 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 sludge heating. The electricity generated at this facility is used within the treatment plant distribution system, and heat is used for digester process heating.

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

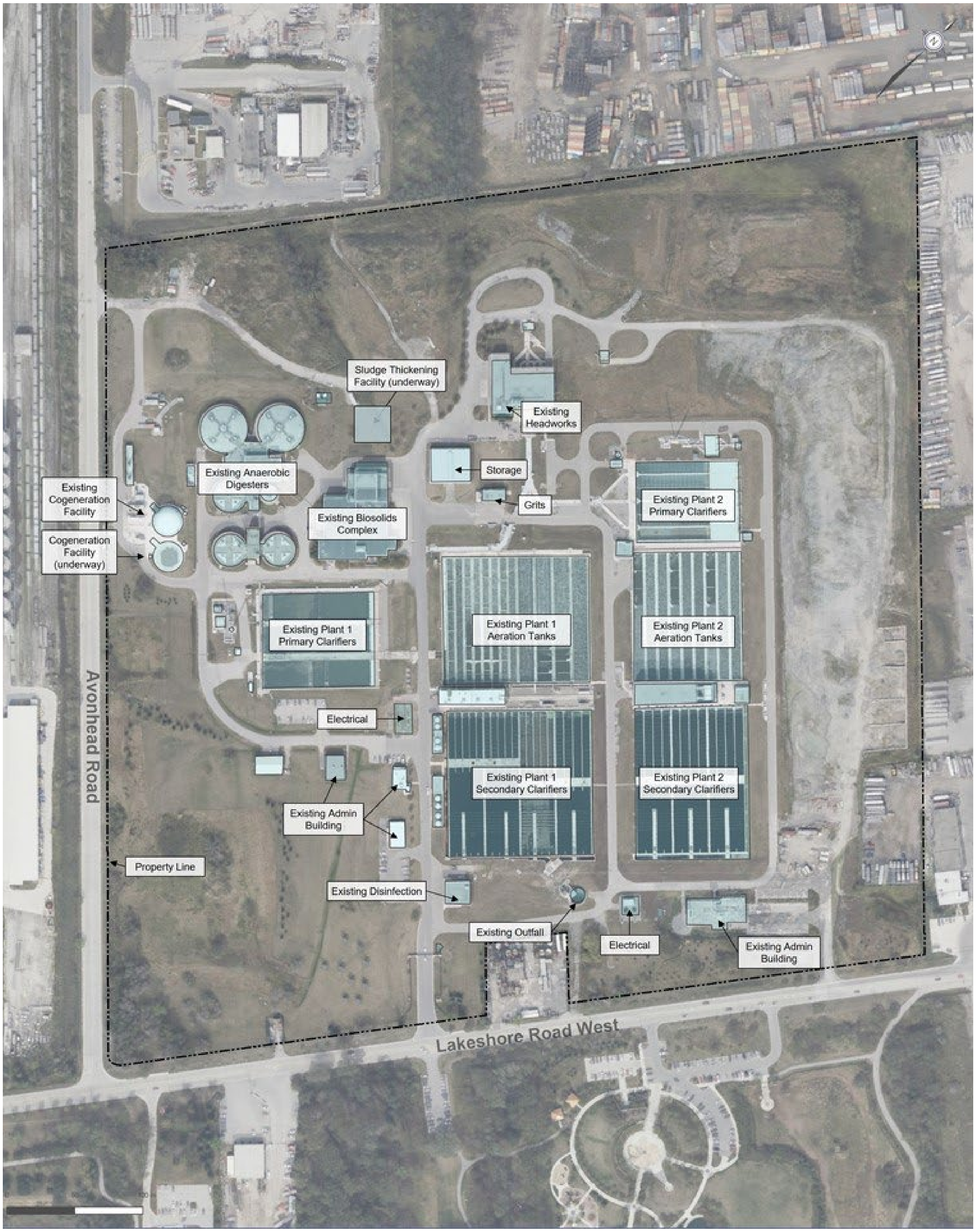


Figure 5-3: Clarkson WRRF Existing Plan Facilities

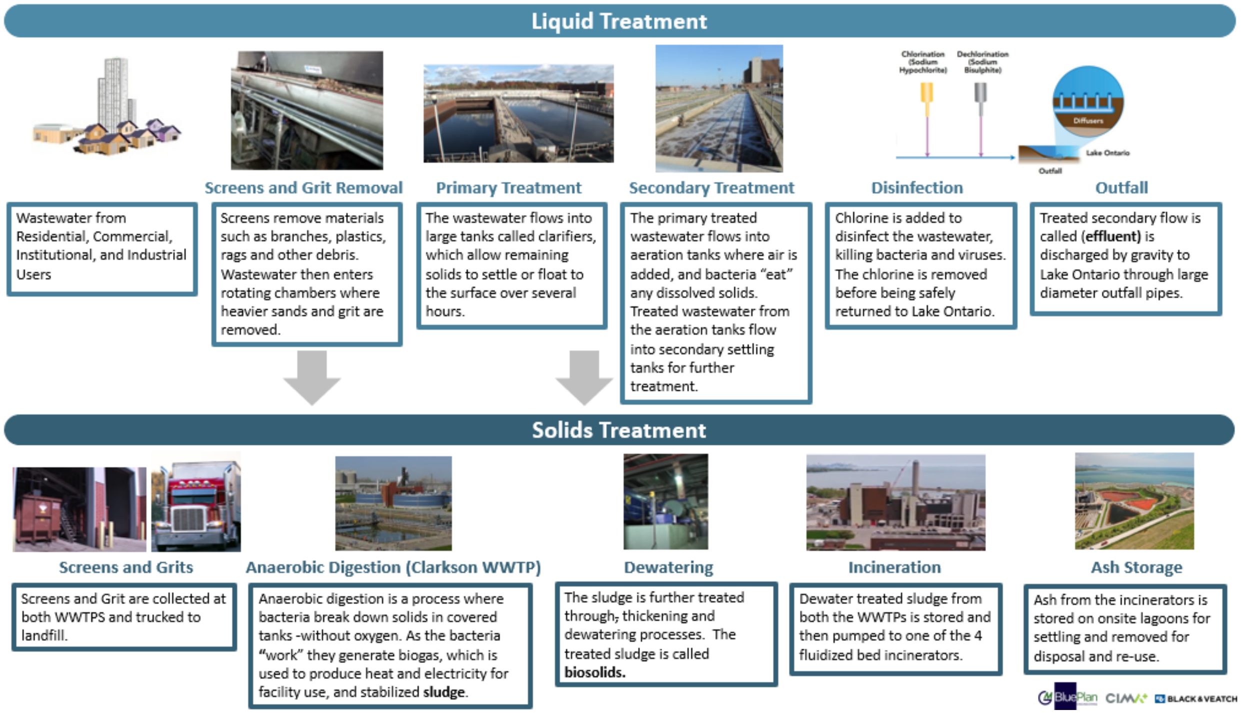


Figure 5-4: Clarkson WRRF Simplified Process Flow Diagram

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

5.5.1.1 Screen and Grit Removal

The screens and grit removal systems are housed in the headworks facility. Mechanical screens remove material such as rags, paper, and branches and other untreatable debris from the wastewater. Heavier inorganic particles, such as sand and grit, are removed through the vortex operated grit chambers. Screenings and grit material removed from the wastewater stream are collected and trucked to landfill for disposal. This facility is also equipped with a waste receiving station.

5.5.1.2 Primary Treatment

From the headworks, the wastewater diverges into two separate streams and is conveyed to the primary clarifiers in Plants 1 and 2. The primary clarifiers allow further solids in the wastewater to settle or float to the surface over several hours. 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 of these tanks via skimming mechanisms. This solids removal process is referred to as primary treatment. To enhance the effectiveness of the solids' removal, the Region adds chemical components including iron salt (ferrous chloride) and optional polymers to the wastewater as it flows into and out of the primary clarifiers. These chemicals act as coagulants, binding the soluble phosphate and other solids for ease of removal. This process is known as chemically enhanced primary treatment (CEPT).

5.5.1.3 Secondary Treatment

The primary treated wastewater then flows into the Plant 1 and 2 secondary treatment facilities, which are the aeration tanks and secondary clarifiers, to further remove the dissolved solids which contain organic contaminants. The functions of the aeration tanks and secondary clarifiers are described as follows:

- Aeration tanks: Air is added to the aeration tanks, allowing the bacteria present in the primary treated wastewater to consume or convert the organic contaminants and harmful ammonia into non-active compounds. The bacteria are aerobic, meaning they use oxygen to consume these contaminants by changing the molecular structure. At this stage nitrification occurs, where the bacteria oxidizes the ammonia 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 activated sludge solids settle to the bottom, and are pumped to the solid treatment facilities for further treatment. A portion of this activated sludge is returned to the primary clarifiers to support the biological processes within the aeration tanks.

5.5.1.4 Disinfection

Secondary effluent, which is substantially free of solids and organic contaminants, passes on to disinfection. At this stage the treated wastewater, now referred to as effluent, is dosed with chlorine (sodium hypochlorite) to kill bacteria or viruses. The chlorinated effluent is conveyed through the outfall to allow time for disinfection. The effluent is dechlorinated seasonally (June 1 to September 30), using sodium bisulphate, to remove the residual chlorine prior to discharge through the outfall to Lake Ontario.

5.5.1.5 Outfall

The final effluent from the Clarkson WRRF is sent to a 12-metre diameter drop shaft and then discharged to Lake Ontario through a 3-metre diameter and 2,200-metre-long outfall with an ECA rated peak flow capacity of 1,400 MLD. However, as described in **Section 4.4.3**, hydraulic analysis has indicated that the actual capacity of the outfall may be higher (i.e., a least 1,500 MLD). The outfall structure allows the final effluent to be retained long enough to thoroughly disinfect and remove chlorine residuals before discharge to Lake Ontario. The diffusers are located along the last 500-metre of the outfall pipe. It has 18 risers and diffuser ports that allow effluent to be discharged to the lake over a large area.

5.5.1.6 Solids Treatment

The waste activated sludge (WAS) from the secondary clarifiers from each plant is pumped to the Biosolids Building (refer to **Figure 5-3**) where it is thickened using rotary drum thickeners. The thickened WAS (TWAS) is conveyed to storage tanks where it is mixed before being pumped to the anaerobic digesters. The removed liquid from the thickening processes is conveyed to decant tanks and then back to the primary clarifiers. The raw sludge from the primary clarifiers and TWAS are pumped to the anaerobic digesters where sludge is broken down to produce digester gas and digested sludge. The digester gas is captured and sent to the onsite storage tank prior to the cogeneration facility to produce heat and electricity for facility use; heat is used as part of the digestion process and electricity is fed back into the facility's electrical distribution system.

After digestion, the biosolids are dewatered using high speed centrifuges which reduce the water content, bringing the solids content up to approximately 28% by weight. The dewatered sludge is then conveyed to the truck loading bay and then hauled to the Receiving Silo at the G.E. Booth WRRF for incineration.

5.5.1.7 Incineration (Thermal Oxidation)

The G.E. Booth WRRF has four fluidized bed reactors or incinerators. One incinerator is reserved for standby use, allowing for up to three operating units at any time. Each incinerator has an operating capacity of 70 dry tonnes of solids per day (dT/d). This amount varies depending on operating settings such as sludge feed rate, organic content, and water content, but they are operated such that the ECA air quality emissions requirements are met. These incinerators, although located at the G.E. Booth WRRF, manage the biosolids from the Clarkson WRRF.

5.5.1.8 Odour Control

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

5.5.1.9 Power Generation and Energy Management

The Clarkson WRRF can produce renewable energy in two ways: cogeneration fueled by digester gas and hydroelectric energy collected at the outfall drop shaft. The cogeneration facility is equipped with a 1.4 MW generator that is fueled by digester gas, a renewable fuel. Electricity generated by the cogeneration unit is fed back into the Clarkson WRRF electrical distribution system and residual heat is used to heat the digester process. The Region has plans to construct a second cogeneration unit to double capacity to 2.8 MW of hydroelectric power generated using a Kaplan style turbine located at the bottom of the outfall drop shaft. This supplies a 240-kW generator supplying 600 V power to the disinfection building.

5.5.1.10 Standby Power

The Clarkson WRRF has two hydro feeds for redundancy; however, the plant only has standby power for the headworks and administration facilities. Additional standby power is required to support the liquid treatment processes at the WRRF's expanded capacity. The Region has plans to construct a new centralized facility with diesel generators to provide this capacity. The facility would mitigate the potential for odour generation during power outages and would allow for continuous primary treatment to avoid non-compliance. Three 2.5 MW generators were recommended for a total available capacity of 7.5 MW.

5.5.2 Unit Process Treatment Capacity

Wastewater treatment systems in Ontario are governed by the MECP and subject to Federal legislation, as described in **Section 3.1**. The MECP issues Environmental Compliance Approvals (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 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.

5.5.2.1 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 5-1 illustrates the parameters for planning capacity of each unit process at the G.E. Booth and the Clarkson WRRFs. Inlet sewers and screening facilities, as well as the outfall are designed to meet peak instantaneous flows, and the grit chambers and disinfection time to meet peak hourly flows. Designing the primary clarifiers at peak day flows allows all the plant to by-pass secondary treatment during severe wet weather events. In this case, the by-pass flows receive primary treatment and disinfection before they are 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 5-1: Unit Process Capacity Assessment Basis

Unit Process	Capacity Parameters	Capacity Assumptions
Inlet Sewer	Peak Hourly Flow	All sewers online
Screens	Peak Hourly Flow	One screen offline
Grit Chambers	Peak Hourly Flow	All grit chambers online
Primary Clarifiers	Peak Day Flow	One primary clarifier out of service
Aeration Tanks	Average Day Flow	One aeration tank offline
Oxygenation System	Peak Loading	One blower offline per plant
Secondary Clarifiers	Peak Hourly Flow, Peak Loading	One secondary clarifier online
Disinfection (Contact Time)	Peak Hourly Flow	N/A
Outfall	Peak Hourly 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 350 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 350 MLD and the following peaking factors:

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

As indicated on **Figure 5-5**, the unit processes at the Clarkson WRRF, including the outfall, have capacity to meet 350 MLD average rated design flow requirements.

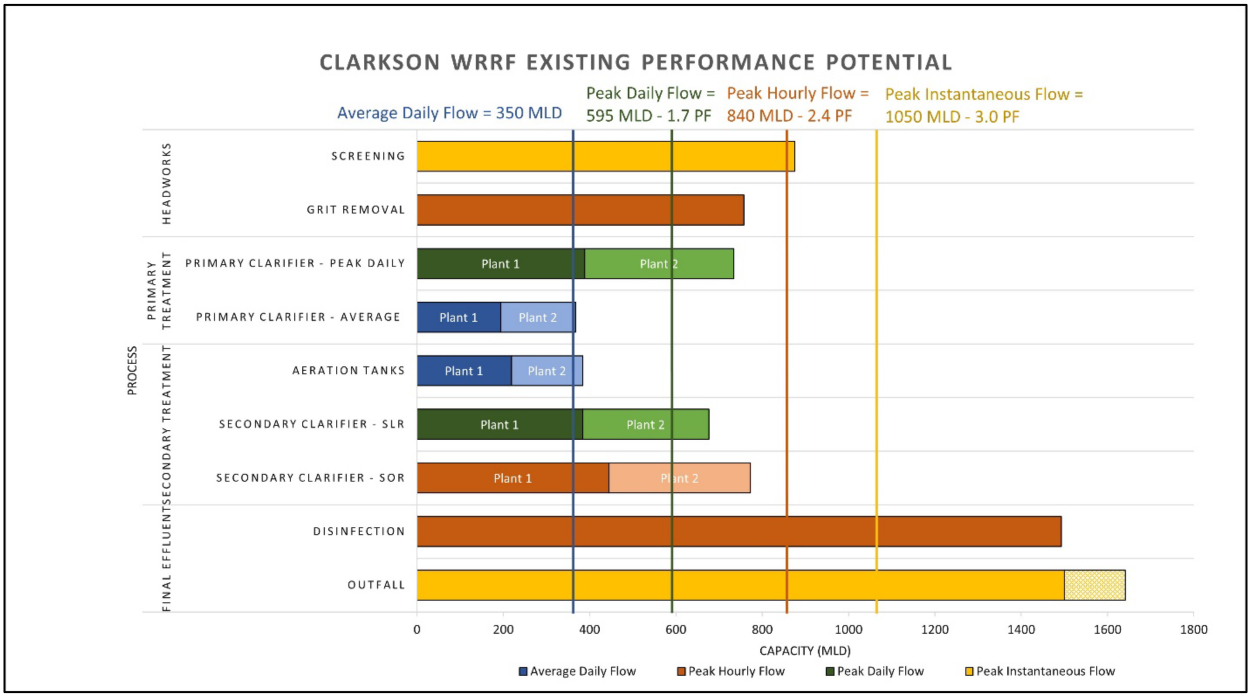


Figure 5-5: Clarkson WRRF Hydraulic Capacity at 350 MLD Average Rated Design Flow

5.5.2.2 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 and peaking factors were used to project future biosolids production at the existing rated capacities of the WRRFs and for each of the wastewater treatment alternatives based on the projected BOD_5 load. The peaking factor used for peak month loading is 1.3.

The new primary sludge thickening facility at the Clarkson WRRF is being designed to meet future treatment needs. The capacity assessment indicated that solids unit processes at Clarkson WRRF have the capacity to meet design peak month loadings with the exception of anaerobic digestion.

5.5.2.3 Outfall

Based on the hydraulic analysis, expanding the Clarkson WRRF will not require additional outfall capacity. The existing outfall is sufficient to meet future needs and may have additional capacity beyond that identified in the ECA. A separate study is being undertaken by Peel Region to explore the feasibility of retrofitting the existing fixed orifice diffusers with variable orifice diffusers (Tideflex “duckbilled” diffusers). Variable orifice diffusers offer the advantage of being able to change output depending on different flow conditions, thereby allowing for increased discharge velocities and enhanced mixing and dilution.

5.5.3 Effluent Design Objectives and Limits

The effluent existing ECA design objectives and compliance limits for the Clarkson WRRF effluent are shown in **Table 5-2**. The operating objectives are what the plant is designed to meet, while the compliance limits are the limits that must be met, or the Region is in non-compliance with MECP requirements. The Clarkson WRRF effluent currently meets its compliance limits.

Table 5-2: Clarkson WRRF Design Objectives and Compliance Limits (Amended ECA Number 0729-9KBNNY)*

Parameter	Effluent Design Objectives - Concentration	Compliance Limits - Concentration	Compliance Limits – Loading[3]
Carbonaceous Biological Oxygen Demand ($CBOD_5$)[1]	15 mg/L	25 mg/L	N/A
Total Suspended Solids (TSS)[2]	15 mg/L	25 mg/L	N/A
Total Phosphorous (TP)	0.8 mg/L	1.0 mg/L	350 (kg/d)
Total Ammonia Nitrogen[2] for May 1 to June 15	6.6 mg/L	13.2 mg/L	N/A
Total Ammonia Nitrogen[2] for June 16 to Sept 15	6.6 mg/L	10.5 mg/L	N/A
Total Ammonia Nitrogen[2] for Sept 16 to Oct 31	6.6 mg/L	13.2 mg/L	N/A
Total Ammonia Nitrogen[2] for Nov 1 to April 30	13.2 mg/L	24.7 mg/L	N/A
E.coli	N/A	200 organisms/100mL (June 1 to September 30)	N/A
Total Chlorine Residual (TCR)	0.0 mg/L	0.1 mg/L	N/A
pH	6.5 to 9.0	6.5 to 9.0	N/A

[1] Based on annual average concentration values
[2] Based on monthly average concentration values
[3] Based on the annual average daily loading during any calendar year
**Note: The Amended ECA NUMBER 0729-9KBNNY issued June 2014 mistakenly expressed total ammonia as TAN. The table above has been corrected accordingly, and the future amended ECA for the Clarkson WRRF will also be corrected.*

In order to confirm the effluent limits for the expansion, a Receiving Water Impact Assessment (RWIA) was undertaken to meet the MECP's Provincial Water Quality Objectives (PWQO), following Phase 2 of the Class EA. The results of the RWIA have been used in the evaluation of alternative treatment technologies and design concepts (**Section 8.0**), and the development of the preferred design concept (**Section 9.0**).

5.6 G.E. Booth Wastewater Treatment Plant

5.6.1 Wastewater Treatment Processes

The G.E. Booth WRRF is also a conventional activated sludge plant with chemical phosphorus removal, meaning it uses biological and chemical processes to treat wastewater. Wastewater flows by gravity to the WRRF through one 2,400 mm diameter sewer and two 2,140 mm sewers. The trunk sewers converge at the inlet chamber system then flow through two conduits into the headworks facility and subsequent conventional treatment process. The wastewater is then diverted into three separate secondary treatment plants known as Plants 1, 2 and 3, served by common disinfection and solids handling facilities. The existing liquid treatment processes are the same as described above for the Clarkson WRRF, and include screening, grit removal, primary clarification, aeration, secondary clarification and chlorine disinfection and de-chlorination.

The solids treatment processes are also similar to the Clarkson WRRF, with the exception of providing anaerobic digestion. The waste activated sludge (WAS) from the secondary clarifiers from all three plants is pumped to one Solids Handling Facility where they are thickened using centrifuges. The raw sludge from the primary clarifiers together with thickened WAS is dewatered. The dewatered cake is distributed to storage silos from where it is pumped into one of 4 fluidized bed incinerator reactors housed in the Thermal Oxidization Building. The ash slurry from the incinerators is conveyed to ash tanks and then pumped to one of two on-site lagoons for settling. Periodically, the settled ash is relocated to the adjacent holding pond for long-term, on-site disposal. Options for beneficial use of the ash are being pursued by the Region of Peel.

The G.E. Booth WRRF also has systems in place to control odour from the headworks, influent and effluent channels and solids treatment processes. The G.E. Booth WRRF does not have standby power capacity but has two hydro feeds for redundancy. The Class EA for the G.E. Booth WRRF is establishing the needs for additional odour control and standby power.

Figure 5-6 shows the site plan for the G.E. Booth WRRF showing existing facilities. The G.E. Booth WRRF is currently being upgraded, including replacement of Plant 1, and refurbishment of one incinerator.

Figure 5-6: G.E. Booth WRRF Existing Plant Facilities

5.6.2 Unit Process Treatment Capacity

5.6.2.1 Wastewater (Liquid) Capacity

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. Currently work is underway at the G.E. Booth WRRF to improve level of service and restore hydraulic capacity to 518 MLD. Works are currently underway at the G.E. Booth WRRF to improve level of service and restore hydraulic capacity to 518 MLD, including replacing the aging Plant 1 and upgrades to the Plant 3 primary clarifiers.

5.6.2.2 Solid Capacity

The capacity assessment indicated that the sludge dewatering and incinerator process are of insufficient size at the G.E. Booth WRRF to meet the existing design flow requirement of 518 MLD.

5.6.2.3 Outfall Capacity

As indicated, additional outfall capacity is required at the G.E. Booth WRRF to meet current and future treatment needs.

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

Further details on the environmental baseline conditions at the Clarkson 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. 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 Clarkson WRRF Class EA: Natural Heritage Characterization Report and Natural Impact Assessment Report, which are provided in **Volume 2**, **Appendix A1** and **Appendix A2**, respectively. This Natural Heritage Characterization Report provides a review of the presence and extent of the natural heritage features and functions on and surrounding the Clarkson WRRF. The Report was based on a mixture of secondary source information and the following ecological surveys:

- Summer and Fall Botanical and Ecological Land Classification (2020)
- Two rounds of Breeding Bird Surveys (2020)
- One Aquatic Site Reconnaissance (2022)

The information presented in the Natural Heritage Characterization Report (**Volume 2 Appendix A1**) was used to support the evaluation of alternative solutions and alternative design concepts and is summarized below. The Natural Impact Assessment Report (**Volume 2 Appendix A2**) 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 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. Within the WRRF site and surrounding area, no provincially rare vegetation communities were identified. All ecological communities are illustrated in **Figure 6-1** and described in **Volume 2 Appendix A1**. The majority of the surrounding area is identified as industrial, and approximately 77% of the Clarkson WRRF is developed or disturbed land cover. Other ecological communities on the site include land categorized as cultural meadows (CUM), meadow marshes (MAM), or deciduous swamp (SWD).

The undeveloped lands at the north end, along the eastern boundary, and toward the southwest of the property are cultural meadow communities with some meadow marshes. The meadow marsh communities were described as containing several invasive species, with large numbers of European Reed (Phragmites australis ssp. Australis). A small area in the northwest corner is classified as a deciduous swamp but has been severely impacted by Emerald Ash Borer (Agrilus planipennis).

A small proportion of the cultural meadow community, located at the north central end of the property, is part of the City of Mississauga's Natural Area System (NAS), and the Credit River Watershed Natural Heritage System (CRWNHS). The systems include woodlots, wetlands, watercourses, and valleylands. The City's goal is to protect, enhance, restore, and expand its Natural Heritage and Urban Forest system (Natural Heritage and Urban Forest Strategy (NH&UFS), approved in 2014).

Two non-provincially significant wetland community types were identified within the Clarkson WRRF property, as identified in **Figure 6-1**. These wetlands account for approximately 3% of the land cover within the plant and include the following communities:

- Mineral Meadow Marsh (MAM2); and,
- Green Ash Mineral Deciduous Swamp (SWD2-2).

Four (4) MAM2 communities are present within the property and surround the wastewater treatment plant facility.

The SWD2-2 community is located in the northwest corner of the Clarkson WRRF property adjacent to Avonhead Road in between the industrialized area to the north and the wastewater treatment plant. Site investigations of the SWD2-2 community indicate that it does not qualify as a woodland as per Section 6.3.12 of the City of Mississauga's Official Plan (OP) due to its size and the isolated nature of the feature. The Region of Peel defines significant woodlands under the heading of Core Areas (Core Woodlands) and Natural Areas and Corridors (NAC Woodlands); the criteria and thresholds of which are defined in Table 1 of the Regional OP. A review of the Natural Heritage Reference Manual (NHRM) for Natural Heritage Polices of the Provincial Policy Statement was also completed to understand whether significance criteria were met. The specific results of this review are outlined in **Volume 2 Appendix A1**, with the noted SWD2-2 community not meeting the test for significance per the NHRM (2010) criteria.

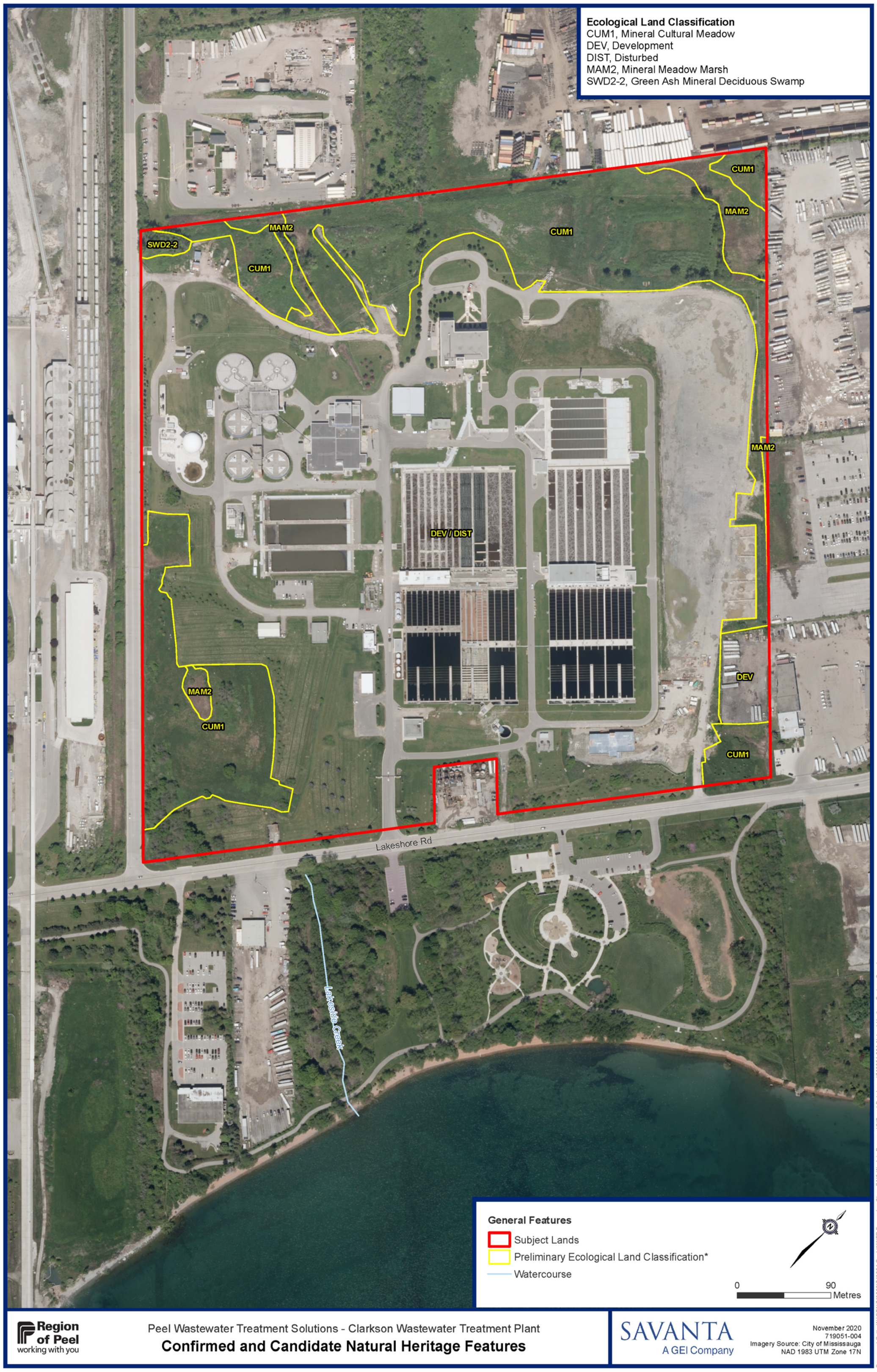


Figure 6-1: Natural Heritage Features at the Clarkson WRRF

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 Clarkson WRRF property.

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 Clarkson WRRF property. As described in **Section 6.1.1**, two non-provincially significant wetlands were noted on site.

6.1.4 Significant Valleylands

Significant valleylands are defined and designated by the planning authority with general guidelines for determining significance of these features presented in the NHRM (MNR, 2010) for Policy 2.1 of the Provincial Policy Statement. The recommended criteria for designating significant valleylands includes prominence as distinctive landform, degree of naturalness, importance of its ecological features, restoration potential, and historical and cultural value. No significant valleylands are present within the Clarkson WRRF property.

6.1.5 Wildlife

There are numerous wildlife species that have been noted on and in the vicinity of the Clarkson WRRF. Based on a review of background information and on-site observation, these species include:

- One species of mammal, the White-tailed Deer (*Odocolleus virginanus*),
- 27 bird species, including the Peregrine Falcon (*Falco peregrenis*), identified as a species of special concern, and the Bank Swallow (Riparia riparia) and Barn Swallow (*Hirundo rustica*), two threatened bird species in Ontario and Canada,
- One species of butterfly, the Northern Crescent (*Phycodides pascoensis*),
- One species of Odonata (Dragonflies and Damselflies); and,
- At least seven species of amphibians and reptiles, including records of Green Frog (*Lithobates clamitans*), American Toad (*Anaxyrus americanus*), Northern Leopard Frog (*Lithobates pipiens*) and Gray Treefrog (*Hyla versicolor*), Eastern Red-backed Salamander (*Plethodon cinereus*) and Eastern Gartersnakes (*Thamnophis sirtalis sirtalis*) and Midland Painted Turtles (*Chrysemys picta*).

6.1.6 Significant Wildlife Habitat

Significant Wildlife Habitat (SWH) is one of the more complex natural heritage features to identify and evaluate. There are several provincial documents that discuss identifying and evaluating SWH including the NHRM (MNR, 2010), the Significant Wildlife Habitat Technical Guide (MNR, 2000), and the SWH Eco-Region Criterion Schedule (MNRF, 2015). The Clarkson WRRF property is located in Eco-Region 7E and was therefore assessed using the 7E Criterion Schedule (MNRF, 2015). There are four general types of

SWH: 1) Seasonal Concentration Areas; 2) Rare or Specialized Habitats; 3) Habitat for Species of Conservation Concern; and 4) Animal Movement Corridors.

The Clarkson WRRF property was reviewed to identify any type of SWH based on the background ecological data collected and the presence of Ecological Land Classification (ELC) communities. As shown in **Figure 6-1**, there is a confirmed deciduous forest (SWD) community in the northeast corner of the Clarkson WRRF property which has been identified as a candidate Significant Wildlife Habitat (SWH) for Bat Maternity Colonies. No other SWH types are likely to be present within the Clarkson WRRF property based on the availability of habitat and/or presence of SWH indicator species.

6.1.7 Species at Risk

Candidate Species at Risk (SAR) bat habitat may be present within the SWD2-2 vegetation community in the north-west corner of the Clarkson WRRF property. In addition, breeding bird surveys observed the following SAR on or adjacent to the property: Peregrine Falcon, Bank Swallow, and Barn Swallow. However, no potential breeding habitat was identified in the Study Area for these breeding birds, and therefore, no SAR species was identified as candidate.

6.1.8 Watercourses

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. Lakeside Creek is classified as an intermittent warm water creek. Lakeside Creek currently would not be affected by works at the Clarkson WRRF.

6.1.9 Fish and Fish Habitat

Credit Valley Conservation (CVC) has indicated that fish habitat is present within Lakeside Creek which is adjacent to the plant.

6.1.10 Flood Plains and Regulated Areas

Currently, Lakeside Creek terminates south of Lakeshore Road West, across from the Clarkson WRRF. There are no open watercourses on the Clarkson WRRF site. Additionally, the Clarkson WRRF property is outside the existing Credit Valley Conservation (CVC) regulated areas. However, this may change as the CVC is currently revising their floodplain and regulation limit mapping.

Expansion works at the Clarkson WRRF will be designed and constructed to ensure that they comply with CVC requirements with respect to erosion control and stormwater management.

6.1.11 Lake Ontario 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 Great Lakes Water Quality Agreement (GLWQA). This report documents the following indicators:

- Drinking water
- Beaches
- Fish consumption
- Toxic chemicals
- Invasive species
- Groundwater
- Habitat and species
- Water 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 Provincial Water Quality Objectives (PWQOs) continue to be met. The critical parameters for receiving water in Ontario consists of Total Ammonia Nitrogen (TAN), Total Phosphorous (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 Receiving Water Impact Assessment (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.

6.2 Social / Cultural Environment

The social environment includes the land and water uses in the areas surrounding the Clarkson WRRF. **Figure 6-2** provides an overview of these uses. The cultural environment includes heritage buildings or features and discovered or undiscovered archaeological resources.

Figure 6-2: Clarkson WRRF and Surrounding Land Uses

6.2.1 Residential, Commercial and Industrial Land Use and Users

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). The property immediate 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 metre north of the north property limits, at the corner of Southdown Road and Orr Road.

6.2.2 Recreation

While the Clarkson WRRF is primarily industrial in nature, there are some key recreational areas in the immediate vicinity of the WRRF. The Lakeside Park and Dog Park and the Waterfront Trail are located nearby, as described below.

6.2.2.1 Lakeside Park and Dog Park

Lakeside Park and Dog Park is located immediately south of the Clarkson WRRF. The park is well-manicured and offers users views of Lake Ontario and includes a fenced area for off-leash dogs. Although the lake is accessible from the park, the beach is rocky and not generally used for recreational uses.

The park has innovative low impact development (LID) features, including a rain garden (bioretention swale), pervious concrete parking lot, green roof, and splash pad; with water from the splash pad reused for irrigation.

6.2.2.2 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 Clarkson WRRF. From Orr Road, the trail follows Southdown Road south to Lakeshore Road West. It then meanders through Lakeside Park, immediately across from the Clarkson WRRF, and routes back onto Lakeshore Road West beyond Avonhead Road.

6.2.3 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 Source Protection Plans (SPP) by prescribed authorities. In the Greater Toronto Area, Credit Valley Conservation (CVC), Toronto and Region Conservation Authority (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 Intake Protection Zones (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 levels of IPZ:

- IPZ-1 is a 1-kilometre radius around the intake point and represents an area of high vulnerability.
- 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.
- IPZ-3 is the area upstream of the intake, such as rivers that outlet to Lake Ontario.

Threats could include chemical contaminants such as pesticide use and fuel handling as well as biological factors such as livestock grazing and sewage disposal, including treated wastewater outfalls.

Specific to this Class EA, the Region of Peel's Lorne Park WTP is located approximately 6 kilometres from Clarkson WRRF. The Clarkson WRRF outfall is outside the IPZ-1 for the Lorne Park WTP, as shown in **Figure 6-3**.

Figure 6-3: Nearby Water Treatment Plant Intake Protection Zones at the Clarkson WRRF

Protection of IPZs is considered in the RWIA presented in **Volume 2 Appendix B**, and further summarized in **Section 8.0** of this ESR.

6.2.4 Road Networks, Traffic Conditions, and Transit

The properties surrounding the Clarkson WRRF are readily accessible by Southdown Road and Lakeshore Road West, as well as several roads through adjacent industrial areas. The nearest 400-Series Highway is the Queen Elizabeth Way (QEW), just over 4 kilometres north of the plant.

Public transit near the Clarkson WRRF is limited to a single City of Mississauga MiWay route (14A) that travels south on Southdown Road, continuing west on Lakeshore Road West, and then looping north on Winston Churchill Boulevard back to Royal Windsor Drive. The nearest GO Station, Clarkson Station, is located at Southdown Road and Lakeshore Road West.

Currently, biosolids are transported by trucks from Clarkson WRRF to G.E. Booth WRRF, travelling north along Southdown Road then east along Lakeshore Road. On average, three trucks per day (40 m^3 capacity) travel between the plants to haul biosolids.

6.2.5 Aesthetic / Visual Conditions

The Clarkson WRRF is shielded from public view along its north and east boundaries. The west boundary of the site fronts Avonhead Road, which is a public road that primarily provides access to industrial users and is therefore unlikely to be used regularly by the general public. The south boundary (‘front’) of the site fronts Lakeshore Road West and is immediately across from the City of Mississauga’s Lakeside Park.

The front of the property is landscaped with manicured lawn and mature trees, along with sunflower-inspired photovoltaic cells (Solar Flairs™) located west of the main facility's access road.

6.2.6 Air Quality and Odour Conditions

The Region has been proactive over the years in implementing air emission and odour control at its Water Resource Recovery Facility. The aim is to not only meet MECP regulations, but to also be a "good neighbour" in the community.

At the Clarkson WRRF, odourous air generated in the headworks building is collected and treated with two air scrubbers to remove odour components before discharging treated air to the atmosphere. Three biofiltration units are also used to treat odorous air collected from the outlet side of the primary clarifiers which is combined with untreated air collected from the primary clarifier inlets and discharged to the atmosphere via the exhaust stack.

Currently the nearest existing residential areas (sensitive land use) are located north of Orr Road, over 500 metres away from the plant boundary. The MECP's Guideline D-2 Compatibility between Sewage Treatment and Sensitive Land Use Guidelines suggests a minimum separation distance of more than 150 metres should be considered for plants the size of the Clarkson WRRF.

The currently approved ECA for the Clarkson WRRF also requires that the Region log all residential odour complaints, investigate, and resolve them. The Region staff make every effort to contact the customers and satisfactorily address their concerns. There have been no recent odour complaints.

As part of this EA, an Air Quality Assessment (AQA) has been completed to establish a preferred design concept that includes emission and odour control measures. The AQA Report is included in **Volume 2 Appendix C**, with further details provided in **Section 10.0**.

6.2.7 Noise Conditions

Most of the noise sources at the Clarkson WRRF are within closed buildings, so off-site noise impacts due to the operations at the Clarkson WRRF are limited. However, some noise is emitted through buildings vents and openings as well as from construction activities. As the nearest residential receptors are located over 500 metres away from the plant, noise disturbance is assumed to be minimal, however a proposed expansion to the existing facilities will need to be supported by a noise study identifying the impacts of increased operations and associated mitigation measures if required.

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

6.2.8 Archaeological Conditions

A Stage 1 Archaeological Assessment (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 during Phase 3 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 area for development. The Stage 1 and Stage 2 AA reports are provided in **Volume 2 Appendix E**.

6.2.9 Cultural Heritage Conditions

The Clarkson WRRF facility takes its name from the historic community of Clarkson, centered along Lakeshore Road, west of Southdown Road. Clarkson is considered one of the oldest settled villages in the Region of Peel, having been first settled in 1808. In 1893, the land on which the Clarkson WRRF sits was acquired by Toronto businessman George Horace Gooderham of the Gooderham family. At its height, the property contained four barns, four houses and a dedicated rail spur. The estate was sold off in parcels beginning in the 1940s for business and residential uses. The area surrounding the Clarkson WRRF gradually developed to become an industrial area, as it is today. No designated or candidate properties of cultural heritage value or interest lie within 300 metres of the Clarkson WRRF.

6.2.10 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 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, and;
- 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 Clarkson WRRF expansion on design and construction requirements.

6.3.1 Physiology and Topography

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.

6.3.2 Hydrogeological and Geotechnical Conditions

Well records indicated that groundwater was encountered in the wells at depths of about 1.8 to 7.0 metres below grade. As Lake Ontario is about 300-metres south-east of the Clarkson WRRF, it is expected that groundwater flows toward the lake. Prevailing groundwater levels in the area are anticipated to be near or just above the water level of Lake Ontario. Barring some localized stockpiling, the Clarkson WRRF ranges in elevation from 83 m asl to 90 m asl with the average Lake Ontario level being approximately 74.8 m asl with fluctuations between 74 m asl and 75.5 m asl. Therefore, it is anticipated that groundwater may be encountered as shallow as 7.5 metres below grade or up to 16 metres below grade. There may also be perched water conditions at the interface of the soil overburden with the bedrock surface.

Surficial geology mapping from the Ontario Geological Survey (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 metres 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.

Construction techniques and measures to mitigate the hydrogeological and geotechnical impacts are discussed in **Section 10.0**.

6.3.3 Areas of Potential Environmental Concern

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

The Phase One 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. Overall, eight APECs were identified at the Clarkson WRRF. 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

The 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 Greenhouse Gas (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 Clarkson WRRF and the potential implications of the Clarkson 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 greenhouse gas 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

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 millimetres and 925 millimetres per year and southern area in Mississauga receives between 794 and 836 millimetres. 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 Clarkson WRRF is located in CVC's jurisdiction, and specifically within the Lake Ontario Shoreline East Subwatershed. 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[2]), 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).

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 6-2** provides potential future climate conditions based on the Representative

[2] Credit Valley Conservation 2018. Available online at: https://cvc.ca/wp-content/uploads/2018/12/LOISS-Characterization-FINAL-December-2018.pdf

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 greenhouse gas (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 6-2: Climate Condition and Projections

Climate Condition	Climate Variable	Trend	Historical Baseline (1981-2010)	Climate Model Projections Mid-Century (2050s)	Climate Model Projections End of Century (2080s)
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

Climate Condition	Climate Variable	Trend	Historical Baseline (1981-2010)	Climate Model Projections Mid-Century (2050s)	Climate Model Projections End of Century (2080s)
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 6-3** describes potential impacts on wastewater infrastructure.

Table 6-3: Potential Climate Change Impacts on 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 and quality; and extended spring and fall seasons leading to greater potential for higher flows (e.g., during the Spring freshet), potential spill and compliance issues.
	• 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.

Climate Condition	Climate Parameter	Potential Impact on Wastewater Infrastructure
		• Increased water demand and associated worsening water quality (e.g., lack of dilution, higher concentrations of nutrients or pollutants in the water).
Drought	• Multiple days or extended periods of no precipitation	• Reduced water quantity and quality (dry conditions could result in wastewater being less diluted by rain, reducing effluent quality); • Extended periods of dry weather could result in influent wastewater of higher strength (less dilution). • Possibility that drought could affect the effluent quality. • 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.
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. • Increased rainfall may improve system performance by diluting wastewater and reducing its temperature (reducing corrosion and odours).
	• 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.

Climate Condition	Climate Parameter	Potential Impact on Wastewater Infrastructure
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. • Accumulation of ice on infrastructure may result in power outages. • Hazardous driving conditions for operating, 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.

Alternative solutions and treatment process designs were developed to provide flexibility and redundancy for adapting to the potential climate change parameters described in **Table 6-3**, as discussed in **Section 7.0** and **Section 8.0**, respectively.

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 Greenhouse Gas (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.

6.5 Existing Environmental Conditions at the G.E. Booth WRRF

6.5.1 Natural Environment

Figure 6-4 summarizes the major natural features on and surrounding the G.E. Booth WRRF. Overall, much of the G.E. Booth WRRF property has been previously disturbed, with few natural areas; these areas are concentrated near Lake Ontario and the forested areas in the northwest and northeast ends of the property where Serson Creek is located. These areas have also been identified as candidate significant wildlife habitats (SWHs). Eleven Species at Risk (SAR) species were identified as candidate based on potential habitat availability within the Study Area and included five threatened bird species and three endangered bat species as well as one species each of endangered tree, butterfly, and fish.

Applewood and Serson Creeks are located on the G.E. Booth WRRF site and are within CVC's Regulation Limit Area. Applewood Creek is located on the eastern boundary of the WRRF and has been identified as supporting permanent direct habitat for fish species. Serson Creek baseflows are currently piped underneath the G.E. Booth WRRF site to Lake Ontario, with higher flows diverted through a straight open channel along the eastern boundary of the site. Due to the alterations and underground diversions, fish are unable to access Serson Creek from Lake Ontario through the current channel under the G.E. Booth WRRF. Part of the Lakeview Community Development and Credit Valley Conservation (CVC) plans are to develop a naturalized corridor along the western boundary of the WRRF, which includes plans to naturalize Serson Creek.

The Jim Tovey Lakeview Conservation Area (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, Credit Valley Conservation (CVC) and the Toronto and Region Conservation Authority (TRCA). The objective of the JTLCA 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. It involves the creation of a new 26-hectare (ha) conservation area, including creating wetland and woodlot habitats along the eastern Mississauga shoreline. The construction of the JTLCA is also expected to alter the 100-year flood hazard lines along the Lake Ontario shoreline.

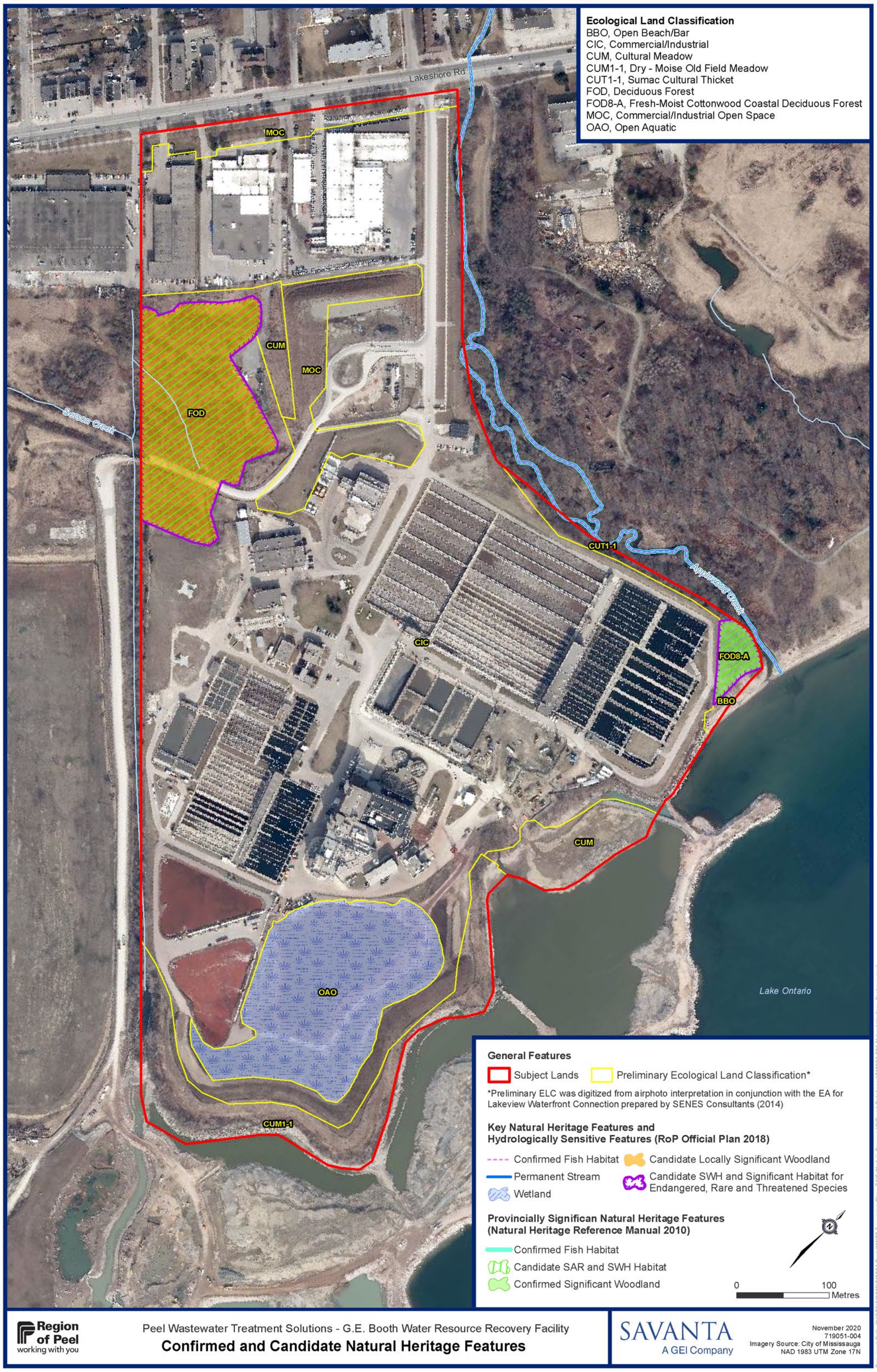


Figure 6-4: Natural Heritage Features at the G.E. Booth WRRF

6.5.2 Social and Cultural Environment

The G.E. Booth WRRF is in the community of Lakeview, which has a rich history rooted in supporting the Canadian military as far back as World War I. The community first developed around these military bases, gradually converting to a heavily residential area. Today, the G.E. Booth WRRF site is surrounded by residential areas to the north, planned residential development to the west and recreational land use areas to the east and south, as shown on **Figure 6-5**. The area will continue to grow in popularity once the neighbouring Lakeview Village Community and JTLCA are open.

Figure 6-5: G.E. Booth WRRF and Surrounding Land Uses

Two surface water treatment plants (WTPs) are located within about 5 kilometres of the G.E. Booth WRRF: The Region of Peel's Arthur P. Kennedy WTP and the City of Toronto's R.L. Clark WTP. Under Ontario's Source Water Protection Plan requirements, drinking water sources must be protected.

Figure 6-6 illustrates the zones of highest vulnerability or Intake Protection Zones 1 (IPZ-1) that apply for each WTP. Any increase in capacity at the G.E. Booth WRRF or construction of a new outfall at the WRRF must ensure that the effluent discharge plume does not negatively impact drinking water quality by impinging on the WTP IPZ 1 areas.

Figure 6-6: Nearby Water Treatment Plant Intake Protection Zones to the G.E. Booth WRRF

While much of the area surrounding G.E. Booth WRRF is developed or has been previously disturbed, small areas at the northeast end of the site and near the southern terminus of Applewood Creek retain archaeological potential. In addition, there are four designated cultural heritage properties located within 300 metres of the G.E. Booth WRRF site including the Long Branch Indoor Rifle Range (1940); Long Branch Outdoor Rifle Range (1910); Small Arms Limited Building (1941); and the Arsenal Lands Water Tower (1941).

6.5.3 Physical Environment

The physiography, topography, geotechnical and hydrogeological conditions at the G.E. Booth WRRF site are well understood given the numerous subsurface investigations, geotechnical reports, and hydrogeological reports that have been completed. Generally, the site bedrock consists of shale with limestone interbeds, with the bedrock surface sloping toward Lake Ontario. The overburden consists of shallow soils composed primarily of gravel and sand, with some silty clays. Hydrologically the site is bordered to the east by Applewood Creek and to the west by Serson Creek, both paralleling the site and discharging to Lake Ontario. The topography and hydrology correlate to a shallow groundwater table with groundwater flow direction in the overburden inferred to be south towards Lake Ontario.

A geotechnical investigation was completed in 1972 prior to construction of the existing outfall at the G.E. Booth WRRF. The borehole locations extended along the length of the existing outfall and indicate that there is a sound bedrock consisting of shale with hard limestone interbeds approximately 0.3 to 1.1 metres below the lakebed surface. Based on the geotechnical information available, it is anticipated that a new outfall tunnel at the G.E. Booth WRRF would be constructed in shale bedrock of the Georgian Bay

Formation (formerly called Meaford Dundas). The Georgian Bay Shale formation is horizontally bedded, characterized as a fresh to slightly weathered, weak to moderately strong shale with occasional thin interbeds of harder siltstone and limestone layers.

A Phase 1 Environmental Site Assessment (ESA) was completed as part of the G.E. Booth WRRF Class EA, which identified Areas of Potential Environmental Concern (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.

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 areas: wastewater treatment, outfall capacity, and biosolids management. Phase 2 addressed important technical questions that guided the development and assessment of alternative solutions. Because Peel'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.

Table 7-1: Development of Phase 2 Alternative Solutions

Methodology and Section	Description
Study Area Baseline Inventory (**Section 5.0** and **Section 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, species at risk (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.

Methodology and Section	Description
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 cover 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 H**.

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 of the above criteria. Any alternative that failed one 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 7-2.**

Table 7-2: 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. **This option is 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. **This concept is Screened out**
Construct New WRRF or WRRFs: Construct one or more new treatment facilities, presumably in Mississauga or Brampton, to treat additional flows.	Constructing a new Water Resource Recovery Facility (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. **This concept is Screened out.**

Wastewater Treatment Concept	Ability to Meet Screening Criteria	Screening Results
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 Peel'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, Peel 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 Real Time Control (RTC).	The Region of Peel is undertaking a study to identify the feasibility of implementing Real Time Control (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. Peel is currently completing a feasibility study for implementing RTC in their system.	Partial solution that supports Class EA Objectives as identified in the Study Opportunity Statement. **Plans are underway to implement and will be part of Peel's Overall Wastewater Treatment Strategy.**
Expand One or Both of the Existing Water Resource Recovery Facility: Expand either one 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. **This concept is 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 or more new facilities ("Construct New WRRF or WRRFs") was also reviewed but ultimately screened out; this concept is inconsistent with Peel'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 Peel's overall wastewater management strategy.

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

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 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 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 7-3 presents a summary of the screening of the long list of wastewater treatment strategies. The recommended shortlist of wastewater treatment alternatives to meet future capacity requirements were to **W.2 Expand the Clarkson WRRF** and **W.3 Expand both the G.E. Booth WRRF and the Clarkson WRRF**.

Table 7-3: 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. **This concept is 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. **This concept is 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. **This concept is Carried Forward.**

7.3.2 Biosolids Management Strategies

7.3.2.1 Overview of 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 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 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 mange biosolids at each WRRF separately.

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 K**. 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 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.

Further information on the market assessment is provided in **Section 8.4.1**.

7.3.2.3 Screening of Biosolids Management Strategies

Table 7-4 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, four additional incinerators 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 process (incineration) for management at both WRRFs sludge, increasing risks to Peel. 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 Peel'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 screening criteria. The benefits of this strategy are that it:

- Eliminates trucking of digested and dewatered sludge from Clarkson WRRF to the G.E. Booth WRRF for incineration,
- 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, and
- Maximizes existing infrastructure investments (i.e., incinerators)

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 7-4: 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 option.	Does not address the project objectives in terms of providing greater flexibility and reliability in biosolids management. **This concept is screened out.**

ID	Alternative Strategy	Description	Relevant Screening Criteria	Comments
B.2	Independent sludge treatment and management of biosolids at each WRRF.	Each plant treats and manages their respective sludge, independently. Dewatered sludge is no longer trucked from the Clarkson WRRF to the G.E. Booth WRRF for incineration. 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. **This concept is Carried Forward.**

7.3.3 Outfall Capacity and Peak Wet Weather Flow Management

As described in **Section 5.0**, the Clarkson WRRF existing outfall is 3 metres in diameter and 2,200-metre 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 ML; however, the hydraulic capacity analysis indicates that it has a capacity of approximately 1,600 MLD. Further, there is potential opportunity to retrofit the existing diffusers with larger diameter nozzles in the future to further optimize outfall performance, if required.

With a life expectancy of at least 75 years, the outfall was sized at the time to meet expected long-term capacity requirements. As such, no additional outfall capacity is required at the Clarkson WRRF. However, as presented in **Section 5.0**, the existing outfall at the G.E. Booth WRRF has existing capacity challenges and will be unable 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 from the G.E. Booth WRRF to the Clarkson WRRF to take advantage of additional outfall capacity at the Clarkson WRRF.

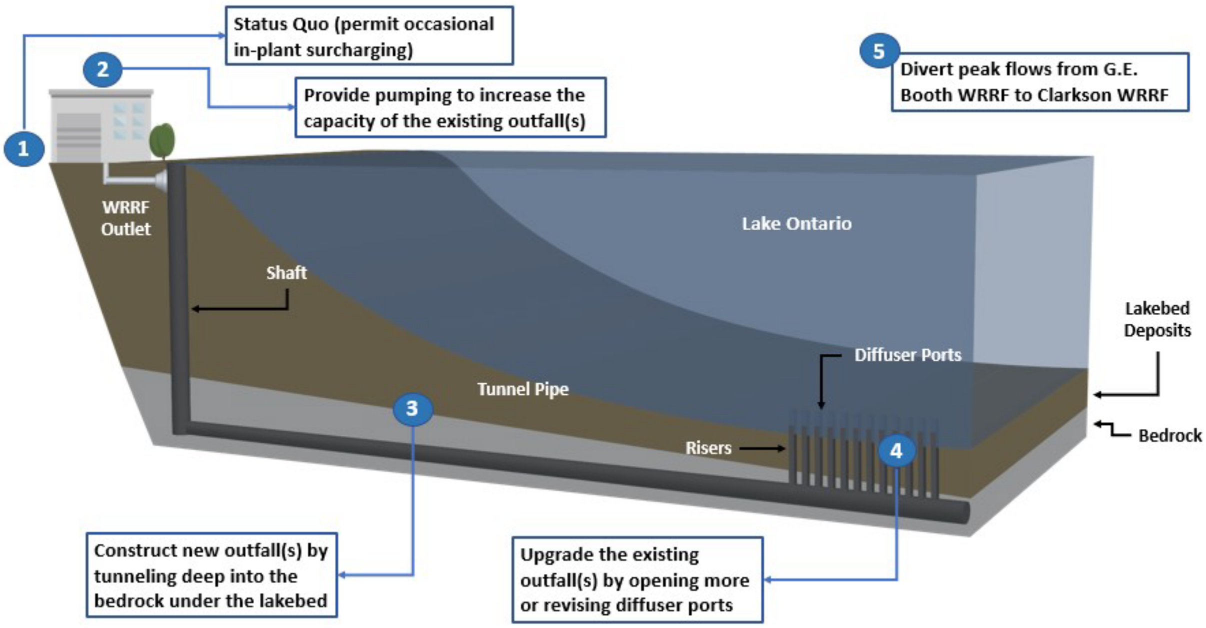


Figure 7-1: Potential Options to Increase Outfall Capacity at the G.E. Booth WRRF

Table 7-5 provides a review of these strategies based on the screening criteria in **Section 7.2**.

Table 7-5: 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. **This concept is 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. **This concept is carried forward for W.2 – Expand Clarkson WRRF only**
O.3	Construct a new, larger	This alternative involves constructing a new larger diameter outfall and diffuser	This would allow Peel to adequately increase outfall	Addresses all project objectives.

ID	Alternative Strategy	Description	Relevant Screening Criteria	Comments
	outfall into Lake Ontario.	deeper into Lake Ontario, via tunnelling in the bedrock under the lakebed.	capacity in the long-term, while continuing to meet MECP water quality requirements aimed at protecting human health and the environment.	**This concept was 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 can not be implemented. **This concept is screened out.**
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. **This concept was 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 incinerations at the G.E. Booth WRRF. Consequently, incineration will continue at the G.E. Booth WRRF until they reach the end of the remaining useful life (i.e., 15 – 20 years).
  - Additional treatment capacity will be provided at the G.E. Booth WRRF in excess of the existing incineration capacity. For Phase 2 alternative comparison purposes, it was assumed that a thermal hydrolysis process (THP) with digestion would be used to reduce the sludge volume and mass prior to incineration.
  - 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 o 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 Clarkson WRRF have been evaluated in Phase 3 of the Class EA and are presented in **Section 8.0**. The technologies and design concepts for the G.E. Booth WRRF are being assessed as part of ongoing Class EA for the G.E. Booth WRRF.

The following 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.

Figure 7-2:

Alternative Solution 1

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 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 7-3:

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 7-4:

Alternative Solution 2B

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 7-5:

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 7-6:

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 7-7:

Alternative Solution 4B

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

Region of Peel working with you

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

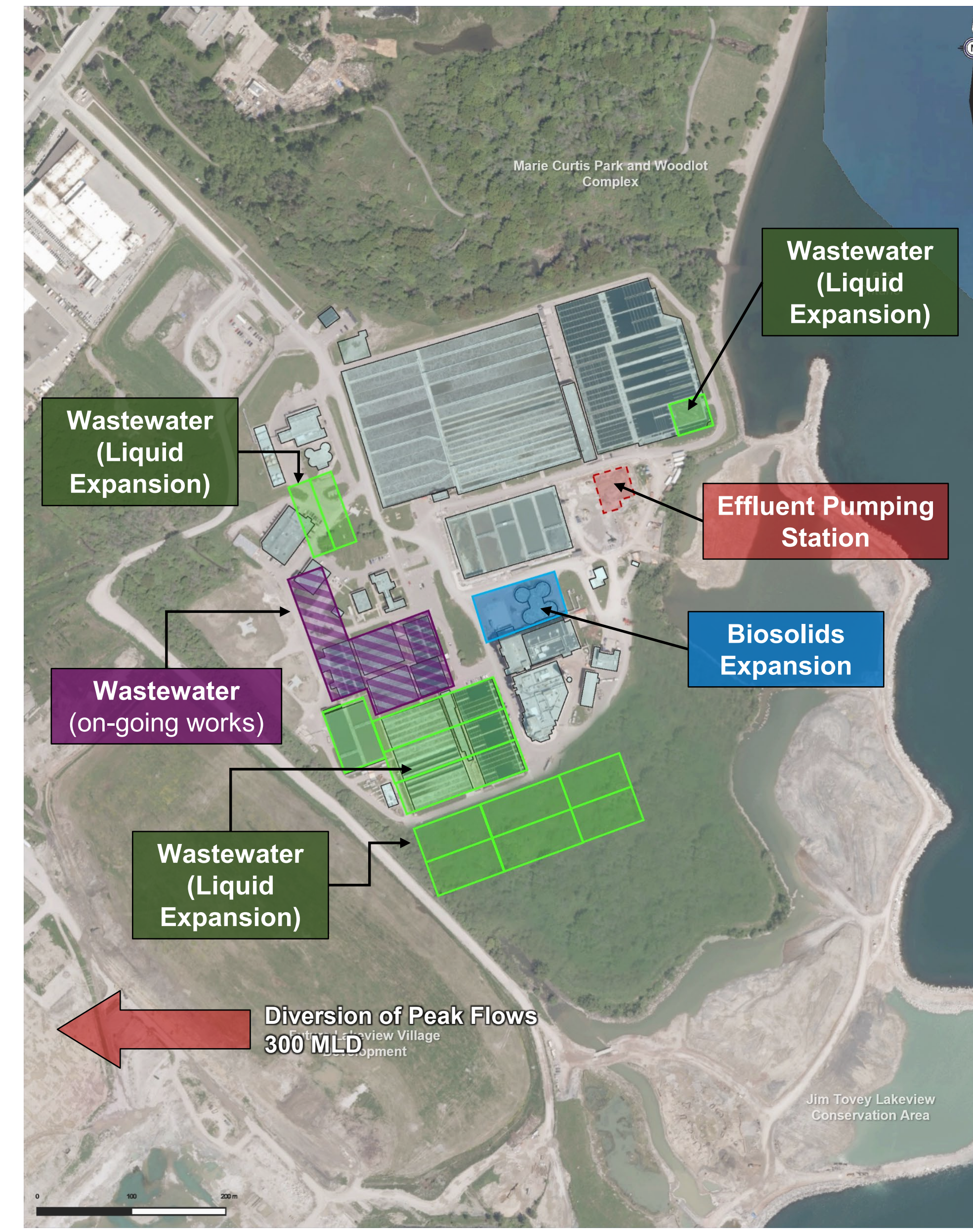
Biosolids

- 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 7-8:

Alternative Solution 5

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

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. **Table 7-6** to **Table 7-9** below detail the evaluation criteria used with a brief description.

Table 7-6: Evaluation Criteria - Natural Environment

Criterion	Description
Terrestrial Systems	Potential for alternative solutions to impact terrestrial habitats or systems, including terrestrial features / functions (ANSIs, ESAs), unique vegetation species, mature trees, existing park / open spaces linkages or wildlife
Aquatic Systems	Potential of the solution to impact aquatic habitats or systems, including possible impacts on aquatic life and species at risk features / functions.
Surface (Lake) Water Quality	Potential of the solution to impact the quality of surface water (Lake Ontario).
Ground Water Quality and Quantity	Potential of the solution to impact the quality and quantity of groundwater.
Air Quality	The potential of the solution to minimize increases in air emissions.
Climate Change	The qualitative impacts of the solution on climate change in terms of Greenhouse Gas (GHG) Emissions

Table 7-7: Evaluation Criteria - Social - Cultural

Criterion	Description
Odour (post construction)	The potential of the solution to produce odour (post-construction).
Noise / Vibrations (post construction)	The potential of the solution to produce noise / vibration (post-construction).
Visual Aesthetics (post construction)	The potential of the solution to impact the scenic attributes of the community and surrounding areas (post-construction).

Criterion	Description
Truck Traffic (post construction)	The potential of the solution to increase truck traffic (post-construction).
Disruption During Construction	The potential of the solution to impact surrounding landowners and users, including disruption to traffic and parking, noise and odour generation, parks, and greenspace impacts.
Property Acquisition and Easements	The extent to which property acquisition or easements are required to implement the solution.
Recreational Use and Users	The potential for the solution to impact surrounding recreational uses including both land and water uses.
Human Health and Safety	The potential of the solution to impact human health and safety; community and occupation.
Existing and Future Land Use Compatibility	The extent to which the solution fits in with the existing land and future planned land uses in the area.
Archaeology / Natural Heritage	The potential of solution to impact any archaeological sites and / or significant / natural heritage areas.

Table 7-8: Evaluation Criteria - Technical

Criterion	Description
Effectiveness	Effectiveness of the solution at meeting stated project objectives, including meeting wastewater, biosolids and wet weather management needs.
Long-term Flexibility	The ability of the solution to meet to meet future demands beyond 2041, provide flexibility in biosolids treatment and product utilization, and flexibility in managing wet weather flows.
Ease of Operation	The solution's relative complexity as it relates to operation and maintenance of the Region's wastewater collection/treatment system.
Redundancy	Ability for the solution to provide treatment, biosolids, and/or wet weather flow redundancy for maintenance during regular and emergency situations.
Compatibility with Existing Infrastructure	The ability for the solution to be compatible and easily implemented within the existing plant site and its infrastructure.

Criterion	Description
Geotechnical and Hydrogeology	The extent of potential geotechnical challenges and impact to hydrogeology as related to the infrastructure during and post construction.
Contaminated Soils	The potential of the solution to encounter contaminated soils during construction and/or operation.
Energy Use and Recovery	The ability of the solution to include energy efficient technologies, reduce overall energy requirements and potentially result in energy recovery.
Climate Change Adaptability	The ability of the solution to adapt to climate change impacts (i.e., wet weather flow, severe events, higher Lake levels).
Permits and Approvals	Ease of receiving permits and approvals, including the agency approvals necessary.

Table 7-9: Evaluation Criteria - Economic

Criterion	Description
Capital Costs	Capital costs estimates based on Phase 2 high-level assumptions based on experience on other similar sized projects and assumptions with respect to the technologies to be implemented
Operating and Maintenance Costs	Operating and maintenance costs were not estimated in Phase 2; A qualitative approach was applied to compare alternatives based on operational experience on other similar sized projects and assumptions with respect to the technologies to be implemented.
Cash Flow	Expansion timing requirements were used to identify implications on Peel's cash flows.

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 1 to 10 was developed. The rating scale is defined in **Table 7-10** below.

Table 7-10: Impact Scale

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 H**.

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 Jim Tovey Lakeview Conservation Area (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 greenhouse gas (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 as a result of 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 Provincial Water Quality Objectives (PWQOs) in the nearshore and not interfering with WTP intake protection zones (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.
- 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 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 7-11**. 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 7-11**, 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 7-11: 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	$ 650 M	$ 40 M	$ 253 M	N/A	$ 200 M	$ 1,123 M
4A	$ 520M	$ 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 at the GEB, THP + Digestion as the basis for estimate. For solids 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 7-12** presents a summary of the timing of expansions.

Table 7-12: Estimated Timing of Construction

Alternative	G.E. Booth Capacity Expansion Requirements to 2041	Clarkson Capacity Expansion Requirements to 2041	G.E. Booth Effluent Pumping Station Expansion Requirements to 2041	G.E. Booth New Outfall Expansion Requirements to 2041
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 – 2041	2024 – 2029	N/A	2025 – 2030
4B	2026 – 2041	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 Peel'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.

7.5.2.5 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 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), 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.
- 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. With respect to the Clarkson WRRF the solution includes:

- Flow diversion of 80 MLD (average day flows) when the East-to-West Diversion Trunk Sewer becomes operational in 2026, and an additional 70 MLD by the year 2031; for a total of 150 MLD diversion of flows to the Clarkson WRRF.
- Expand the Clarkson WRRF from 350 MLD to 500 MLD (rated flow capacity) by the year 2029.
- Stop trucking digested and dewatered biosolids from the Clarkson WRRF to the G.E. Booth WRRF for incineration and develop long-term plans for treating and managing biosolids at the Clarkson WRRF.

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 in **Section 1.1**, the interrelated nature of the Region's wastewater collection and conveyance systems meant that the solution established for the Clarkson WRRF was dependent on the solution selected for the G.E. Booth WRRF. Consequently, the Clarkson WRRF Class EA was completed in conjunction with the G.E. Booth 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 Clarkson WRRF expansion.

Questions Answered During Phase 3

What technologies should be used to treat wastewater (liquid and solids)?

How should biosolids be managed?

What is the preferred design concept to expand the Clarkson 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

The general Phase 3 evaluation approach for the Clarkson WRRF is as follows:

Table 8-1: Summary of Phase 3 evaluation approach.

Methodology and Section	Description
Basis for Alternative Design Concept Development (**Section 8.2**)	The system-wide diversion requirements, the wastewater and biosolids expansion requirements, the proposed effluent quality limits and other factors that were considered in the development and assessment of the design concepts are described in **Section 8.2.**
Screen the Long List of Alternative Treatment Technologies (**Section 8.3.2** and **Section 8.4.3**)	Long lists of liquid and solids treatment technologies were summarized and screened based on "must have" criteria. The technologies that "pass" the screening process were carried forward to establish a short list of alternative wastewater treatment design concepts and biosolids management design concepts. The results of the biosolids product market assessment were also considered in the development of biosolids management concepts. **Section 8.3.2** details the screening of wastewater technologies and **Section 8.4.3** describes the screening of the solids treatment technologies.

Methodology and Section	Description
Evaluate Alternative Design Concepts (**Section 8.3.4** to **Section 8.3.6** and **Section 8.4.4** to **Section 8.4.7)**	The short list of wastewater treatment and biosolids management design concepts were assessed separately using detailed evaluation criteria that considered all components of the environment - natural, social, cultural, technical, and economic. Preferred wastewater and biosolids design concepts were selected based on the assessments. **Section 8.3.4** to **Section 8.3.6** detail the development and assessment of the wastewater design concepts, while **Section 8.4.4** to **Section 8.4.7** detail the development and assessment of biosolids management concepts.
Develop the Overall Preferred Design Concept **(Section 9.0 and Section 10.0)**	An overall preferred design concept that represents a combination of the wastewater and biosolids preferred concepts was developed for the Clarkson WRRF. The concept includes measures to mitigate potential impacts and an implementation plan. **Section 9.0** summarizes the preferred overall design concept, while details on the mitigation measures and implementation plan are provided in **Section 10.0**.

As the components of the treatment system are interrelated, the assessment of wastewater and biosolids alternatives, while presented separately herein, were undertaken simultaneously to account for these interrelationships. Likewise, the interrelationships between the WRRFs were considered in the development and assessment of alternatives, particularly with respect to biosolids management.

8.1.1 Screening Approach Criteria

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 concept and biosolids design concepts. The applied screening criteria are described in **Table 8-2**.

Table 8-2: Phase 3 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 Clarkson WRRF. The technology

Screening Criteria	Description
	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.
Ability to Implement within Required Schedule	Capacity expansion of Clarkson WRRF is required by 2029 to accommodate projected wastewater flows. This criterion assesses the option's impact on the implementation schedule.

8.1.2 Detailed Evaluation Approach Criteria

Table 8-3 to **Table 8-6** presents the evaluation criteria used to assess the Phase 3 design concepts, as well as the sources of information used. These criteria are similar to the criteria used for Phase 2 but revised to reflect the more detailed evaluation undertaken in Phase 3. 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., 1 to 10; with 10 having the least impacts and most preferred and 1 having the most impacts and least preferred) and is presented in **Table 7-10**. 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, including natural heritage assessments, receiving water impact analysis, air quality and noise assessments, archaeological assessments, a geotechnical and hydrogeological desktop review, and a Phase 1 ESA (refer to **Volume 2 – Supporting Technical Reports** for more information on these investigations). VE input was also instrumental in assessing the alternatives and establishing the preferred design concept.

Finally, each alternative design concept was reviewed against the key objectives developed earlier in the study (**Table 1-1**). The alternative design concepts with the least net effects that aligned best with the Peel's objectives were selected as preferred.

Table 8-3: Detailed Evaluation for Assessing Alternative Wastewater Treatment and Biosolids Management Design Concepts (Natural Environment)

Comparative Criteria	Criteria Description	Source of Information for Assessing Alternative Design Concepts
Terrestrial System	Potential for alternative to impact terrestrial habitats or systems, including terrestrial features/functions (ANSIs, ESAs), unique vegetation species, mature trees, existing park/open spaces, linkages, or wildlife.	Sensitive terrestrial area impacted by alternative design concept as identified in the **Section 6.1** and **Volume 2 Appendix A1** (Natural Heritage Characterization Report).
Aquatic System	Potential of the alternative to impact aquatic habitats or systems, including possible impacts on aquatic life and species at risk features / functions.	Sensitive Aquatic Habitat area impacted by alternative design concept as identified in the **Section 6.1** and **Volume 2 Appendix A1** (Natural Heritage Characterization Report).
Surface Water Quality and Source Water Protection	Potential of the alternative to impact surface water quality and support the Region's Source Water Protection Program.	Impact of the alternative design concept to Lake Ontario Water Quality, including the potential from stormwater runoff from the site, as well as the ability to meet Provincial Water Quality Objectives (PWQOs). Information sources for identifying potential impacts are included in **Section 6.1** and **Volume 2 Appendix B** (Receiving Water Impact Assessment).
Groundwater Water Quality and Quantity	Potential of the alternative to impact the quality and quantity of groundwater.	Potential impacts of alternative design concept on existing groundwater quality and quantity as identified in the **Section 6.1** and **Section 6.3** and in **Volume 2 Appendix F** (Hydrogeological and Geotechnical Background Information).
Air Quality	Potential of the alternative to minimize increases in air emissions.	Potential impacts of alternative design concept on air quality based on information in **Section 6.2**, engineering expertise on air emission controls that will be implemented as part of all design concept alternatives, further information provided in **Volume 2 Appendix C** (Air Quality Impact Assessment).
Greenhouse Gas (GHG) Emissions	The ability of the alternative to support Peel's Climate Change Master Plan's goals with respect to energy efficiency and GHG emission reductions.	A detailed evaluation of GHG emissions was completed considering the following GHG Emission Scopes: • Scope 1 corresponds to direct emissions from owned or controlled sources at the WRRF. • Scope 2 represents indirect emissions resulting from purchased electricity, heating and cooling used at the plant. • Scope 3 corresponds to all other indirect emissions related to materials and goods required at the facility (e.g., chemicals, equipment, etc.) across their supply chain. While Scope 1 and 2 emissions can be readily quantified, Scope 3 emissions are difficult to quantify and there is limited consensus on the standard approach to assessing them. For the purposes of this evaluation, the evaluation of overall GHG emissions is based on quantitative estimates of Scope 1 and 2 emissions in terms of tonnes CO_2 equivalent/year (eq/yr) and a qualitative/relative assessment of Scope 3 emissions. An alternative's impact in terms of Scope 1 and 2 emissions is assigned 75% of the overall score for GHG emissions, while Scope 3 emissions are assigned 25% of the score. Information on climate change impacts provided in **Section 6.4** was used to support the evaluation.

Table 8-4: Detailed Evaluation for Assessing Alternative Wastewater Treatment and Biosolids Management Design Concepts (Social / Cultural Environment)

Comparative Criteria	Criteria Description	Source of Information for Assessing Alternative Design Concepts
Odour	The potential of the alternative to produce odour (post-construction).	Potential impacts of alternative design concept on air quality based on information in **Section 6.2**, engineering expertise on air emission controls that will be implemented as part of all design concept alternatives, and **Volume 2 Appendix C** (Air Quality Impact Assessment).
Noise / Vibrations	The potential of the alternative to produce noise/vibrations (post-construction).	Potential impacts of alternative design concept on noise/vibration levels based on information in **Section 6.2**, engineering expertise on noise/vibration controls that will be implemented as part of all design concept alternatives, and **Volume 2 Appendix D** (Acoustic Assessment Report).
Visual / Aesthetics	The potential of the alternative to impact the scenic attributes of the community and surrounding areas.	Potential to impact scenic attributes is based on inventory of surrounding land uses presented in **Section 6.2**, and planning/engineering expertise on landscape/design measures to be implemented as part of all design concept alternatives.
Truck Traffic / Transportation System	The potential of the alternative to increase truck traffic and demands on the transportation system.	Impacts identified based on changes to existing number of trucks coming to and from the Clarkson WRRF on a daily basis, and surrounding transportation network. Information sources include **Section 6.2**, future biosolids quantities, and engineering expertise on number of trucks required under each alternative design concept.
Disruption During Construction	The potential of the alternative to impact surrounding landowners and users, including disruption to traffic and parking, noise, and odour generation, parks, and greenspace impacts.	Potential disruptions during construction are based on the inventory of surrounding land uses as identified in **Section 6.2**, and engineering expertise on construction methods needed to implement the alternative design concepts, and the associated schedule for construction.
Recreational Use and Users	The potential for the alternative to impact surrounding recreational uses including both land and water uses.	Potential impacts to recreational users based on an inventory of recreational uses and users identified in **Section 6.1** and **Section 6.2**, and **Volume 2 Appendix B** (Receiving Water Impact Assessment).
Agricultural Use and Users	The potential of the alternative to impact the agricultural productivity (i.e., ability to improve quality of soil and yields).	There are no agricultural land uses in the vicinity of either the Clarkson WRRF or the G.E. Booth WRRF, so there will be no impacts to agricultural lands as a result of the expansions of the facilities themselves. However, a major end use for biosolids has been identified as agricultural lands. The impacts on agricultural lands consider the implications of biosolids use on agricultural productivity and is based on the quality of the biosolids product.
Human Health and Well Being	The potential for the alternative to impact human health and well-being.	Potential impacts to human health and safety based on an inventory of recreational uses and users identified in **Section 6.2**, and engineering expertise on operations.
Existing and Future Land Use Compatibility	The extent to which the alternative fits in with the existing land and future planned land uses in the area.	Impacts on existing and future land use compatibility based on information presented in **Section 6.2**.
Archaeology / Cultural Heritage	The potential of alternative to impact any archaeological sites and/or significant cultural heritage sites or buildings.	Potential impacts of alternative design concept on archaeological potential and/or known cultural heritage sites or buildings as identified in the **Section 6.2** and in **Volume 2 Appendix E** (Stage 1 and 2 Archaeological Assessment Reports).

Table 8-5: Detailed Evaluation for Assessing Alternative Wastewater Treatment and Biosolids Management Design Concepts (Technical Considerations)

Comparative Criteria	Criteria Description	Source of Information for Assessing Alternative Design Concepts
Effectiveness	The effectiveness of the alternative to meet performance and product quality criteria within the planning period.	Measured based on existing system and future needs as identified in **Section 4.0** and **Section 5.0**, and information presented in **Volume 2 Appendix B** (Receiving Water Impact Assessment), and engineering expertise on wastewater treatment and biosolids management.
Long-term Sustainability	The ability of the alternative to meet current needs, while not compromising the ability to meet future needs and market demands (i.e., the ability of the alternative to provide sustainable treatment and end use markets through the planning period and reduce risks to the Region.)	Measured based on existing system and future needs as identified in **Section 4.0** and **Section 5.0**, the environmental inventories (**Section 6.0**), information presented in **Volume 2 Appendix B** (Receiving Water Impact Assessment) and **Volume 3 Appendix K** (Biosolids Product Market Assessment), and engineering expertise on wastewater treatment and biosolids management.
Ease of Operation	The alternative's relative complexity as it relates to operation and maintenance of the Region's wastewater treatment system.	Measured based on information in **Section 4.0** and **Section 5.0** on the treatment needs and processes, and engineering expertise on operations.
Ease of Implementation	The alternative's relative ease at which it can be implemented considering constructability, regulatory, and public acceptability factors.	Measured based on information in **Section 4.0** and **Section 5.0** on the treatment needs and processes, environmental inventory information (**Section 6.0**) and engineering expertise on operations.
Resiliency	The ability to adapt to abrupt changes in the environment and emergency situations (i.e., the alternative has system redundancy during regular and emergency situations).	Measured based on information in **Section 4.0** and **Section 5.0** on the treatment needs and processes, environmental inventory information (**Section 6.0**) and engineering expertise on operations.
Compatibility with Existing Infrastructure	The ability for the alternative to be compatible and easily implemented within the existing plant site and its infrastructure.	Measured based on information in **Section 4.0** and **Section 5.0** on the treatment needs and processes, environmental inventory information (**Section 6.0**), and engineering expertise on operations, and engineering expertise on potential impacts of the alternative design concepts.
Geotechnical and Hydrogeology	The extent of potential geotechnical challenges and impact to hydrogeology as related to the infrastructure during and post construction.	Potential impacts of alternative design concept on geotechnical and hydrogeology as identified in **Section 6.3** and in **Volume 2 Appendix F** (Hydrogeological and Geotechnical Background Information).
Contaminated Soils	The potential of the alternative to encounter contaminated soils during construction and/or operation.	Potential impacts of alternative design concept on contaminated soils as identified in **Section 6.3** and in **Volume 2 Appendix G** (Phase 1 Environmental Site Assessment).
Energy Use and Recovery	The ability of the alternative to include energy efficient technologies, reduce overall energy requirements, and potentially result in energy recovery.	Energy use estimates (kWh) and energy production potential (kW3) of each alternative is estimated for comparison purposes.
Climate Change Adaptability	The ability of the alternative to adapt to climate change impacts (i.e., wet weather flow, severe events, higher lake levels).	Potential for alternative design concept to adapt to the climate change impacts as identified in **Section 6.4**, and engineering expertise on potential impacts of the alternative design concepts.
Permits and Approvals	Ease of receiving permits and approvals, including the required agency approvals.	Based on the permits and approvals required as identified in **Section 3.0**, information presented in and planning expertise on the ease and schedule of receiving the approvals and permits.

Table 8-6: Detailed Evaluation for Assessing Alternative Wastewater Treatment and Biosolids Management Design Concepts (Economic Considerations)

Comparative Criteria	Criteria Description	Source of Information for Assessing Alternative Design Concepts
Capital Cost	Capital costs estimates to provide a relative comparison of alternatives.	Capital costs are derived using benchmark costing from other large facility expansion projects. They represent the capital costs required to increase design flows capacity from 350 MLD to 500 MLD for the Clarkson WRRF (planning level estimates for comparison purposes).
Operating and Maintenance (O&M) Costs	Operating Costs	O&M costs are derived from existing O&M costs and benchmark costing from other large facilities using similar processes. Operating costs are based on the projected future average day design flows over the 30-year planning horizon (planning level estimates for comparison purposes).
Life-Cycle Costs	Life-cycle costs (30-year) to provide a relative comparison of alternatives.	Life cycle costs are calculated based on a 30-year life expectancy, with a 3% inflation rate and 3% discount rate (planning level estimates for comparison purposes).

8.2 Basis for Alternative Design Concept Development

The preferred regional 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. The factors applied to develop and assess the alternative design concepts are described below and include diversion requirements, liquid, and solids expansion requirements, proposed effluent quality limits, as well as other design factors such as energy recovery, odour and noise controls, and truck traffic.

8.2.1 East-to-West Diversion and Expansion Timing

Figure 8-1 presents the flow diversion and expansion requirements for the Clarkson 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, increasing capacity at the Clarkson WRRF; this would allow for diversion of an additional 70 MLD by 2031, for total of 150 MLD, before the G.E. Booth WRRF reaches 90% of its approved capacity. In 2041, the G.E. Booth WRRF would reach 90% of its approved capacity, triggering expansion from 518 MLD to 550 MLD.

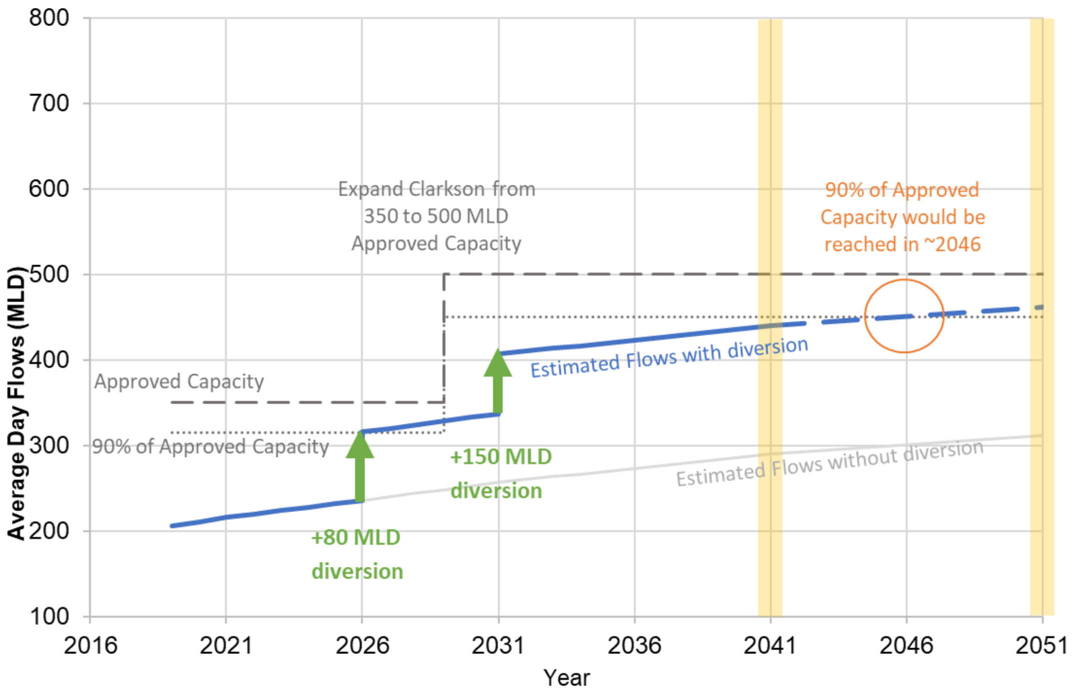


Figure 8-1: Preferred Solution: Diversion and Expansion Approach for the Clarkson WRRF

As indicated above, expansion facilities at the Clarkson WRRF must be in service by 2029 to meet wastewater treatment needs.

8.2.2 Expansion Requirement

A summary of the design parameters for the Clarkson WRRF expansion are presented in **Table 8-7**. This table depicts the design characteristics for 2041, servicing a population of 804,604.

Table 8-7: Summary of Design Parameters for the Clarkson WRRF Expansion

Design Flows Parameter	Design Flows Design Value
Design Flows	
Average Day Flow	500 MLD
Peak Daily Flow	850 MLD
Peak Hourly Flow	1,200 MLD
Peak Instantaneous Flow	1,500 MLD
Wastewater Characteristics	
$cBOD_5$	230 mg/L
TSS	305 mg/L
TKN	30 mg/L
TP	4.6 mg/L
Minimum Month Temperature	10.8 ^{o}C
Alkalinity	233 mg/L

Notes: The facility is expected to receive 350 MLD from the West Trunk Sewer and 150 MLD of flow diverted from the East Trunk Sewer (as part of the East-West Diversion Project). The raw wastewater characteristics in this design basis were defined based on weighted averages of the concentrations from each trunk sewer.

Based on these design parameters, the hydraulic capacity of each unit process in relation to its expanded rated flow capacity of 500 MLD can be seen in **Figure 8-2**. The graph is colour coded based on the capacity limiting condition for each unit process, assuming the following peaking factors:

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

As shown in **Figure 8-2**, there is insufficient screening and grit removal, primary clarifier, aeration tank, and secondary clarifier solids loading rate (SLR) and surface overflow rate (SOR) capacities to meet expansion requirements.

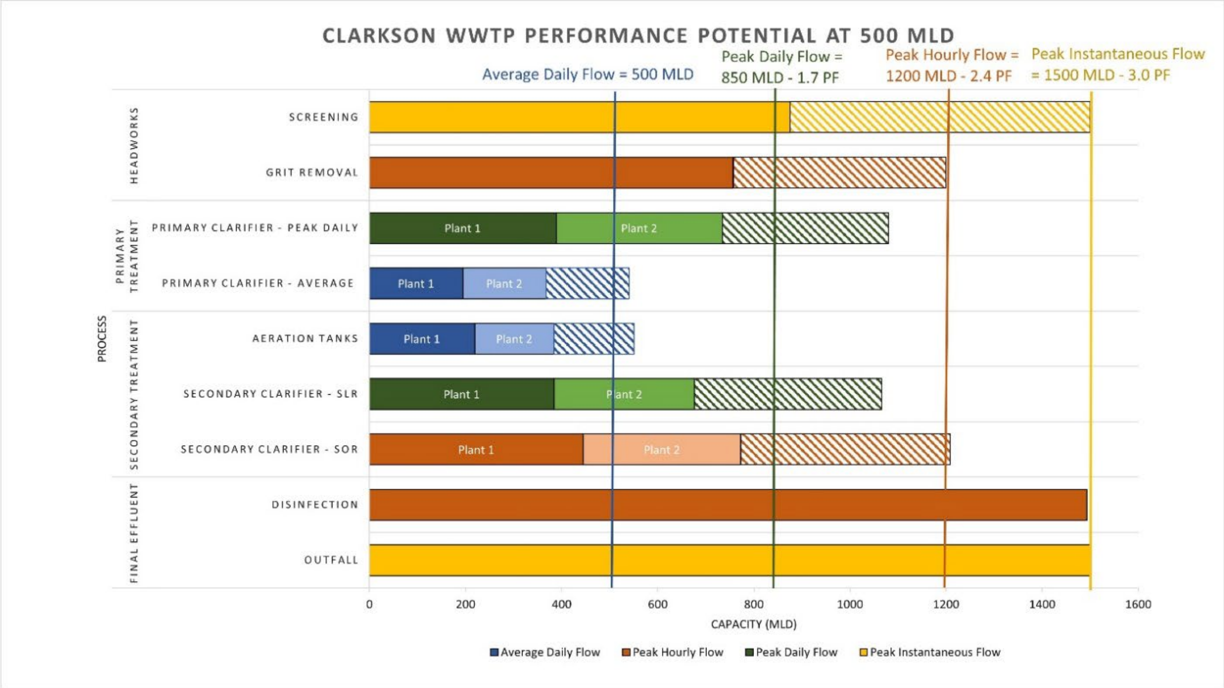


Figure 8-2: Performance Criteria at Clarkson WRRF

As previously stated, the existing Clarkson WRRF consists of two (2) parallel conventional activated sludge (CAS) facilities known as Plant 1 and Plant 2 with a combined rated average daily flow capacity of 350 MLD. The capacity assessment determined that there is a minor capacity shortfall within the existing secondary clarifiers at the proposed design peak hourly flows. Due to the existing secondary clarifier limitations, Plants 1 and 2 will be slightly derated and the new expansion will be designed to make up the capacity shortfall. A summary of the original design basis as well as the proposed flow split is provided below in **Table 8-8**.

Table 8-8: Summary of the Original and Proposed Flow Split

Parameter	Flow	Original Design Basis 1	Proposed Rated Capacity 2, 3
Plant 1	ADF	200 MLD	182 MLD
Plant 1	PDF	N/A	309 MLD
Plant 1	PHF	N/A	437 MLD
Plant 2	ADF	150 MLD	136 MLD
Plant 2	PDF	N/A	231 MLD
Plant 2	PHF	N/A	326 MLD
New Plant 3	ADF	N/A	182 MLD
New Plant 3	PDF	N/A	309 MLD
New Plant 3	PHF	N/A	437 MLD
Total	ADF	350 MLD	500 MLD
Total	PDF	N/A	850 MLD
Total	PHF	N/A	1,200 MLD

Notes: Based on flow split defined in the existing ECA. The peak flows for the original design basis could not be confirmed. Flow split adjusted to accommodate shortfalls in the existing secondary clarifiers to treat projected PHF. Based on new peaking factors of 1.7 for PDF and 2.4 for PHF with equal flow per train to achieve a total of 500 MLD (approximately 45.5 MLD each).

The results of the solids handling capacity analysis are shown in **Table 8-9** and indicate that the Clarkson WRRF has insufficient anerobic digestion capacity to meet future needs.

Table 8-9: Clarkson WRRF Solids Handling Capacity Assessment

Process	Existing Capacity (dt/d)	Future Capacity Needs (dt/d)	Future Needs Assessment
Primary Sludge Thickening (Currently under design)	142	140	Existing capacity is based on the design basis for a new primary sludge thickening facility for a future expanded treatment capacity of 500 MLD. The primary sludge thickening facility is currently being designed. No further expansion is needed.
WAS Thickening	76	73	Expansion of WAS thickening capacity is not expected to be required. WAS blend tanks capacity will need to be expanded to provide desired HRT of 2 hours.
Anaerobic Digestion	116	209	Expansion of anaerobic digestion is required.
Sludge Dewatering	192	131	Expansion of sludge dewatering capacity is not expected to be required.
Cake Handling	138	131	Expansion of cake handling capacity is not expected to be required.

8.2.3 Effluent Quality Limits

To confirm the effluent limits for the expansion, a Receiving Water Impact Assessment (RWIA) was undertaken to meet the MECP's Provincial Water Quality Objectives (PWQOs). The results of the RWIA have been used in the evaluation of alternative treatment technologies and design concepts, and the development of the preferred design concept.

Based on the results of the RWIA and discussions with the MECP, proposed effluent limits and objectives were established. These proposed limits are presented in **Table 8-10**.

Table 8-10: Summary of Proposed Effluent Limits and Objectives for the Clarkson WRRF Expansion

Parameter	Existing ECA	Proposed Future Conditions
Effluent Limits		
$cBOD_5$	25mg/L	25 mg/L
TSS	25 mg/L	25 mg/L
TAN (May 1 – June 15)	13.2 mg/L	13.2 mg/L
TAN (Jun16 – Sept 15)	10.5 mg/L	10.5 mg/L
TAN (Sept 16 – Oct 31)	13.2 mg/L	13.2 mg/L
TAN (Nov 1 – April 30)	24.7 mg/L	24.7 mg/L
TP	1.0 mg/L	0.70 mg/L
E. Coli	200 organisms per 100 mL	200 organisms per 100 mL
TCR	0.01 mg/L	0.01 mg/L
pH	6.0 to 9.5	6.0 to 9.5
Effluent Objectives		
$cBOD_5$	15 mg/L	15 mg/L
TSS	15 mg/L	15 mg/L
TAN (May 1 – Oct 31)	6.6 mg/L (May 1 - Oct 31) 13.2 mg/L (Nov 1 - Apr 30)	6.6 mg/L (May 1 - Oct 31) 13.2 mg/L (Nov 1 - Apr 30)
TAN (Nov 1 0 Apr 30)		
TP	0.80 mg/L	0.60 mg/L
E. Coli	150 organisms per 100 mL	150 organisms per 100 mL
TCR	0.0 mg/L	0.0 mg/L
pH	6.5 to 9.0	6.5 to 9.0

As shown in **Table 8-10**, the proposed future conditions are as follows:

- BOD5 and TSS limits and objectives will remain the same as the existing ECA.
- Total ammonia nitrogen (TAN) limits and objectives remain the same as the existing ECA and are based on achieving a maximum of 0.1 mg/L and 0.2 mg/L unionized ammonia at 75th percentile effluent pH and temperature, respectively. It is important to note that the existing limits in the ECA were derived based on ammonia (NH3) limits and incorrectly stated as Total Ammonia Nitrogen (TAN) limits. The concentrations in **Table 8-10** reflect this correction.
- The phosphorus limit and objectives were reduced and were conservatively selected to maintain existing ECA approved loading limits at 350 kg/d at the expanded plant capacity.

8.2.4 Location of Facilities

Although sizing of facilities will differ with each design concept, the general area for expansion of the liquid and solids facilities are illustrated on **Figure 8-3**. The liquid facilities are located within the existing site boundary with the majority of the secondary treatment facilities located on the east part of the site, adjacent to the existing secondary facilities. The disinfection facilities and outfall are located in the southern central portion of the site. The solids treatment facilities in the northwest corner of the site, adjacent to the existing anaerobic digesters.

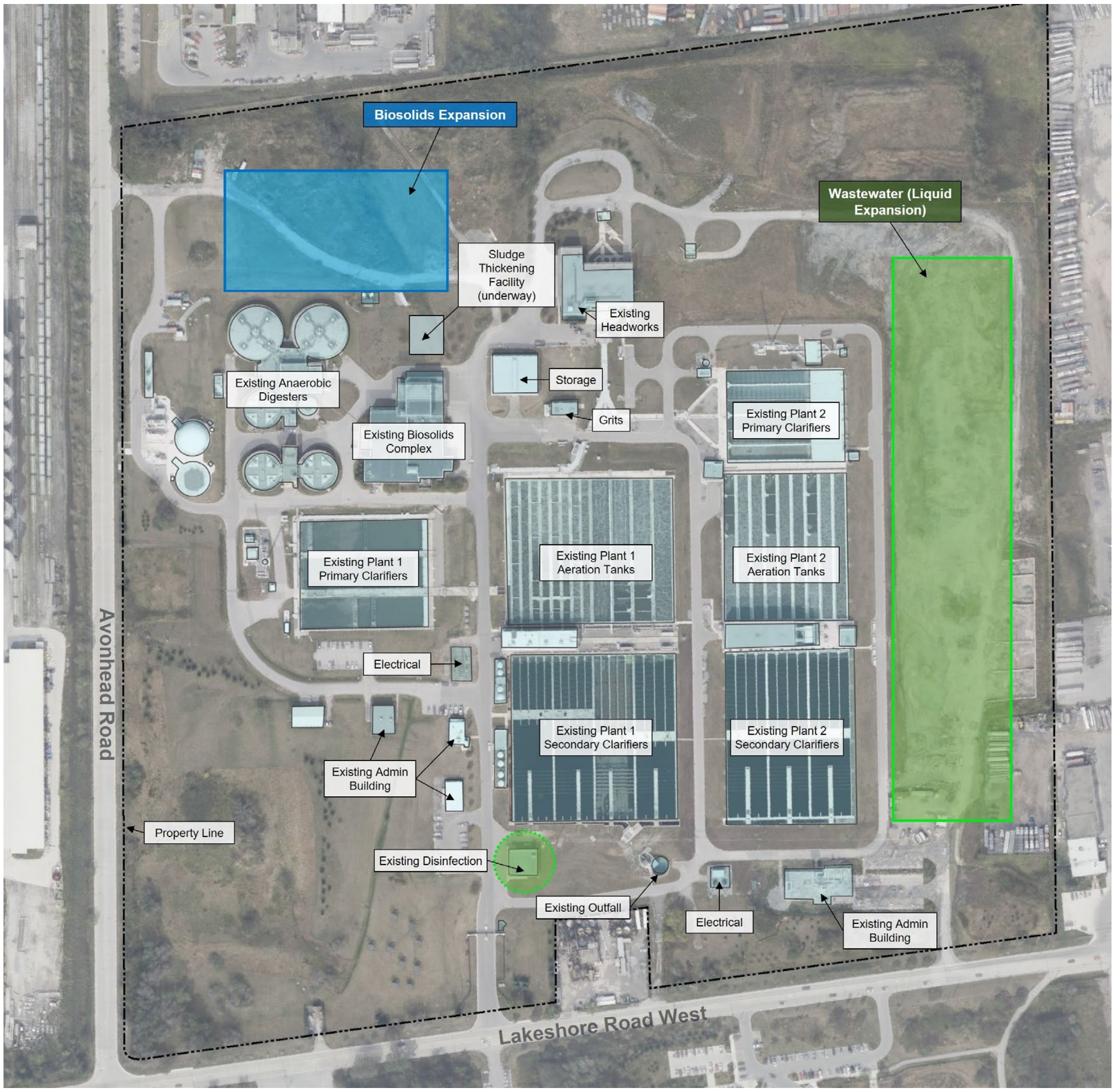


Figure 8-3: General Location for Liquid and Solids Management Facilities

8.2.5 Energy Recovery

The alternatives have been developed to provide opportunities for energy recovery from biogas. The energy recovery is presented as negative Gigajoules/day, (-GJ/d) to support the Region's target Net-Zero Greenhouse Gas (GHG) Emission by 2050. Considering the Region's target Net-Zero GHG Emission by

2050, and their reporting requirements for GHG emissions, an expansion of the WRRF's biogas utilization facility was included for all alternatives. This will allow the Region to maximize the use of the biogas generated at the WRRF which will be presented as a carbon credit for the facility. A biogas utilization sequence was developed for alternative comparison, including the following applications from high to low priority:

- Fuel combined heat and power (CHP) engines to produce electricity and generate heat for process operation. Design is already underway to double the capacity of the existing CHP facility.
- Fuel applications onsite (such as boilers and other biogas users) to reduce fossil fuel (such as natural gas) consumption.
- Upgraded to produce renewable natural gas (RNG).

Greenhouse Gas (GHG) Emission

GHG emissions for each alternative were estimated, in terms of carbon dioxide equivalent (tCO2e) for the Scope 1, 2, and 3 emission classifications indicated in **Table 8-11**.

Table 8-11: Greenhouse Gas Classifications

Classification	Description	Consideration for Project
Scope 1	Direct GHG emissions.	• Natural gas required for liquid and solids treatment processes and/or building services, such as building heating. This type of GHG emissions is reported by the Region. • GHG emissions from wastewater and solids treatment processes (reported by the Region). • GHG emissions from the transport of sludge and biosolids offsite. • Credit for carbon sequestration by biosolids products land application. • Fugitive methane release from the stored biosolids. • Fugitive methane release from anaerobic digestion process. • Fugitive methane release from biogas consumption (reported by the Region).
Scope 2	GHG emissions from the purchased electricity and heat sources.	• Electricity for mechanical equipment (reported by the Region).
Scope 3	Indirect GHG emissions from the production of material that is either purchased for use in the process or avoided as a result of the process materials.	• Chemicals used for liquid and solids treatment and dewatering. • Credit for avoided inorganic fertilizer use by biosolids products land application.

8.2.6 Air, Odour and Noise Controls

All alternatives include odour control and treatment measures, such as regenerative thermal oxidizer (RTO) systems, to ensure that the applicable air quality standards were met. At a minimum, all alternatives considered the existing odour management strategy in each unit process would apply for the expanded facilities.

8.2.7 Biosolids Product Management

8.2.7.1 Third-Party Contractors

There are a number of biosolids management firms in Ontario that provide different levels of biosolids management. These range from transportation of materials on behalf of municipalities to the ownership of processing facilities and the complete management of municipalities' solids stream. Third-party contractors were considered in the development of the biosolids management alternatives.

8.2.7.2 Transportation of Biosolids Products

The cost of transporting biosolids products varies and is dependent on solids concentration, the amount of water in the product being transported, the transportation mode, and the hauling distance. The drier the product, the less water is transported per dry tonne of product. The cost of transportation including fuel, labour, and permitting costs would be the direct responsibility of either the Region or the third-party management firms depending on the product distribution model adapted. Hauling biosolids products may require an ECA or EASR registration. Third-party biosolids management firms indicated that in Central Ontario, due to market demand, biosolids products are typically not transported more than two to three hours from their point of origin. To maintain cost effectiveness, it is anticipated biosolids products generated in the Region would adhere to similar constraints.

8.2.7.3 Land Application Period

As per Section 2.1.2.1 of the NASM, biosolids cannot be land applied from December 1st to March 31st and require a minimum of 240 days of available storage. Although biosolids products that meet the requirements for CFIA regulated fertilizers do not need to meet the same storage requirements, they are also affected by Southern Ontario's limited growing season. A typical growing season for farmers in Southern Ontario lasts from about May to November, which means that biosolids products can be applied to agricultural land, at best, five to six months of the year.

8.3 Wastewater Treatment Design Concepts

8.3.1 Long List of Wastewater Treatment Technologies

A summary of the screening of the long list of wastewater treatment technologies is provided in this section. Details on the long list and the results of the screening process are presented in **Volume 3 Appendix I**.

Table 8-12 lists the unit processes typically applied for wastewater treatment and their general function, as well as the existing treatment processes at the Clarkson WRRF and the long list of alternative treatment technologies considered for the Clarkson WRRF expansion. Since preliminary and primary treatment processes will 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 8-12: Major Unit Processes in Water Resource Recovery Facility

Unit Process and Function	Clarkson 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 Clarkson 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 has insufficient hydraulic capacity.	Construct a new headworks building using the same screen and grit removal systems as current.
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 adds chemicals to remove phosphorus.	Construct new primary treatment facilities using the same primary treatment technologies as current.

Unit Process and Function	Clarkson WRRF – Existing Process Technologies	Long List of Alternative Treatment Technologies
Secondary Treatment: Involves processes to encourage biological activity to remove soluble BOD5, 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).	1. Conventional Activated Sludge (CAS) 2. CAS with Chemically Enhanced Primary Treatment (CEPT) 3. CAS with Wet Weather Flow (WWF) Treatment 4. Biological Nutrient Removal (BNR) 5. Ballasted Activated Sludge 6. Membrane Bioreactors (MBR) 7. Membrane Aerated Biofilm Reactors (MABR) 8. Integrated Fixed Film Activated Sludge (IFAS)/Moving Bed Reactor (MBBR) 9. Sequencing Batch Reactors (SBR) 10. Aerobic Granular Sludge (AGS) 11. 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 Clarkson WRRF.	As effluent limits for the Clarkson 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.	1. Chlorination/Dechlorination 2. Ultraviolet (UV) 3. Ozone (O3) 4. Peracetic Acid (PAA)

8.3.2 Screening of Long List of Wastewater Treatment Technologies

8.3.2.1 Secondary Treatment Technologies

The results of the secondary treatment technology screening are presented in **Table 8-13** and in **Volume 3 Appendix I**. Based on the results of the technology screening, three technologies were identified for further evaluation and the development of the design concept alternatives. In each alternative, the existing two secondary treatment trains would continue to operate as conventional activated sludge with the new train designed around the short-listed alternatives listed in **Table 8-13**.

The short-listed secondary treatment technology alternatives are:

- **Conventional Activated Sludge (CAS) Process:** This is the existing process used at the Clarkson 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.

- **Biological Nutrient Removal (BNR) Process:** Biological nutrient removal (BNR) processes are modifications of the existing activated sludge process that incorporate anoxic and/or anaerobic zones to provide enhanced nitrogen and/or phosphorus removal. Many BNR variants have been developed, representing a wide range of nutrient removal capabilities. The BNR process has the ability to reduce chemical usage, energy use, and sludge production (i.e., smaller biosolids management facilities).

8.3.2.2 Disinfection Technologies

The results of the disinfection technology screening are presented in **Table 8-14** and in **Volume 3 Appendix I**. Based on the results of the technology screening, two technologies were identified for further evaluation and development as disinfection design concept alternatives – chlorination / dechlorination and UV disinfection.

Table 8-13: Clarkson WRRF Secondary Treatment Technology Screening

No.	Technology Alternative	Maturity of Technology	Proven Application at Large WRRFs	Compatibility with Existing and Future Processes	Compatibility with Regional Energy Management and GHG Reduction Goals	Ability to Implement within Required Schedule	Consider for Evaluation
1	Conventional Activated Sludge	Mature technology, the most common wastewater treatment process.	Yes, many large installations internationally.	Yes, current process utilized at Clarkson WRRF.	Higher energy requirements with opportunity for energy enhancement.	Yes, widely used and current technology at Clarkson WRRF. Simplified MECP approvals process.	**Carried Forward**
2	Conventional Activated Sludge with CEPT	Mature technology, coagulation and flocculation in CEPT is a common wastewater treatment process.	Yes, several large installations internationally. Currently used for wet weather flows at G.E. Booth WRRF.	Yes, variation of CAS process which is currently utilized at Clarkson WRRF.	Yes. Reduces loading to secondary treatment and aeration energy consumption.	Yes, proven technology at large facilities. Simplified MECP approvals process.	**Carried Forward**
3	Conventional Activated Sludge with WWF Treatment	Mature technology that has many proven installations.	Application of parallel WWF technology in large facilities is limited.	No. WWF and space constraints are not a significant concern.	Similar to CAS.	Uncertain, may require a longer MECP approvals process.	**Screened out**
4	Ballasted Activated Sludge	Limited number of installations.	No applications at large facilities.	Yes, variation of CAS process which is currently utilized at Clarkson WRRF.	Higher energy requirements with limited opportunity for energy enhancement.	No, may require pilot testing.	**Screened out**
5	Biological Nutrient Removal	Mature technology with well-established variations of the process.	Yes, several large installations in Western Canada.	Yes, variation of CAS process which is currently utilized at Clarkson WRRF.	Yes, reduces chemical usage.	Yes, mature technology at large facilities. Simplified MECP approvals process.	**Carried Forward**
6	Membrane Bioreactor	Mature technology, has become more widely used across North America.	Application at large facilities is limited.	Yes, MBR would be installed in place of secondary treatment.	High energy requirements due to oxygen demand, air scouring, recycle streams and permeate pumps.	Yes, mature technology. Simplified MECP approvals process.	**Screened out**
7	Membrane Aerated Biofilm Reactor	Maturing Technology. Several pilot studies completed in Ontario.	No. However, the MECP is actively testing this technology with several pilot studies having been completed in Ontario.	Yes, MABR would be installed within the anoxic zone of aeration tanks.	Significantly reduces energy consumption for aeration.	No, will likely require pilot testing.	**Screened out**
8	Integrated Fixed-Film Activated Sludge / Moving Bed Bioreactor	Maturing technology. Limited number of installations in North America.	No. However, full-scale pilot testing has previously been completed at G.E. Booth WRRF.	No. High flows would lead to high headloss and hydraulic constraints from media bunching.	High energy requirements from increased oxygen demand.	No, will likely require pilot testing.	**Screened out**
9	Sequencing Batch Reactor	Mature and well-developed technology. Many installations at small facilities.	Application at large facilities is limited.	No. Operation is complex at high, continuous flows. High headloss would require intermediate pumping.	High energy requirements from intermediate pumping.	Uncertain, mature technology but limited large installations. May involve longer MECP approvals process.	**Screened out**
10	Aerobic Granular Sludge	Limited number of full-scale municipal wastewater installations.	Application at large facilities is limited.	No. High headloss would require intermediate pumping.	Limited information on energy requirements.	No, will likely require pilot testing.	**Screened out**
11	Biological Aerated Filter	Mature technology, many installations internationally. Newer in North America.	Yes, several large installations internationally.	No. BAF requires fine screening and high headloss would require intermediate pumping.	High energy requirements from intermediate pumping.	Yes, proven technology at large installations. Simplified MECP approvals process.	**Screened out**

Table 8-14: Clarkson WRRF Disinfection Technology Screening

No.	Technology Alternative	Maturity of Technology	Proven Application at Large WRRFs	Compatibility with Existing and Future Processes	Compatibility with Regional Energy Management and GHG Reduction Goals	Ability to Implement within Required Schedule	Consider for Evaluation
1	Chlorination / dechlorination	Mature technology. Widely used in North America and internationally.	Yes, many large installations internationally.	Yes, currently integrated into the existing outfall.	Requires purchase and storage of two separate chemicals. Low energy consumption.	Yes, mature technology currently in use at Clarkson WRRF.	**Carried Forward**
2	UV Disinfection	Mature technology. Widely used in wastewater and water treatment.	Yes, several large installations in Canada.	Greater headloss due to flow control structures. Might require effluent pumping.	High power requirements from UV lamps. Effluent pumping would also increase energy requirements. However, chemical usage for disinfection would be eliminated.	Yes, mature technology with large scale installations. Simplified MECP approvals process.	**Carried Forward**
3	Ozonation	Maturing technology for wastewater treatment. Limited operating installations.	Limited operating large installations. Several facilities have been discontinued.	Requires many new facilities to house liquid oxygen, ozone generation/off gas destruction equipment, and contact tanks.	High energy requirements from ozone generation, off gas destruction, and diffusion of gas into secondary effluent.	Uncertain, no current operational large installations. May involve long MECP approvals process.	**Screened out**
4	Peracetic Acid	Newer technology not yet widely used at wastewater facilities.	Applications at large facilities is limited.	Limited bulk chemical availability. Triple the chemical cost of chlorination / dechlorination.	Requires purchase and storage of one chemical. Low energy consumption.	Uncertain, limited large installations. May involve long MECP approvals process.	**Screened out**

8.3.3 Assessment of Disinfection Alternatives

The development of the wastewater treatment design concepts is driven by the short list of secondary treatment alternatives. Consequently, the detailed evaluation of the short-listed disinfection technologies was undertaken as a next step to identify the preferred disinfection technology to be considered in each alternative design concept.

8.3.3.1 Description of Alternatives

The short-listed disinfection technologies are described below:

- **Chlorination/Dechlorination:** This technology involves expanding the disinfection facilities at Clarkson WRRF using chlorination and dechlorination. This disinfection approach is already integrated into the existing outfall which will continue to service the 500 MLD Clarkson WRRF.
- **Ultraviolet (UV):** This technology involves expanding the disinfection facilities at Clarkson WRRF using UV disinfection to include a new facility to house UV channels and power equipment. The secondary effluent would be diverted to the new UV facility before discharging to the outfall.

8.3.3.2 Assessment of Alternatives

Chlorination / dechlorination and UV disinfection were assessed using the detailed criteria and approach outlined in **Section 8.1**. **Table 8-15** and **Table 8-16** presents a summary of the evaluation of disinfection alternatives, while the detailed evaluation scoring matrix is provided in **Volume 3 Appendix J1**.

8.3.3.3 Preferred Disinfection Alternative

As outlined in the evaluation scoring matrix in **Volume 3 Appendix J**1, the chlorination / dechlorination technology produced the highest total score. Therefore, the preferred solution to expand the disinfection process at Clarkson WRRF is to continue operating with chlorination/dechlorination. Since chlorination/dechlorination is already integrated into the existing outfall, little modification to the facility is expected other than increasing the dose proportionally to the flow.

Table 8-15: 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 will have limited impacts on natural environment features as it is integrated into the existing outfall, and no major construction is required. UV disinfection requires the construction of a new facility. While this facility would be located in a disturbed area of the site, with limited natural features, additional mitigation measures will 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 Clarkson WRRF currently meet MECP requirements. Chlorination / dechlorination will not impact air emissions at the Clarkson WRRF. UV disinfection will require increased standby power requirements, but air emissions from the generators can be controlled to meet air quality standards. UV has higher overall Scope 1 & 2 GHG emissions than chlorination / dechlorination which account for 75% of the weighting in this evaluation.	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 are able to 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, therefore there would be no new 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 would be minimal additional construction required for the re-use of the existing chlorination / dechlorination system, while 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. The power draw of the UV system at peak flows is approximately 900 kilowatts, which would have a significant impact on the electrical system at maximum flows. 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 Clarkson 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.	From a technical perspective, chlorination/dechlorinated ranked highest (i.e., preferred) due to its compatibility with the existing system and less energy usage.

Table 8-16: Evaluation of Disinfection Alternatives – Economic Considerations

Criteria Category	Alternative 1: Chlorination / Dechlorination	Alternative 2: UV	Evaluation Outcome
Capital Cost	Negligible	$79 M	Although operating costs are lower for UV, the significant capital expenditures required for UV means much higher life cycle costs. From a cost perspective, chlorination/dechlorination is preferred.
Annual O&M Cost	$3.1 M	$2.5 M	
30-Year NPV Life Cycle Cost	$67 M	$118 M	

8.3.4 Development of Alternative Wastewater Design Concepts

8.3.4.1 Design Elements Common to All Alternative Design Concepts

- **Preliminary Treatment:** In the previous 2008 expansion, the headworks facility was undersized due to cost constraints with the intention that flows exceeding the capacity of the screening process would bypass and combine with the primary influent. Sizing of screens for peak instantaneous flows is recommended as part of this expansion to meet MECP guidelines. Therefore, screening would be designed to treat design peak instantaneous flows providing a firm capacity of 1,500 MLD. Additional grit removal units would also need to be constructed to treat peak hourly flows thereby providing an overall capacity of 1,200 MLD for peak hourly flow and a hydraulic capacity of 1,500 MLD.
- **Primary Treatment:** The existing primary treatment processes are leveraged to significantly reduce the organic load to secondary treatment and thus reduce the sizing and energy requirements of the facility. In addition, sludge settled in primary clarifiers has a high energy potential that will produce more gas in the anaerobic digestion process. This gas can be used for multiple purposes including combined heat and power (CHP), renewable natural gas (RNG), or process heating demands. The sizing of the primary clarifiers is based on the surface overflow rate at average daily and peak daily flow. Three (3) new primary clarifiers would be required to meet future needs. However, to provide firm capacity, an extra tank would be constructed for a total of four (4) tanks.
- **Disinfection:** Continue with the existing process of chlorination/dechlorination within the existing outfall but increase dosages to account for higher flows.

8.3.4.2 Wastewater Design Concepts

Three wastewater design concepts were developed based on the short list of secondary treatment technologies with preliminary treatment, primary treatment, and disinfection common to all three 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 Clarkson WRRF with new CAS process trains which are consistent with the existing facility and will follow the same operating philosophy. The process flow diagram for this alternative is shown in **Figure 8-4**.

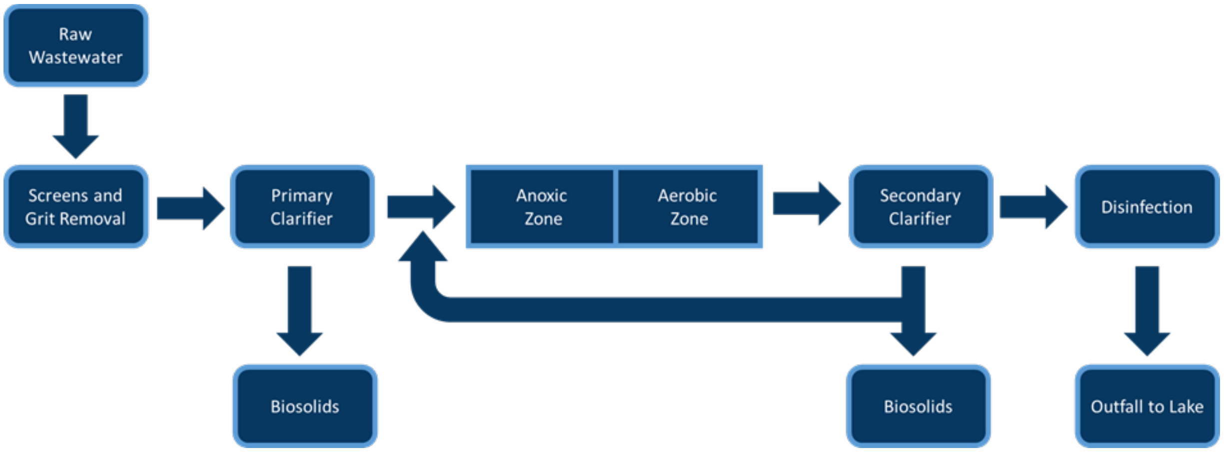


Figure 8-4: Process Flow Diagram Using the CAS Process

Design Concept 2:

CAS Process Optimized with Chemically Enhanced Primary Treatment (CEPT): This alternative involves expanding the Clarkson WRRF with new CAS process trains optimized with CEPT. The addition of metal salts and polymer upstream of the primary clarifiers will aid with solids settling, reducing the organic and solids load to the secondary treatment process. This will reduce the size of the aeration tanks and will reduce the energy consumption required for aeration. Furthermore, the high energy solids from primary treatment will allow for more biogas production through anaerobic digestion. The process flow diagram for this alternative is shown in **Figure 8-5**.

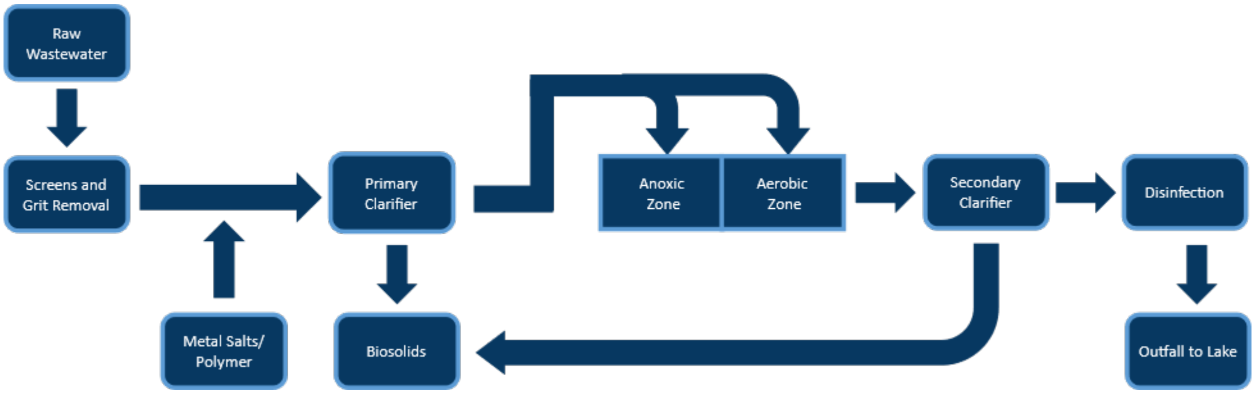


Figure 8-5: Process Flow Diagram of Expansion Using the CAS with CEPT Process

Design Concept 3:

Expansion of Existing Facility Using the Biological Nutrient Removal (BNR) Process: This alternative involves expanding the Clarkson WRRF with a BNR process to provide biological nitrogen and phosphorus removal. This will reduce chemical usage for TP removal, energy use in secondary treatment, and sludge production for biosolids management and disposal. In this design concept, the new Plant 3 would be designed using a BNR process for enhanced biological phosphorus removal. There are several variations of this process. Conceptually, a variant Sidestream Enhanced Biological Phosphorus Removal (S2EBPR) configuration was considered by leveraging filtrate from the primary sludge thickening facility for volatile fatty acids (VFA) to further enhance the process. This process includes an anaerobic zone, followed by an anoxic zone, then an aerobic reactor and secondary clarifiers. Primary sludge thickening filtrate and a fraction of RAS (up to 20% of the RAS flow) are added into the anaerobic zone to enhance treatment performance. The remaining RAS and primary effluent are added into the anoxic and aerobic zones. The process flow diagram for this alternative is shown in **Figure 8-6**.

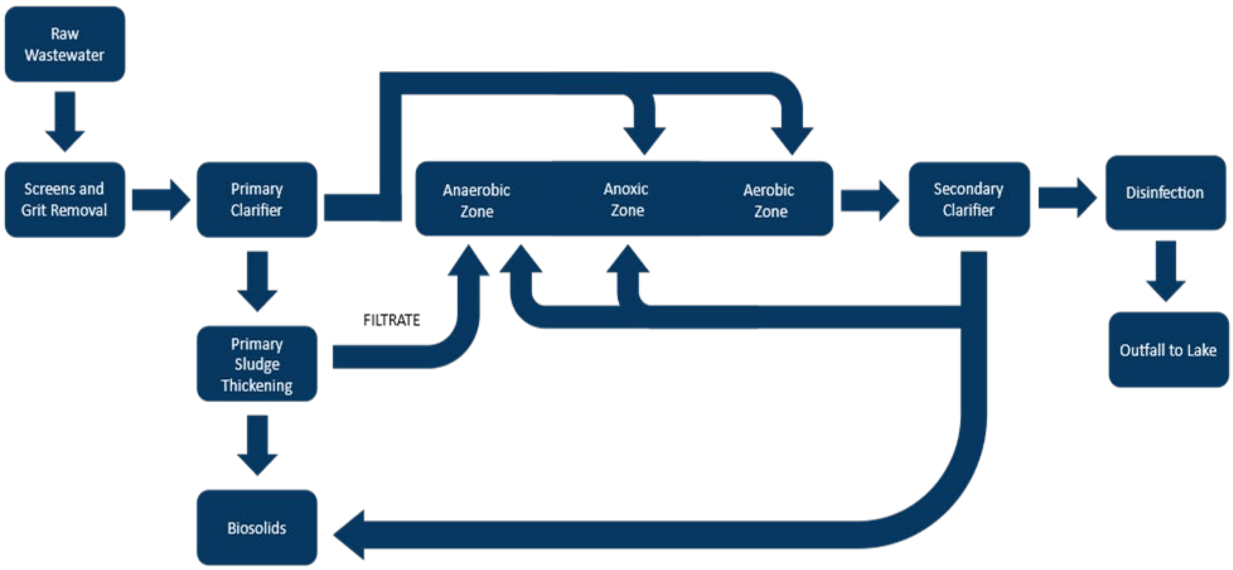


Figure 8-6: Process Flow Diagram of Expansion Using the BNR Process

In all cases, the concepts include the following:

- New grit vortex units,
- A new headworks facility,
- Four new primary tanks,
- Four new aeration tanks (with size varying depending on the design concept),
- Four new secondary tanks, and
- Chlorination / dechlorination that is integrated into the existing outfall, with little modification to the facility expected other than increasing the dose proportionally to the flow.

8.3.5 Evaluation of Wastewater Design Concepts

The three wastewater design concepts were evaluated using the criteria and approach outlined in **Section 8.1**. The evaluation matrix in **Volume 3 Appendix J** provides details on the impacts of the alternative design concepts on the natural, social/cultural, technical, and cost environments, while **Table 8-17** and **Table 8-18** provides a summary of the impacts.

8.3.6 Preferred Wastewater Design Concept

There are minimal differences in the scoring among all three design concepts. All alternatives would be effective at treating wastewater to meet effluent quality objectives and wet weather management needs while also protecting human health and the environment, with no significant difference in impacts to natural, social/cultural, and technical environments. Lifecycle costs are also similar among the alternatives.

To select the preferred design concept, a second level of assessment was undertaken that considered the key priorities of the Region as shown in **Table 8-19.** As illustrated the alternative that best aligned with the Region's objectives is Design Concept 3: Expansion of Existing Facility Using the BNR Process.

Table 8-17: Evaluation of Wastewater Design Concepts – Natural Environmental , Social/Cultural Environment, and Technical Considerations

Criteria Category	Design Concept 1: CAS; Design Concept 2: CAS with CEPT; Design Concept 3: BNR	Evaluation Outcome
Natural Environment	The alternative design concepts will be located to avoid the Cultural Meadow flora and fauna species at the boundary of the site. Although the footprint of the alternative design concepts varies slightly, there is no significant difference in the impacts to natural features on site. All alternatives would be designed to include emission control and treatment to ensure air quality standards are met and impacts will be mitigated. All alternatives have similar direct GHG emissions (Scope 1). The CAS process produces the most Scope 2 GHG emissions due to its increased aeration requirements. The CEPT process produces the most Scope 3 emissions due to increased chemical use and the shipment of these chemicals to the site on a regular basis. The BNR alternative overall produces the lowest GHG emissions with reduced aeration energy (Scope 2) and chemical use (Scope 3).	No significant difference in the ranking of alternatives. However, BNR (Alternative 3) has the advantage of producing less GHG emissions.
Social / Cultural Environment	Overall, concerns related to odour, noise, and visual aesthetics will 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. There would be increased truck traffic to deliver chemicals for the CAS and CEPT design concepts compared to BNR. In addition, the BNR produces less biosolids meaning less trucks for haulage off-site. All alternatives would result in similar disruption during construction. However, noise, dust, and traffic issues can be mitigated. In addition, transportation routes avoid residential and recreational land use areas. No archaeological resources are expected to be impacted with any of the alternatives, based on Stage 1 and 2 archaeological assessments.	No significant difference in the ranking of alternatives. However, BNR (Alternative 3) has the advantage of less truck traffic.
Technical Considerations	Each alternative design concept would be designed to effectively treat wastewater to meet effluent objectives and wet weather management needs. All three concepts would be designed with a spare train to provide firm capacity throughout the facility (i.e., adequate treatment capacity is provided to meet demands when a treatment process is out of service for maintenance). Although not currently an effluent requirement, BNR is more effective at removing total nitrogen (TN). The CAS with CEPT design concept has the lowest energy requirements overall, due to lower aeration and mixing requirements. The BNR process has comparable total energy requirements but has lower aeration requirements, and higher mixing requirements in the anaerobic and anoxic zones. The CAS process has the greatest energy requirements due to the greater aeration demands using this alternative. CAS is the process currently in use at the Clarkson WRRF resulting in almost identical operation and maintenance requirements. The BNR process involves a different operating philosophy but does not require significantly more operator intervention. The CEPT process is the most complex to operate. CAS and the CAS with CEPT design concepts (Alternatives 1 and 2) would be more resilient to changes in flow and temperature resulting from climate change. BNR (Alternative 3) would be slightly less resilient to variations in wastewater flow/load. However, BNR offers more flexibility in treatment as it allows operation as either a BNR facility or a CAS facility with no additional capital cost. The proposed BNR variation (S2EBPR) is relatively new and there is limited operating experience with this process internationally. This process will be piloted at the Ashbridges Bay Treatment Plant in the City of Toronto. Approvals should be similar to a CAS due to the inherent flexibility to operate as a CAS process.	No significant difference in the ranking of alternatives. However, CAS and CAS with CEPT design concepts (Alternatives 1 and 2 respectively) have the advantage of more operational experience.

Table 8-18: Evaluation of Wastewater Design Concepts (Economic Considerations)

Criteria Category	Design Concept 1: CAS	Design Concept 2: CAS with CEPT	Design Concept 3: BNR	Evaluation Outcome
Capital Cost	$341 M	$307 M	$359 M	All alternatives have comparable lifecycle costs. Alternative 2 (CAS with CEPT) has the lowest capital costs, but highest operating costs. Alternative 3 BNR) has the highest capital, but lowest operating costs
Annual O&M Cost	$8.1 M	$9.0 M	$7.5 M	
30-year NPV Life Cycle Cost	$532 M	$518 M	$536 M	

Table 8-19: Alternative Wastewater Design Concept's Ability to Meet the Key Study Objectives

Region's Key Objectives	Design Concept 1 Expansion Using CAS	Design Concept 2 Expansion using CAS with CEPT	Design Concept 3 Expansion using BNR	Evaluation Outcome
Long-term Sustainability			Aligns best with objective	BNR offers the flexibility to operate with reduced chemicals and can also be considered to operate as a CAS facility. BNR has potential for greater nitrogen removal through integrated nitrification and denitrification.
Resiliency	Aligns best with objective	Aligns best with objective		All alternatives have built in redundancy in treatment processes. However, CAS and CEPT would be more resilient to changes in flow and temperature resulting from climate change. BNR would be slightly less resilient to variations in wastewater flow/load
Environmental Protection	Aligns best with objective	Aligns best with objective	Aligns best with objective	All alternatives will protect the environment.
Community Acceptability			Aligns best with objective	BNR will result in less truck traffic due to reduced chemical use and deliveries and reduced biosolids production for off-site disposal.
Ease of Operations	Aligns best with objective			CEPT is most complex as it involves management of polymer and two types of iron salt. BNR, will not as much operating experience, is a well-established variation of the existing CAS process. It has flexibility to be confident for CAS operation similar to the existing.
Energy Efficiency Reduce GHG			Aligns best with objective	BNR uses less energy and less chemicals hauled to the site; and has the lowest GHG emissions.
Fiscally Responsible	Aligns best with objective	Aligns best with objective	Aligns best with objective	While all alternatives have similar lifecycle costs, BNR has lower operating costs.
Preferred Alternative	Expansion Using CAS (Concept 1) has not been selected.	Expansion Using CAS with CEPT (Concept 2) has not been selected.	BNR (Concept 3) has been selected as the preferred as it best aligns with Region's objectives.	Alternative Concept 3 aligns best with all objectives and is selected as the preferred alternative.

8.4 Biosolids Management

As indicated in **Section 1.0**, a major objective of this Class EA is to develop a more diverse and reliable biosolids management program. In discussion with a number of agencies and biosolids management firms that support them, the value of diverse, multiple technology programs with multiple end use options, was a common theme. Having diverse management programs and product markets, reduces risk and provides flexibility to meet market demands and any future regulation changes.

The development and assessment of alternatives presented in this section has been undertaken with this basic principle in mind. The evaluation includes consideration of biosolids markets, solids treatment technologies, and design concepts for the stabilization and management of the solids generated at the Clarkson WRRF.

8.4.1 Biosolids Market Assessment

As indicated in **Section 7.3.2.2**, a Biosolids Product Market Assessment Report was prepared and included in **Volume 3 Appendix K**. The following biosolids product management options were considered: beneficial land use, residual ash use, landfilling, and co-management with municipal solid waste. The treatment technologies, end products, and end users associated with these management options are shown in **Table 8-20**. The Biosolids Product Market Assessment indicates that there are markets for all the management options evaluated with the greatest potential for the Region of Peel being the agricultural market.

Table 8-20: Management Options and End Users for Biosolids Products

Management Options	Biosolid Treatment and Products	Market End Users
Beneficial Land Use	• Digested biosolids (liquid) • Digested biosolids (dewatered cake) • Manufactured soil material • Advanced digested biosolids; liquid or cake • Thermal-dried biosolids • Alkaline stabilized biosolids • Thermal-alkaline hydrolysis biosolids • Composted biosolids products	• Agricultural land application • Silviculture (tree farming) • Horticultural market • Golf courses, parks, and recreation • Landscaping • Land rehabilitation
Residual Ash Management	• Incinerator residual ash disposal • Incinerator residual ash use	• Municipal waste landfill • Incorporation into cement • Other ash reuse options
Landfilling	• Unstabilized dewatered cake • Stabilized dewatered cake • Compost products • Thermally dried product	• Municipal landfill and landfill cover • Monofill (dedicated landfill)
Co-management with Municipal Solid Waste	• Compost products • Biosolids cake (dewatered)	• Management with source separated organics

The treatment technology dictates the characteristics of the biosolids and how the biosolids products can be used. For example, the biosolids currently produced at the Clarkson WRRF meets NASM Category 3 CM2 and Category A and Category B feedstock metals limits for use on agricultural lands. With anaerobic digestion, the Clarkson WRRF biosolids meet CP2 limits for Faecal coliform and could meet the higher quality of CFIA limits with further processing allowing for more broader land uses including agricultural, landscaping, horticultural, golf courses, parks, and home use. Biosolids products can fertilize soils, increase soil organic matter, and in some cases amend soil pH. Biosolids products used in the agricultural market include land application of biosolids as a Category 3 NASM or as a biosolids product meeting CFIA fertilizer requirements.

The treatment/products and end users identified in formed the basis for the identification and screening of the long list of technologies described in the following section.

8.4.2 Long List of Solids Treatment Technologies

The long list of solids treatment technologies is presented in **Table 8-21**, with further details on each provided in **Volume 3 Appendix L**. 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) pretreatment, aerobic digestion, thermal drying, chemical stabilization, composting, and thermal conversion (incineration). There are a number of technologies for each of these categories.

8.4.3 Screening of Long List of Solids Treatment Technologies

The screening criteria identified in **Table 8-2** were applied to the long list of treatment technologies. The screening of these technologies is illustrated in **Table 8-22** to **Table 8-28**, with further details presented in **Volume 3 Appendix L**. Based on the technology screening, five (5) technologies were selected for further evaluation as design concept alternatives.

These five technologies are as follows:

1. Conventional Mesophilic Anaerobic Digestion.
2. Thermal Hydrolysis Process (THP) followed by Mesophilic Anaerobic Digestion.
3. Direct Thermal Drying.
4. Advanced Alkaline Stabilization with Supplemental Heat or Acid.
5. Advanced Alkaline Stabilization with Supplemental Heat and High-Speed Mixing.

Table 8-21: 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 . Open Technologies (Aerated Static Pile and Windrow Composing) 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

Table 8-22: Screening of Long List of Solids Treatment Technologies (1. Anaerobic Digestion)

No.	Technology	Maturity	Compatibility with Existing and Future Processes and Biosolids End Use Markets	Proven Applications	Compatibility with Regional Energy Management and GHG Reduction Goals	Ability to Implement with Required Schedule	Consider Future Evolution
1a	**Conventional Mesophilic Anaerobic Digestion**	Mature Technology	Yes - Current process used at the Clarkson WRRF	Proven applicable at WRRFs similar in size to the Clarkson WRRF.	Yes - Would reduce reliance on incineration and allow beneficial use on land. Additional biogas generated could reduce the need for purchased electrical energy and natural gas.	Yes	**Carried Forward**
1b	**Temperature-Phased Anaerobic Digestion (TPAD)**	Uncommon when compared to mesophilic anaerobic digestion and THP.	Yes, but more complex operation than conventional anaerobic digestion.	Proven applicable at WRRFs similar in size to the Clarkson WRRF.	Yes - Would reduce reliance on incineration and allow beneficial use on land. Additional biogas generated could reduce the need for purchased electrical energy and natural gas.	Yes	**Screened out**
1c	**Acid/Gas Phased Anaerobic Digestion**	Limited number of installations.	Yes, but more complex operation than conventional anaerobic digestion.	Proven applicable at WRRFs similar in size to the Clarkson WRRF.	Yes - Would reduce reliance on incineration and allow beneficial use on land. Additional biogas generated could reduce the need for purchased electrical energy and natural gas.	Yes	**Screened out**

Table 8-23: Screening of Long List of Solids Treatment Technologies (2. Anaerobic Digestion with Hydrolysis Pre-treatment)

No.	Technology	Maturity	Compatibility with Existing and Future Processes and Biosolids End Use Markets	Proven Applications	Compatibility with Regional Energy Management and GHG Reduction Goals	Ability to Implement with Required Schedule	Consider Future Evolution
2a	**Thermal Hydrolysis Pre-treatment (THP)**	Maturing technology becoming popular	THP for use at the Clarkson WRRF prior to the anaerobic digestion system is viable	Yes	Yes - Would reduce reliance on incineration and allow beneficial use on land. Additional biogas generated could reduce the need for purchased electrical energy and natural gas.	Yes	**Carried Forward**
2b	**Thermo / alkaline Hydrolysis Pre-treatment**	Limited number of installations.	Yes	Limited: Does not currently have the full-scale operating experience of the process.	Yes - Would reduce reliance on incineration and allow beneficial use on land. Additional biogas generated could reduce the need for purchased electrical energy and natural gas.	Yes	**Screened out**

Table 8-24: Screening of Long List of Solids Treatment Technologies (3. Aerobic Digestion)

No.	Technology	Maturity	Compatibility with Existing and Future Processes and Biosolids End Use Markets	Proven Applications	Compatibility with Regional Energy Management and GHG Reduction Goals	Ability to Implement with Required Schedule	Consider Future Evolution
3a	**Conventional Aerobic Digestion**	Mature Technology	Not compatible with primary solids. Would require a separate stabilization process for primary solids.	No	No - Will consume additional energy and will not generate biogas.	Yes	**Screened out**
3b	**Autothermal Thermophilic Aerobic Digestion (ATAD)**	Maturing Technology (Second Generation)	Not compatible with primary solids. Would require a separate stabilization process for primary solids.	No	No - Will consume additional energy and will not generate biogas.	Yes	**Screened out**

Table 8-25: Screening of Long List of Solids Treatment Technologies (4. Thermal Drying)

No.	Technology	Maturity	Compatibility with Existing and Future Processes and Biosolids End Use Markets	Proven Applications	Compatibility with Regional Energy Management and GHG Reduction Goals	Ability to Implement with Required Schedule	Consider Future Evolution
4a	**Direct Thermal Dryer (Drum Dryer, Belt Dryer, Fluidized Bed Dryer)**	Mature Technology	Yes	Yes	Yes - Would reduce reliance on incineration and allow beneficial use on land. The process will require additional energy to remove water from the dewatered biosolids cake.	Yes	Carried Forward
4b	**Indirect Thermal Dryer (Paddle Dryer, Disc Dryer)**	Mature Technology	Yes	Limited experience in North America	Yes - Would reduce reliance on incineration and allow beneficial use on land. The process will require additional energy to remove water from the dewatered biosolids cake.	Yes	Screened Out
4c	**Solar Dryer**	Newer, successful technology becoming popular but still not a mature technology for large WRRFs.	Yes	Limited	Yes - Would reduce reliance on incineration and allow beneficial use on land.	Difficult for the Region to obtain the approvals required to implement a solar drying facility on a remote site in time to provide wastewater solids management capacity by 2029.	Screened Out

Table 8-26: Screening of Long List of Solids Treatment Technologies (5. Chemical Stabilization)

No.	Technology	Maturity	Compatibility with Existing and Future Processes and Biosolids End Use Markets	Proven Applications	Compatibility with Regional Energy Management and GHG Reduction Goals	Ability to Implement with Required Schedule	Consider Future Evolution
5a	**Alkaline Stabilization**	Mature Technology	Without additions presented in 5b and 5c, 5a results in large volume of product and does not compliment end-use alternatives identified. Significant odour potential.	Large systems in operation	Yes - Diversification would reduce reliance on incineration and allow beneficial use on land.	Yes - Could be available at facilities operated by third-parties to manage the solids generated at the Clarkson WRRF by 2029	Screened Out
5b	**Alkaline Stabilization with Supplemental Heat or Acid**	Mature Technology	Yes	Large systems in operation	Yes - Diversification would reduce reliance on incineration and allow beneficial use on land.	Yes - Could be available at facilities operated by third-parties to manage the solids generated at the Clarkson WRRF by 2029	Carried Forward
5c	**Alkaline Stabilization with Supplemental Heat and High-Speed Mixing**	Maturing technology	Yes	Large systems in operation	Yes - Diversification would reduce reliance on incineration and allow beneficial use on land.	Yes - Could be available at facilities operated by third-parties to manage the solids generated at the Clarkson WRRF by 2029	Carried Forward

Table 8-27: Screening of Long List of Solids Treatment Technologies (6. Composting)

No.	Technology	Maturity	Compatibility with Existing and Future Processes and Biosolids End Use Markets	Proven Applications	Compatibility with Regional Energy Management and GHG Reduction Goals	Ability to Implement with Required Schedule	Consider Future Evolution
6a	**Composting (Open Technologies Aerated Static Pile and Windrow Composting) or co-composting with Region of Halton**	Mature Technology	No - Large volume of amendment material would be required, resulting in large volume of product. Does not compliment the end use alternatives and markets that have been identified for the Region of Peel.	Yes	Yes - Diversification would reduce reliance on incineration and allow beneficial use on land.	It would be difficult for the Region to obtain the approvals required to implement a composting facility on a remote site in time to provide wastewater solids management capacity by 2029.	Screened out

Table 8-28: Screening of Long List of Solids Treatment Technologies (7. Thermal Conversion)

No.	Technology	Maturity	Compatibility with Existing and Future Processes and Biosolids End Use Markets	Proven Applications	Compatibility with Regional Energy Management and GHG Reduction Goals	Ability to Implement with Required Schedule	Consider Future Evolution
7a	**Incineration**	Mature Technology	Yes	Yes	Incineration of biosolids at both the G.E Booth and Clarkson WRRFs is not compatible with Region Energy Management and GHG Reduction Goals	Yes	Screened Out
7b	**Gasification**	Currently unproven technology at full scale. May destroy PFAS	Yes	Currently not operating at a commercial sale	Thermal conversion of biosolids at both the G.E Booth and Clarkson WRRFs is not compatible with Region Energy Management and GHG Reduction Goals	Anticipated technology to not be operating at a commercial scale in time to provide wastewater solids management capacity by 2029	Screened Out
7c	**Pyrolysis**	Currently unproven technology at full scale. May destroy PFAS	Yes	Currently not operating at a commercial sale	Thermal conversion of biosolids at both the G.E Booth and Clarkson WRRFs is not compatible with Region Energy Management and GHG Reduction Goals	Anticipated technology to not be operating at a commercial scale in time to provide wastewater solids management capacity by 2029	Screened Out
7d	**Wet Oxidation**	Process has been used for years. New technologies are being developing for use with biosolids	Yes	Currently not operating at a commercial sale	Thermal conversion of biosolids at both the G.E Booth and Clarkson WRRFs is not compatible with Region Energy Management and GHG Reduction Goals	Anticipated technology to not be operating at a commercial scale in time to provide wastewater solids management capacity by 2029	Screened Out
7e	**Hydrothermal Liquification**	Developing technology for use with biosolids	Yes	Currently not operating at a commercial sale	Thermal conversion of biosolids at both the G.E Booth and Clarkson WRRFs is not compatible with Region Energy Management and GHG Reduction Goals	Anticipated technology to not be operating at a commercial scale in time to provide wastewater solids management capacity by 2029	Screened Out

8.4.4 Development of Biosolids Treatment Design Concepts

Based on the selected treatment technologies, the biosolids end users and market assessment, the following three design concepts were developed for the Clarkson WRRF, including:

- Alternative 1: Anaerobic Digestion and Dewatering, Prior to Beneficial Use by Third-party Management Firms (Digestion/Dewatering Concept).
- Alternative 2: Thermal Hydrolysis Process (THP), Anaerobic Digestion, and Dewatering, Prior to Beneficial Use by Third-party Management Firms (THP Concept).
- Alternative 3: Direct Thermal Drying of Anaerobically Digested Biosolids, Prior to Third-Party Product Distribution (Drying Concept).

Each alternative includes beneficial use of the biosolid products by third-party biosolids management firms. The third-party firms will either land apply the product as part of an agricultural practice, beneficially use the product for land reclamation, and/or market and distribute the end product that meets the Canadian Food Inspection Agency (CFIA) registration requirements for fertilizer products. The responsibility of the biosolids management firms commonly includes transport, storage, and use or distribution of the biosolids. The responsibility of the third-party firms begins when dewatered cake or dried product is discharged into their vehicles from the Clarkson WRRF for transport.

Additional treatment by third-party management firms will likely use the other short-listed technologies such as:

- Advanced Alkaline Stabilization with Supplemental Heat or Acid
- Advanced Alkaline Stabilization with Supplemental Heat and High-Speed Mixing

8.4.5 Alternative Design Concepts

Descriptions of each alternative design concepts for treating and managing biosolids is presented in the sections below.

8.4.5.1 Design Concept 1: Anaerobic Digestion and Dewatering Prior to Beneficial Use by Third-Party Management Firms (Digestion/Dewatering Concept)

This alternative considers an expansion of the anaerobic digestion system that currently serves the Clarkson WRRF. The stabilized biosolids will meet the NASM CP2 Pathogen reduction requirements. This alternative includes dewatering the stabilized biosolids to reduce the volume and mass of the material that will be transported from the Clarkson WRRF. This alternative also allows for third-party firms to further treat the digested/dewatered cake off-site using alkaline stabilization technologies and potentially market as a fertilizer. Key features of Design Concept 1 include:

- Construct four new anaerobic digesters.
- Decommission and replace the two oldest digesters, Digesters 1 and 2.
- Use of the existing dewatering equipment to dewater the digested sludge.
- Continue to utilize the biogas produced through the process to reduce natural gas demands and to generate electricity.

The process flow diagram for Design Concept 1 is presented as **Figure 8-7**.

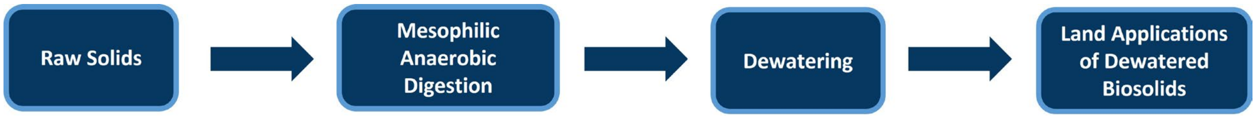


Figure 8-7: Process Flow Diagram for Design Concept 1 - Digestion/Dewatering Concept.

8.4.5.2 Design Concept 2: Thermal Hydrolysis, Anaerobic Digestion, and Dewatering Prior to Beneficial Use by Third-Party Management Firms

This alternative includes adding thermal hydrolysis (THP) to the anaerobic digestion system, dewatering, and third-party management of the resulting biosolids cake. The use of the THP allows for a reduced detention time in the anaerobic digestion system and would reduce the size of the expansion to the digestion system capacity. This process allows the biosolids cake to meet the CP1 pathogen reduction criteria and potentially meet the CFIA fertilizer quality requirements. Key features of Design Concept 2 include:

- Construct two new anaerobic digesters.
- Decommission and replace the two oldest digesters, Digesters 1 and 2.
- Modify the existing three digesters (Digesters 3 to 5) to allow operating at higher solids concentration.
- Construct a THP facility including pre-digestion dewatering and odour control.
- Utilize the biogas produced through the process to reduce natural gas demands and to generate electricity.

The process flow diagram for Design Concept 2 is shown as **Figure 8-8.**

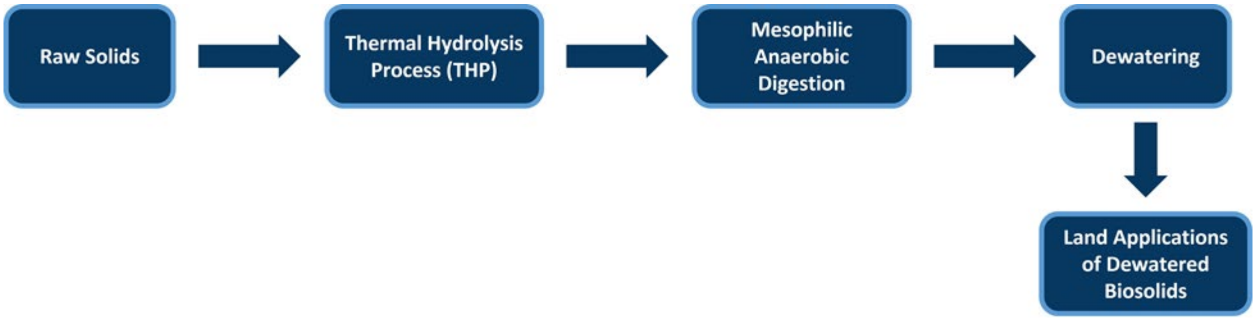


Figure 8-8: Process Flow Diagram Design Concept 2 - THP Concept.

8.4.5.3 Design Concept 3: Direct Thermal Drying of Anaerobically Digested Sludge and Beneficial Use by third-Party Management Firms

This alternative includes direct thermal drying of biosolids following anaerobic digestion and dewatering. There are two primary types of direct thermal dryers; fluidized bed dryers and rotary drum dryers. Either type could be implemented at the Clarkson WRRF. To develop this alternative, direct thermal drying of solids using rotary drum dryers was selected as a representative technology for sizing and economic evaluation. Biosolids drying would take place following anaerobic digestion and dewatering.

The dried biosolid product has been certified as a fertilizer in Ontario and marketed in both the bulk and retail markets. Key features of Design Concept 3 are:

- Construct four new anaerobic digesters.
- Decommission and replace the two oldest digesters, Digesters 1 and 2.
- Construct a drying facility (80 dt/d capacity), including odour control.
- Construct an on-site short-term storage facility for dried biosolids product (4-day capacity).
- Continue to utilize the biogas produced through the process to reduce natural gas demands and to generate electricity.

The process flow diagram for Design Concept 3 is presented on **Figure 8-9**.

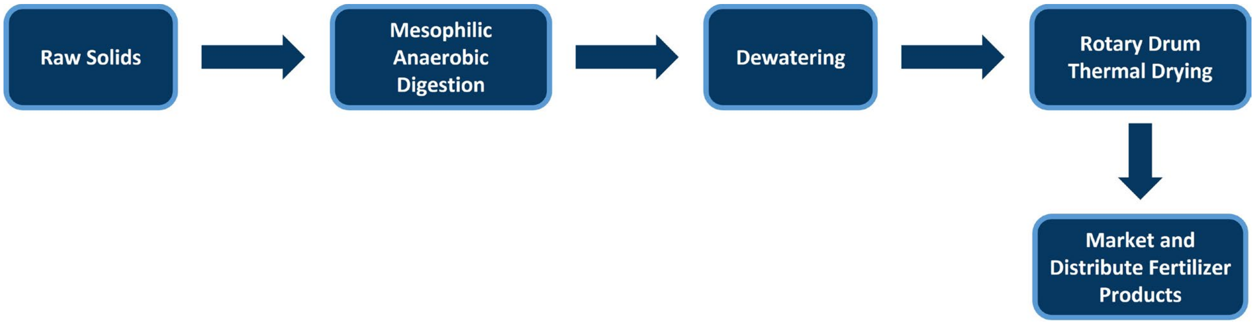


Figure 8-9: Process Flow Diagram Design Concept 3 - Drying Concept

8.4.6 Evaluation of Biosolids Management Design Concepts

The three 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 8-17** provides a summary of the impacts.

Table 8-29: Evaluation of Biosolids Management Design Concepts - Natural Environment, Social/Cultural Environment, and Technical Considerations

Criteria Category	Design Concept 1: Digestion/Dewatering ; Design Concept 2: THP ; Design Concept 3: Drying	Evaluation Outcome
Natural Environment	The expansion area for the biosolids facilities is in the northwest corner of the site, adjacent to the existing anaerobic digesters. The area in the northwest corner of the site is classified SWD2-2 (Green Ash Deciduous Forest), with potential for breeding birds and species at risk (SAR). This area is avoided with all alternatives. However, alternatives will encroach on the area classified as MAM2 (Mineral Meadow Marsh), a non-provincially significant wetland. Alternatives 1 and 3 have the largest footprints, so will impact this area more so than Alternative 2. Impacts to these natural features must be controlled though proper mitigation techniques throughout construction, as well as compensation for the loss of the Mineral Meadow Marsh area elsewhere on the site (area exists at the southwest of the site for additional Mineral Meadow Marsh area). All alternatives will be designed to mitigate surface and groundwater impacts. Stormwater management plans will be developed, as well as shoring and dewatering plans. Air emissions at the Clarkson WRRF meet MECP requirements, and any expansion will 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 will be mitigated. Alternative 1 has the lowest GHG emissions from processing, followed closely by Alternative 2. Alternative 3 consumes more energy as part of the drying process which results in higher GHG emissions. The GHG emissions off site are impacted by the volumes transported and the required distance to market. Due to significantly higher trucking requirements, Alternatives 1 and 2 would have higher GHG emissions than Alternative 3 for sludge hauling. All alternatives would have similar GHG reduction credits from beneficial use of biosolids.	Alternative 2 (THP) ranked slightly higher than the other alternatives in overall natural environment scoring, as it has the advantage of a slightly smaller footprint than Alternatives 1 (Digestion) and 3 (Drying), as well as producing slightly lower GHG emissions.
Social/Cultural Environment	Overall, concerns related to odour, noise, and visual aesthetics will 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 the requirements of the nearest receptors. All alternatives would require some level of truck traffic to transport biosolids products. However, Alternative 3 (anaerobic digestion followed by drying) would have significantly lower vehicle traffic to transport the dried product. All alternatives would result in similar disruption during construction. However, noise, dust, and traffic issues can be mitigated. In addition, transportation routes avoid residential and recreational land use areas. Biosolids products improve the characteristics and productivity of agricultural soil. Alternatives 2 and 3 produce the highest quality biosolids product that meet fertilizer standards. No archaeological resources are expected to be impacted with any of the alternatives, based on Stage 1 and 2 archaeological assessments.	Alternative 3 (Drying) ranked slightly higher than the other alternatives as it has the advantage of less truck traffic, while also producing high quality, easily marketable biosolids product that meet fertilizer standards.
Technical Considerations	While all alternatives would add some complexity to operation, Alternative 1 would be the simplest. Alternative 2 with THP would be the most complex, requiring specially trained operators (stationary engineers) in addition to wastewater operators. Alternative 2 may also require side-stream treatment to reduce ammonia loads back to secondary treatment. Alternative 1 would be the easiest to implement. Alternative 2 would require digestion expansion and THP construction completed at the same time to provide the required stabilization capacity, making Alternative 2 the most difficult to implement. Alternative 3 could allow the Region to defer the construction of the drying facility once the digestion expansion is completed, resulting in more flexibility in capital project implementation to ease cash flow and construction contracts coordination. Alternative 1 would use the least energy. Drying for Alternative 3 would use the most energy onsite. All alternatives will produce biogas to be used for energy recovery. Alternative 1 would require greater permitting and approvals to allow for land application of digested biosolids. Alternatives 2 and 3 would generate a marketable fertilizer product. However, the physical characteristics of the THP, anaerobic digested, and dewatered product (Alternative 2) has a clay-like consistency and as a result is currently less marketable than the dried product.	Alternatives 1 and 3 ranked slightly higher from a technical perspective than Alternative 2.

Table 8-30: Evaluation of Biosolids Management Design Concepts - Economic Considerations

Criteria Category	Design Concept 1: Digestion/Dewatering	Design Concept 2: THP	Design Concept 3: Drying	Evaluation Outcome
Capital Cost	$150 M	$179 M	$236 M	Alternatives 1 and 3 have similar life cycle costs. Alternative 3 has the highest capital, but the lowest operating costs.
Annual O&M Cost	$9.7 M	$9.5 M	$5.3 M	
30-Year NPV Life (dollars per dry tonne)	$264/dt	$289/dt	$262/dt	

8.4.7 Preferred Biosolids Management Concept

There are minimal differences in the scoring among all three biosolids design concepts. Similar to the assessment of wastewater design concepts described in **Section 8.3.3**, a second level of assessment was therefore carried out that considered the key priorities of the Region as shown on **Table 8-31**. Based on consideration of the Region's objectives, Design Concept 3 (Direct Thermal Drying of Anaerobically Digested Biosolids and Third-Party Distribution) and Design Concept 1 (Anaerobic Digestion and Dewatering and Third-Party Distribution) best aligned with Region's objectives. These concepts were selected together as they provide a diversified biosolid management program to increase flexibility and strengthen resiliency to market change, fluctuations in utility costs, and new regulations.

Expanding the current Mesophilic Anaerobic Digestion systems (Design Concept 1) is compatible with current operations and can provide greater process flexibility in the Clarkson WRRF's solids management process now and in the future. The construction of the drying facility (Design Concept 3) can begin once the digestion expansion is completed, resulting in more flexibility in capital project implementation to ease cash flow and the coordination of construction contracts.

These concepts allow the Region to use the biosolids products in the following ways

- The digested/dewatered biosolids cake product can be applied to agricultural lands by third-party management firms.
- The thermally dried product can be distributed as a fertilizer by the Region or a third-party biosolids management firm.

The digested/dewatered biosolids cake product can be further treated through advanced alkaline stabilization and marketed as a fertilizer by a third-party biosolids treatment/management firm.

Design Concept 2 (THP Concept), ranked slightly less but relatively close to Design Concepts 1 and 3, was not recommended for further consideration based on the following reasons:

- Operational complexity associated with working with high pressure steam.
- More implementation challenges relating to timing of construction and approvals.
- The Thermal hydrolysis process would create higher strength side streams requiring treatment.
- The resulting dewatered cake from the THP and anaerobic digestion process, while having a lower pathogen concentration than mesophilic anaerobic digestion, would have physical characteristics, total solids concentration and a clay-like texture, similar to anaerobically digested biosolids. Based on the market assessment, there are limited third-party management firms who have marketed and distributed the biosolids from the THP process as fertilizer to the end users.

Table 8-31: Alternative Biosolids Management Design Concept's Ability to Meet the Key Study Objectives

Region's Key Objectives	Design Concept 1: Digestion/Dewatering	Design Concept 2: THP	Design Concept 3: Drying	Evaluation Outcome
Long-term sustainability			Aligns best with objective.	THP and drying can produce registered fertilizer products that can generate products with a demand from multiple markets There are limited third-party management firms, however, who have marketed and distributed the biosolids from the THP process as fertilizer to the end users.
Resiliency	Aligns best with objective.	Aligns best with objective.	Aligns best with objective.	All alternatives have built in redundancy in treatment processes.
Environmental Protection	Aligns best with objective.	Aligns best with objective.	Aligns best with objective.	All alternatives will protect the environment.
Community Acceptability			Aligns best with objective.	All alternatives would require some level of truck traffic to transport biosolids products; Drying would have significantly lower vehicle traffic to transport the dried product, resulting in less impacts to the community.
Ease of Operations	Aligns best with objective.			THP has operational complexity associated with working with high pressure steam.
Ease of Implementation	Aligns best with objective.		Aligns best with objective.	THP has more implementation challenges relating to timing of construction and approvals. In addition, although it produces registered fertilizer; there are currently no operating THP facilities in Canada. It will take time to obtain CFIA registration.
Energy Efficiency Reduce GHG	Aligns best with objective.	Aligns best with objective.		Digestion/dewatering and drying would use the least energy. Digestion/dewatering and drying have very similar GHG emissions, while drying has higher GHG emissions. However, drying has the least amount of dried biosolids products for trucking, resulting in less GHG emission associated with transportation.
Fiscally Responsible	Aligns best with objective.		Aligns best with objective.	THP has higher overall lifecycle costs than digestion/dewatering or drying.
Preferred Alternatives	Selected as one of the preferred alternatives as it best aligns with Region's Key Objectives.	Not selected as it does not align with Region's Key Objectives.	Selected as one of the preferred alternatives as it best aligns with Region's Key Objectives.	**Concept 1 and Concept 3 best align with the Region's objectives and are selected as the preferred design concepts.**

8.5 Summary of Overall Preferred Design Concept

The wastewater treatment design concept identified as the preferred solution for the Clarkson WRRF expansion is the Biological Nutrient Removal (BNR) process, which includes the following components:

- Construct a new headworks facility.
- Construct a new process train including 4 new primary tanks, 4 new plug-flow aeration tanks configured to operate as S2EBPR or CAS with wet weather step feeding, and 4 new secondary clarifiers.
- Disinfection utilizing chlorination / dichlorination technology similar to the existing facility.

The biosolids management design concept identified as the preferred solution for the Clarkson WRRF expansion includes the following components:

- Expand the existing anaerobic digestion facility by constructing four new digesters.
- Decommission and replace the existing Digesters 1 and 2.
- Construct a direct thermal drying facility to create a fertilizer product from the anaerobically digested biosolid cake.
- Diversify management streams through third-party management firms that will haul anaerobically digested and dewatered cake for direct land application and/or further processing off-site into a fertilizer product.
- Construct an on-site short-term storage facility for dewatered cake (3-day capacity) and for dried biosolids product (4-day capacity).

Two biosolids products would be created through the processes described above; a digested/dewatered cake product and a dried product. These two products will allow the Region to have access to a variety of markets. The digested/dewatered cake can be applied to agricultural lands or further treated through alkaline stabilization by a third-party biosolids treatment/management firm and marketed as a fertilizer. The dried product can be marketed as a fertilizer as well. This diversified biosolids management program provides operational flexibility and redundancy.

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

9.0 Preferred Design Concept

9.1 Facility Layout and Description

Figure 9-1 provides a site plan showing all of the WRRF design components to expand the Clarkson WRRF to 500 MLD average rated flow capacity. The site plan consists of multiple existing wastewater treatment and the following new expansion facilities:

- Headworks building in northeast portion of the site (grit removal and screening).
- New wastewater train (inlet conduits, primary clarifiers, aeration tanks, blower building, secondary clarifiers, and effluent channels) in east portion of the site (Referred to as Plant 3).
- Sidestream treatment facility in north portion of the site.
- Digester control building and additional digesters in north-west portion of the site.
- Direct thermal drying facility in north portion of the site.
- Energy Centre in south portion of the site.
- Administration building in south portion of the site.

The preferred facility layout shown in **Figure 9-1** is based on optimizing the site area and providing flexibility for future improvements to the facility. In addition, the expansion facilities were located on site to ensure compatibility with existing plant process, and to minimize community and natural environment impacts.

More details on the expansion facilities are provided in the following sections.

9.2 Wastewater Process Components

9.2.1 Preliminary Treatment

The preferred design components for preliminary treatment at the Clarkson WRRF includes demolishing the existing headworks facility and constructing a new headworks facility sized to accommodate peak flows for the whole plant. The new headworks facility will include new screening and grit removal systems.

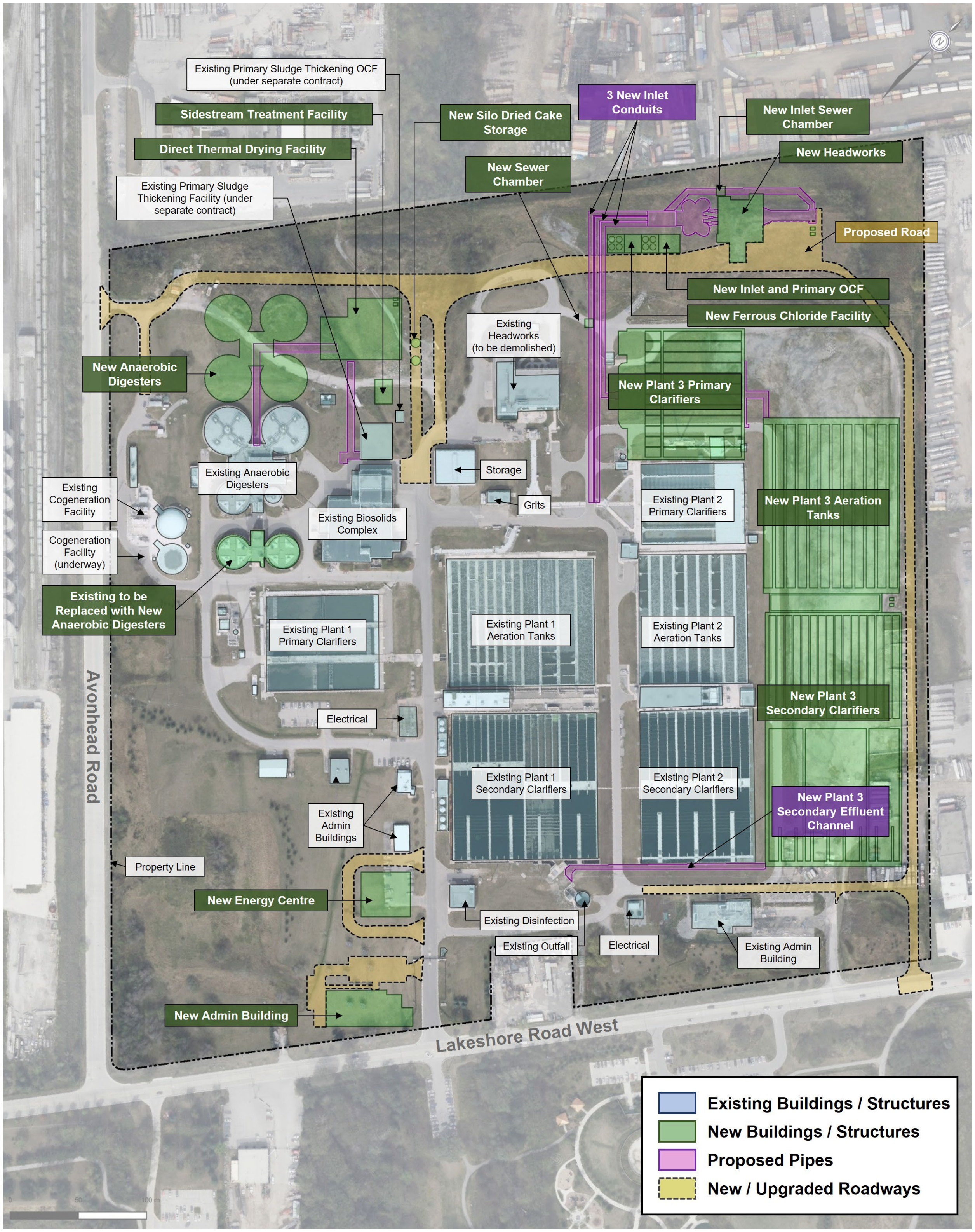


Figure 9-1: Preferred WRRF Design Components

9.2.2 Primary Treatment

The preferred design components for primary treatment at the Clarkson WRRF include constructing four rectangular primary clarifier tanks. Three primary clarifiers will provide the required capacity based on the design surface overflow rates at average daily and peak daily flow with the fourth tank providing redundancy.

The primary clarifiers will be equipped with sludge and scum collection mechanisms. The collected sludge and scum will be pumped to the Primary Sludge Thickening Facility, which is currently being constructed.

The conceptual design also includes provision for metal salt addition to the primary influent for phosphorus removal and to enhance sludge settling.

9.2.3 Secondary Treatment

The preferred design components for secondary treatment at the Clarkson WRRF include channel aeration and additional aeration tanks. Channel aeration will include coarse bubble diffusion to prevent solids settling in the channels. Channel aeration will be provided in the new primary inlet channels, Plant 3 aeration tank inlet and step feed channels, and the Plant 3 Mixed Liquor Suspended Solids (MLSS) channels. The primary clarifier inlet channels and effluent launders will be covered to capture odorous air for treatment in unit.

Four new three-pass rectangular aeration tanks are proposed with fine bubble diffusers along the tank floor. Three of the tanks will provide the required firm capacity with the fourth tank providing redundancy. The aeration tanks will be designed with the flexibility to operate as conventional plug-flow activated sludge process with wet weather step-feed flexibility, or as a Sidestream Enhanced Biological Phosphorus Removal (S2EBPR) process. The tanks will be six meters deep to minimize footprint and improve oxygen transfer efficiency. Air supply to the aeration tanks will be provided by blowers located in the new Plant 3 blower building.

Following the aeration tanks, mixed liquor enters the secondary clarifiers, where solids and microorganisms are settled and returned to the aeration basin. Waste activated sludge (WAS) will be wasted to the WAS thickening facility.

9.2.4 Sidestream Treatment

Centrate from dewatering of digested solids contains a high ammonia concentration and contributes to the influent wastewater Total Kjeldahl Nitrogen (TKN) loading. The additional loading from centrate results in greater aeration demands and energy requirements. To reduce the impact on the main process aeration system requirements, a sidestream treatment system will be added as part of the new Plant 3 expansion to treat the ammonia in the centrate before it is recycled back to the headworks facility.

9.2.5 Effluent Disinfection

The Clarkson WRRF expansion will continue to be serviced by the existing chlorination and dechlorination system. The existing chlorination/dechlorination system is integrated into the existing outfall with sodium hypochlorite injected upstream of the outfall chamber and sodium bisulphite injected before the effluent discharges into Lake Ontario. Additional sodium hypochlorite dosing points will be added to the new Plant 3 secondary effluent channel.

9.2.6 Outfall

The existing Clarkson WRRF outfall will be maintained as it has sufficient capacity to meet expansion needs and to protect the nearshore environment.

9.2.7 Odour Control

Odour treatment at the Clarkson WRRF expansion will include the collection and treatment of air from the headworks, preliminary treatment, and primary treatment facilities. Air from the Plant 1 primary inlet channels and effluent launders will continue to be treated in the existing biofilter while the existing Plant 2 odour control system will be demolished and consolidated with the new odour control system for Plant 3.

This conceptual design assumes a common carbon adsorption odour control system for the screening, grit removal, and Plant 2 and 3 primary clarifiers. Odour control consists of radial flow dry media units, however further technology evaluation is recommended during detailed design to confirm the preferred technology. Channels and effluent launders will be covered to minimize the odorous air release into the environment.

9.3 Solids Process Components

9.3.1 Anaerobic Digestion

The preferred design concept at the Clarkson WRRF includes the expansion of the existing anaerobic digestion facility to stabilize the primary and WAS solids.

Currently, the Clarkson WRRF has a WAS thickening facility and a primary sludge thickening facility is being constructed under a separate project. The facility has five (5) existing digesters; the recommended design concept involves replacing the old Digesters 1 and 2 that are approaching the end of their useful life with two new digesters of equivalent capacity. To meet the firm capacity with one of the largest digesters off-line, four new digesters will be required. Overall, the upgraded facility will have eight (8) primary digesters, these are two (2) replacement digesters, two (2) existing digesters and four (4) new digesters while the remaining smallest existing digester will be used as a secondary digester.

9.3.2 Drying Facility

The direct thermal dryers will be used to increase the total solids concentration of the digested and dewatered biosolids from 24 percent to approximately 92 percent. Andritz DDS 80 direct rotary drum dyers have been selected for the conceptual design; however, other manufacturers will be considered during detailed design. Three Andritz DDS 80 units will be required, two on-duty and one standby, each with a rated capacity to evaporate 8,000 kg of water per operating hour.

9.3.3 Drying Odour Facility

The off gas from the thermal drying process will be directed to an odour control system. The design of the odour control system is based on using regenerative thermal oxidizers (RTO). Thermal oxidation is a common process used with drying facilities. For the purposes of this conceptual design, it is anticipated that the odour control system will provide a minimum destruction and removal efficiency (DRE) of 98 percent.

9.4 Biosolids Management

9.4.1 Energy Reuse and Recovery

Biogas is generated during the anaerobic digestion process. The biogas generated at the Clarkson WRRF is stored within a biogas dome on site. The biogas is used in a combined heat and power process (CHP) to recover heat energy and generate electricity. The Region intends to expand the dome gas storage and install additional CHP units, as part of a separate on-going project.

Biogas use on-site will reduce the demand for natural gas. Biogas can be used to fuel a number of appliances on-site, such as the boilers and the dryers. Biogas can also be used to generate electricity and heat for process operations using the combined heat and power (CHP) engines. Both options will support the Region’s goals of reducing their carbon footprint and overall GHG emissions.

9.4.2 Beneficial Land Use of Biosolids

Using the biosolids management process identified in **Section 9.3**, two biosolids products are produced; a digested/dewatered cake product and a dried product, which allows the Region a variety of beneficial end use options. The digested/dewatered cake can be applied to agricultural lands or further treated through alkaline stabilization by a third-party biosolids treatment/management firm and marketed as a fertilizer. The dried product can be marketed as a fertilizer as well. This diversified biosolids management program provides operational flexibility and redundancy.

9.5 Energy Centre

The electrical upgrades will involve power distribution modifications to service the expansion as well as support the Region’s plans to provide a standby power system to Clarkson WRRF. During the development of the Peel Energy Strategy, the Region evaluated different options related to site wide power distribution and emergency generation. The preferred approach to power distribution in support of the growth at Clarkson WRRF includes a new underground 27.6 kilovolt power distribution loop to provide power to plant processes, and the use of a centrally located power generation facility (i.e., Energy Centre).

The Energy Center will manage the supply of normal and emergency power to the plant. It will be equipped with new standby generator units that will provide emergency power to all buildings and processes systems at the site via the common 27.6 kilovolt underground distribution system. Generator noise and combustion exhaust emissions will be controlled in accordance with MECP NPC-300 limits and O.Reg. 419/05 requirements.

9.6 New Administration Building

The new administration building will be a two-story above-grade structure located near the site entrance off Lakeshore Road West. It will include an open lobby area designated for visitors with informative displays aimed at public engagement in wastewater treatment. The first floor will also include a large laboratory and change facilities. The second floor will consist of office space, a SCADA room, a library/records room, a control room, and a lunchroom. The new building is required to support the additional staff that will be required to operate the expanded plant.

9.7 Conceptual Rendering

Architectural features will be incorporated into the above-grade buildings and will be designed to have a long service life with minimal maintenance requirements. As part of the design process, contextual consideration will 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 will 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 9-2 and **Figure 9-3** provide conceptual renderings of the current facility and preferred facility, respectively, for illustration purposes. Any additional concepts and/or renders developed during the detailed design stage will adhere to the Region's design standards.

Figure 9-2. Current Clarkson WRRF.

Figure 9-3. Future Clarkson WRRF (after expansion).

10.0 Impacts and Mitigation Measures

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** provides a summary of the impacts and mitigation measures of the proposed facility expansion.

10.1 Natural Environment

10.1.1 Terrestrial and Aquatic Features and Habitats

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 Clarkson WRRF (refer to **Appendix A**). The documented natural heritage features are as follows:

- Two non-provincially significant wetlands;
- Mineral Meadow Marsh (MAM2);
- Green Ash Mineral Deciduous Swamp (SWD2-2);
- Significant Wildlife Habitat (SWH) for Bat Maternity Colonies within a SWD2-2 community;
- Candidate habitat for endangered species within SWD 2-2 (Little Brown Myotis (Myotis lucifugus)); and,
- Indirect fish habitat.

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 Clarkson WRRF expansion, while avoiding the more sensitive SWD2-2 communities, will require encroachment and permanent removal of 0.15 hectares of MAM2 habitat. To compensate for the removal of the non-significant wetlands, one created wetland (0.15 hectares in size) is proposed in the south-west corner of the property. This created wetland will be re-constructed as a MAM2 vegetation community and meet the CVC's land-based offsetting requirements, as land will be replicated at a 1:1 ratio. A 10-metre buffer will be provided surrounding the constructed wetland in accordance with CVC guidelines. The exact location, orientation, and shape of the constructed wetland will be determined at the detailed design stage.

As indicated, the SWD2-2 community will not be impacted by the proposed expansion and will be maintained on the landscape. The Candidate SWH for Bat Maternity Roosting within the SWD2-2 community will be retained in place. The candidate habitat for Species at Risk (SAR), the Little Brown Myotis habitat, also located within the SWD2-2 community will be retained. Where possible, opportunities to plant buffer plantings surrounding the vegetation to the east and south will be explored during detailed design. Therefore, no negative impacts are expected to the candidate SWH, and candidate SAR (Little Brown Myotis) as a result of the proposed facility expansion.

Pertaining to the indirect fish habitat, there are no permanent or intermittent watercourse features present within the Clarkson WRRF site. However, one seasonal headwater drainage feature (HDF) was identified in the north portion of the site, which is currently piped through the property, eventually daylighting on the south side of Lakeshore Road (outside of the subject lands) and discharging to Lakeside Creek. Per the recommendations in the Southdown District Stormwater Servicing and Environmental Management Master Plan (T.Y. Lin, July 2022) completed for the City of Mississauga, the drainage feature is to be re-routed to an upgraded storm sewer on Avonhead Road, which will also discharge to Lakeside Creek.

The expanded facilities will encroach on a portion of this identified HDF. However, given that the downstream extent of the feature was previously modified to facilitate the existing facility footprint and the feature is not identified as a regulated watercourse by CVC, modification of the downstream extent of the HDF is permitted to maintain the HDF function (rather than maintenance of the HDF in-place), provided that flows to downstream receiving habitats are maintained. During detailed design the Region will continue to work with CVC and the City of Mississauga to ensure the final site plan maintains the HDF function and is consistent with the City's plans for stormwater management in the area.

In addition, the Region has the option to complete a comprehensive planting plan that includes the restoration efforts required for the plant expansion and the currently ongoing Primary Sludge Thickening Facility project.

10.1.2 Stormwater Management Plan

The proposed facility expansion will require the completion of a stormwater management (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. The additional clarifier and aeration tanks are open to the environment therefore rainwater collected within these tanks will not contribute to increased stormwater flows exiting the property. 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. 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. The plan will likely include continued piping of stormwater though the site and discharging to Lakeside Creek, until such time as the Southdown District Master Plan's recommendation of piping stormwater along Avonhead Road is implemented.

10.1.3 Lake Ontario Water Quality

To continue to protect Lake Ontario water quality at the expanded flows, Peel will reduce the limits and objectives for total phosphorus (TP) concentrations 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) for other parameters would also continue to be met and has 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.

10.1.4 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 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). As mandated by the Clean Water Act, 2006, 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, disinfection failure at Clarkson WWTP 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.

10.1.5 Greenhouse Gas (GHG) Emission Control

The Region's Energy Policy aims to achieve net-zero Greenhouse Gas (GHG) emissions at their WRRFs by 2050. The following initiatives are being undertaken at the Clarkson WRRF to reduce GHG emissions:

- Implementation of Ammonia-Based Aeration Control (ABAC): This initiative is currently under design and is expected to be commissioned in 2026. The outcome of this initiative is to reduce electricity consumption by the aeration system.
- Primary Sludge Thickening: This initiative is currently under design and is expected to be commissioned in 2026. The outcome of this initiative is to reduce anaerobic digestion heating requirements by increasing the solids concentrations prior to digestion. It will also serve to increase the capacity of the existing digesters.
- Cogeneration (Cooling and Heating Process - CHP) Expansion: this initiative is currently under design and is expected to be commissioned in 2026. The outcome of this initiative is to maximize the use of biogas and to reduce electricity purchase from the grid and natural gas consumption.

To minimize GHG emissions and increase energy recovery, the following additional measures are considered as part of the preferred design concept:

- The Biological Phosphorus Removal (BPR) process results in reduced chemical usage and lower aeration requirements.
- Sidestream Centrate Treatment reduces Total Kjeldahl Nitrogen (TKN) loading to aeration resulting in reduced aeration needs and energy savings.
- Biogas generation from anaerobic digestion can be used for dryer operation to reduce natural gas consumption and for renewable natural gas (RNG) or to generate electricity and heat for process operations through CHP.

In addition, beneficial use of the biosolids generated at the Clarkson WRRF provides the opportunity for Peel to receive carbon credits from beneficial use on land. Carbon sequestration and synthetic fertilizer replacement credits can be received from biosolids beneficial use on land either as a NSAM or fertilizer product. Currently, carbon credits are not considered as part of Peel's GHG emission reporting requirements. However, analysis indicates that the Region could achieve carbon neutral at the Clarkson WRRF if carbon credits from biosolids beneficial use on land are included in the reporting scope.

The Region is undertaking a pilot program to divert 50 percent of biosolids from the Clarkson WRRF from incineration at the G.E. Booth WRRF to direct land application as per NASM requirements. This pilot program reduces the total incineration capacity requirements at the G.E. Booth WRRF while the existing incinerators are under major rehabilitation thereby reducing GHG emissions. GHG emissions are further reduced due to carbon credits from biosolids beneficial use on land.

10.2 Social and Cultural Environment

10.2.1 Air Emission and Odour Control

An Air Quality Impact Assessment (AQIA) report was prepared (refer to **Volume 3 Appendix C**) in support of the proposed facility expansion which identified that the existing facility and the proposed facility expansion both have air pollutants and sources of odour emissions that require mitigation measures to prevent or minimize off-site effects. For all the assessed air pollutants, the cumulative concentrations (ambient emissions plus expansion emissions) were found to be less than the respective criteria at all locations beyond the limits of the Clarkson WRRF property, including all sensitive receptors. Similarly, odour impacts due to the plant expansion are not expected to change appreciably at the identified sensitive receptors. Compliance with the applicable standards and criteria in Ontario Regulation (O.Reg.) 419/05 demonstrates that the proposed Clarkson WRRF expansion will meet the air quality requirements for obtaining a provincial ECA for air.

The air dispersion modelling assessment predicts that the ambient air concentrations in the vicinity of the Clarkson WRRF will continue to be lower than the ambient air quality criteria assuming the following mitigation measures are implemented at the detailed design stage:

- The plant's existing preventative maintenance program is to continue including operation of all pollution control equipment, diesel-fired engines (vehicle, equipment, and standby power generating), and all processes with the potential for environmental effects.

- During the operation phase of the facility expansion, the existing emissions control equipment and proposed control measures are to be implemented.
- The facility odour monitoring protocol will be followed to confirm that odour emissions are effectively managed.

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 Clarkson WRRF. The construction site entrance will also need to be swept periodically to minimize any dirt build-up.

10.2.2 Noise and Vibration Control

An Acoustic Assessment Report (AAR) was completed in support of the conceptual design of the proposed facility expansion (refer to **Volume 2 Appendix D**). The AAR assesses the compliance of the existing facility and also evaluates the cumulative impact of the additional noise sources due to the expansion against the applicable MECP NPC-300 limits. Seven (7) representative Points of Reception (PORs) were identified, which included three (3) accessible vacant lot receptors. The sound levels at the receptors represented the worst-case scenario assuming all significant sound sources were being operated simultaneously during daytime/evening and night-time hours. Using the predicted worst-case noise emission scenarios, the Clarkson WRRF is anticipated to be compliant with the MECP NPC-300 limits both in its existing condition and following the proposed 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.

10.2.3 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. In addition to the temporary construction impacts, TMPs must be completed by all third-party biosolids management firms who are awarded contracts to haul biosolids product from the facility. The TMPs will identify haul routes that minimize local traffic impacts with appropriate mitigation measures.

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 storm water runoff collections points by construction activities.

10.2.4 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 headworks building, Plant 3 blower building, digester control building, thermal drying facility, and sidestream treatment facility buildings. 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 with light precast concrete panels and pre-finished metal cladding. The proposed buildings will be designed to have a long service life with minimal maintenance.

An overall plan for site restoration, including plans for habitat compensation, tree replanting, revegetation and regrading will be developed.

10.2.5 Archaeological Potential

In support of the Clarkson WRRF expansion, a Stage 1 Archaeological Assessment (AA) was completed to identify any areas of potential archaeological significance within the study area. The Stage 1 AA established archaeological potential to exist within several parcels of land within the Stage 1 study area and a Stage 2 AA was recommended. Upon development of the preferred design concept, construction impacts were identified to potentially encroach on a parcel of land located at the northwest corner of the property that retained archaeological potential. As such, a Stage 2 AA was completed in that area which included test pit survey at 5-metre to 10-metre intervals. The Stage 2 AA identified extensive past disturbances within the Stage 2 AA study area. No archaeological resources were encountered during the Stage 2 AA; therefore, the Clarkson WRRF property is considered free of archaeological concern.

Mississaugas of the Credit First Nation (MCFN) and Huron-Wendat First Nation were involved in the review or the AAs, and their input was considered prior to finalizing the submissions to the Ministry of Heritage, Sports, Tourism and Cultural Industries (MHSTCI).

Should previously undocumented archaeological resources be discovered during construction, the Region of Peel will cease construction until the MHSTCI is contacted, and appropriate mitigation or resource recovery is implemented.

10.3 Technical Considerations

10.3.1 Topographic Survey

A topographic survey of the Clarkson WRRF site was completed 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.

10.3.2 Subsurface Utility Engineering (SUE)

As the existing Clarkson WRRF facility has extensive below-grade infrastructure throughout the property, a 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

Background information on the geotechnical and hydrogeological conditions of the Clarkson WRRF is provided in **Volume 2 Appendix F.** Surficial geology mapping from the Ontario Geological Survey (OGS) indicates that the site is underlain by fine-grained (clay and/or silt) glacial till derived from glaciolacustrine deposits or shale (OGS, 2010).

As documented in available subsurface investigations and geotechnical and hydrogeological reports previously prepared for the Clarkson WRRF, shallow rock is present throughout the site. Previously completed available investigations were conducted mainly in the area of the new primary sludge thickening facility. Detailed geotechnical, geochemical, and hydrogeological investigations at the proposed structure locations are required 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. Groundwater levels from reports in the biosolids area ranged from 2.75 metres to 5 metres below the ground surface. During construction of the proposed works, dewatering operations will be necessary to facilitate dry working conditions, and a Permit to Take Water 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 Ontario Regulation (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 Permit to Take Water (PTTW) from the Ministry of Environment, Conservation and Parks (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.

10.3.4 Environmental Risk Impacts

The Phase One ESA, as completed in Phase 2 of the 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, polychlorinated biphenyls (PCBs), as well as other industrial activities. It also documented the potential for the presence of designated substances such as asbestos and lead. Overall, eight Areas of Potential Environmental Concerns (APECs) were identified at the Clarkson WRRF; the locations of which are shown in **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, including but not limited to APECs 3, 4, 5, 6, & 8.

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.

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 Clarkson WRRF expansion has been designed to be adaptable and accommodate peak flows based on detailed flow analysis and considering wet weather impacts.
- The proposed expansion is outside of the regional floodplain.
- Hydraulic analysis indicates that the existing outfall has 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 Real Time Control (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.
- Preferred design concept incorporated energy conservation, as well as the potential to generate energy through the anaerobic digestion process.

10.3.6 Construction Management

A detailed Construction Management Plan (CMP) is to be developed during detailed design 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 CMP will also address the following considerations:

- Haulage of material;
- Impacts to existing trees;
- 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.

An Environmental Management Plan (EMP) will 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 Clarkson WRRF expansion scope of work is summarized in **Table 10-1**.

Table 10-1: Conceptual Capital Cost Estimate

Description	Amount (2022$)
Yard Works	$34,500,000.00
Administration Building	$4,982,000.00
Headworks	$36,011,000.00
Primary Clarifier	$29,190,000.00
Aeration Tanks	$53,349,000.00
Blower Building	$23,139,500.00
Secondary Clarifiers	$41,237,000.00
Chemical Building	$2,382,500.00
Disinfection	$280,000.00
Sidestream Treatment	$3,330,000.00
Drying Facility	$82,695,000.00
Digestion	$169,861,000.00
Electrical (Incl. New Service and 2MW Gen)	$21,400,000.00
SUBTOTAL FOR CONSTRUCTION (2022$)	**$502,357,000.00**
Subtotal for Construction (Rounded)	**$502,000,000.00**
Construction Contingency & Estimating Allowance (30%)	$150,600,000.00
Engineering (15%)	$75,300,000.00
General Contractor Overhead, Profit, Mobilization & Bond (15%)	$75,300,000.00
TOTAL CAPITAL COST ESTIMATE	**$803,200,000.00**

Table 10-2: Summary of Impacts and Mitigation Measures from Clarkson WRRF Expansion

Potential Impacts	Mitigation Measures	Additional Studies During Detailed Design	Monitoring Requirement	Net Effects
Natural Environment				
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 Clarkson WRRF. Adequate chlorination/dechlorination 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.
Expansion facilities are located to avoid sensitive natural areas on site to the greatest extent possible. However, the biosolids facilities will encroach on the non-provincially significant wetland categorized as MAM2 (Mineral Meadow Marsh).	Relocation and restoration of Mineral Meadow Marsh on site (southwest area). This created wetland will be re-constructed as a MAM2 vegetation community and meet the CVC's land-based offsetting requirements, as land will be replicated at a 1:1 ratio. A 10-metre buffer will be provided surrounding the constructed wetland in accordance with CVC guidelines.	The exact location, orientation, and shape of the constructed wetland will be determined at the detailed design stage.	Monitoring during construction by qualified personnel.	Relocation and restoration of Mineral Meadow Marsh on site (southwest area) will preserve the meadow marsh flora and fauna within the broader site area.
Non-provincially significant wetland in northwest corner of site (SWD2-2 - Green Ash Mineral Deciduous Swamp) has candidate SWH for Bat Maternity Colonies, including Species at Risk (SAR) (Little Brown Myotis).	Construction will avoid the area categorized as SWD2-2. Adequate buffer between construction working area and SWD2-2.	Opportunities to plant buffer area adjacent to SWD2-2 will be explored during detailed design as part of the overall landscaping plan.	N/A	No negative impacts are expected to the candidate SWH and candidate SAR (Little Brown Myotis) as a result of the proposed facility expansion.
Expansion could potentially increase runoff, impact water quality, and decrease infiltration.	The stormwater impact of the additional impermeable areas will likely be balanced by the addition of the new open tank areas. Site grading to be designed to drain to local swales, culverts, and catch basins that convey drainage to the existing storm sewer discharging to Lake Ontario. Site drainage structures will be designed in accordance with Region of Peel and/or City of Mississauga Standards. Plans to be consistent with City of Mississauga Southdown District Master Plan.	Prepare a Stormwater Management Plan. Develop and implement a site-specific spill management plan. Maintain all necessary mitigation measures on site in event of a spill.	Additional monitoring requirements to be identified during detailed design.	Potential impacts of increased runoff will be controlled to protect water quality.

Potential Impacts	Mitigation Measures	Additional Studies During Detailed Design	Monitoring Requirement	Net Effects
	Runoff, erosion and sedimentation, and spills will be controlled throughout construction.			
Climate Change: New treatment processes have the potential to increase Greenhouse Gas (GHG) emissions.	BNR treatment process selected to reduce chemical usage and to lower aeration requirements, resulting in lower energy use and GHG emissions. Less reliance on incineration to manage biosolids results in lower GHG emissions on a Region-wide basis. Beneficial land use of dried product provides carbon credit from replacement of commercial fertilizer. Biogas recovery from anaerobic digesters used to reduce natural gas consumption or to generate electricity and heat for process operations. To maximize the use of biogas the Region will continue to operate the existing CHP engine, and the planned second CHP engineer, to be commissioned by 2026.	Energy Recovery and Reuse details to be established during detailed design.	Additional monitoring requirements to be identified during detailed design and identified in the Amended ECA (Air and Noise).	Emission impacts will be controlled and meet applicable regulations.
Social/Cultural Environment				
New treatment processes have the potential to increase odour and air emissions	Air dispersion modelling was completed to compare the effects of the expanded plant against existing Ontario ambient air quality criteria. The analysis indicates that the odour impacts at identified sensitive receptors proximate to the plant are not expected to change appreciably as a result of the planned expansion; and that for all air pollutants assessed, the predicted cumulative concentrations were less than the respective criteria at all sensitive receptor locations. Odour mitigation measures planned at the expanded plant include 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).	The expansion is expected to 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 quality.
New treatment processes have the potential to increase noise impacts at nearby sensitive receptors.	The Acoustic Assessment Report (AAR) assessed the compliance of the existing condition of the Clarkson WRRF and the cumulative impact from existing noise sources with the source additions envisioned from the proposed capacity expansion against the applicable MECP NPC - 300 limits. Seven (7) representative Points of Reception (PORs) were identified and considered for this assessment which included three (3) accessible vacant lot receptors. Under the predicted worst-case noise emission scenarios, the Clarkson WRRF is expected to be compliant with the MECP NPC-300 limits both in its existing condition and also after the proposed capacity expansion (which includes noise attenuation measures).	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).	The expansion is expected to comply with MECP NPC-300 applicable standards and criteria and will meet the noise control requirements for obtaining a provincial Environmental Compliance Approval for noise.

Potential Impacts	Mitigation Measures	Additional Studies During Detailed Design	Monitoring Requirement	Net Effects
Increased truck traffic during construction. Increased truck traffic during operations to transport biosolids for beneficial use; partial offset as digested/dewatered sludge will no longer be trucked to G.E. Booth WRRF for incineration.	Drying technology selected to reduce the volume of biosolids and trucks required to transport off-site for beneficial use. Truck traffic and truck loading for construction and operations to meet by-law requirements. Third-party biosolids management firm responsible for haulage of biosolids product to provide Traffic Management Plans such that routes are selected to minimize local traffic impact with appropriate mitigation measures.	Traffic management plan (construction) Traffic management plan (transport of biosolids by third-party management firms)	N/A	Traffic management plans to meet Peel and City of Mississauga requirements.
Expansion of facilities may change the visual character of the area.	Clarkson WRRF is located in an industrial area, and expansion facilities are primarily at the northern and eastern portion of the property adjacent to other industrial users. Buffer remains between the WRRF and Lakeside Park. The proposed buildings will be designed to have a long service life and minimum maintenance. Proposed buildings will complement the aesthetics of the existing buildings on site with light precast concrete panels and pre-finished metal cladding. Landscaping of facility expansion will be completed including the additional wetland feature and other plantings.	Architectural features will be confirmed through detailed design.	N/A	No change in the visual character of the facilities at the plant site; further landscaping during construction to retain natural features on site.
Potential impacts to undiscovered archaeological resources	Stage 1 and 2 Archaeological Assessments (AAs) were completed. No archaeological sites were identified during the Stage 2 AA. The study area is considered free of further archaeological concern. Confirmation from the Ministry of Heritage, Sports, Tourism and Cultural Industries (MHSTCI) is being sought on the Stage 2 AA (approval of Stage 2 AA required before construction).	No additional studies needed.	Should previously undocumented archaeological resources be discovered during construction, the Region of Peel will cease construction until the MHSTCI 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 (Permit to Take Water).	N/A	No net effects expected.

Potential Impacts	Mitigation Measures	Additional Studies During Detailed Design	Monitoring Requirement	Net Effects
Areas of Potential Environmental Concern (APEC)	Phase 1 Environmental Site Assessment (ESA) indicated that there are 8 APECs on site with potential for designated substances such as asbestos and lead.	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	Real Time Control (RTC) in collection system helps manage peak flow events. Clarkson 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 outfall has the capacity to meet needs under design flows (hydraulic analysis indicated that the outfall has a peak flow capacity of 1500 MLD; slightly higher than the ECA’s peak flow capacity of1400 MLD).	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 Clarkson WRRF, as presented below in **Table 11-1**.

Table 11-1: Ongoing Works Summary

Project	Scheduled Dates
Cogeneration Expansion and Aeration Optimization Project	Q2 2022 to Q1 2026
Clarkson and G.E. Booth WRRF Instrumentation and Control Process (ICP) Consolidation Project	Q2 2023 to Q4 2024
Primary Sludge Thickening Facility Project	Q3 2022 to Q2 2026

The Region is also planning to clean the existing outfall and modify the outfall diffusers to improve outfall efficiency. The work plan will consist of an initial outfall condition investigation, removal of accumulated sediment in the outfall, and replacement of the existing outfall nozzles with duckbill diffusers. The outfall cleaning task must be completed during periods of reduced flow, so it should be completed prior to the initial commissioning of the East to West Diversion Tunnel in 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 Equipment Procurement

Per Peel's purchasing requirements, all technical specifications for equipment prepared for the plant expansion shall include a minimum of two acceptable named manufacturers plus an "Agency Approved Equal". Wherever possible, performance-based specification wording shall be used (i.e., not tied to single manufacturers) to clearly identify grade and quality requirements while ensuring industry wide competition, and therefore value to the Region.

Procurement options for major pieces of equipment will be considered to provide the Region with the greatest value while minimizing schedule risks. Some major process equipment systems differ substantially in terms of layouts and requirements while having the same process capacity. Major process equipment delivery times may also significantly affect the overall schedule which was an important screening criterion for the Region during the Class EA process when evaluating secondary treatment technologies at Clarkson WRRF. In addition, with recent market volatility and supply shortages, issues may arise with increasing costs and supply timelines.

Pre-selection results in a separate equipment supply contract and has the advantage of targeting the preferred equipment, while sole accountability remains with the General Contractor. It can be appropriate based on experience with equipment and/or continuity throughout the facility. However, it can result in sacrificing competitive pricing as the supplier will have no competition.

Pre-purchasing of equipment by the Region can be considered in cases where certain equipment has demonstrated long-delivery times that could adversely impact the schedule. However, the Region would become responsible for any delay and coordination issues rather than the Contractor with potential cost impacts.

The following major equipment is recommended for pre-selection:

- Primary clarifier mechanism
- Process blowers
- Channel aeration
- Direct thermal drying
- Standby generators
- Sidestream treatment system

11.1.3 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 Clarkson WRRF be packaged into five separate engineering assignments as follows:

- Engineering Assignment 1: Liquids Process Expansion
- Engineering Assignment 2: New Digesters and Beneficial Gas Reuse
- Engineering Assignment 3: Operations Building
- Engineering Assignment 4: Existing Digester Replacement
- Engineering Assignment 5: Drying Facility

The site areas affected by these engineering assignments are shown in **Figure 11-1** and are described further in the sections below

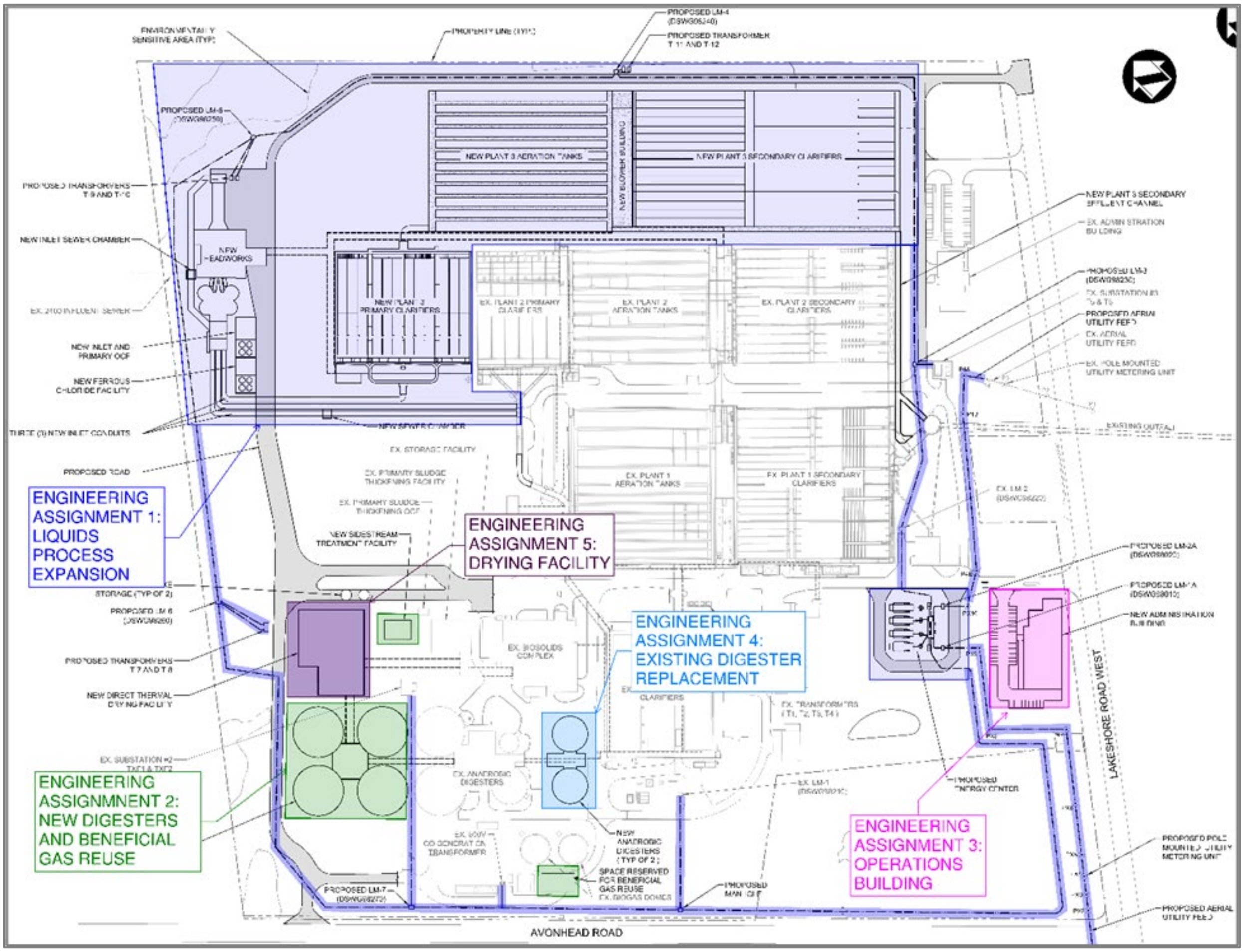


Figure 11-1: Clarkson WRRF Engineering Assignments

11.1.3.1 Engineering Assignment 1: Liquids Processing Expansion

The construction of the liquids process expansion under Engineering Assignment 1 could be broken up into three different construction contracts as described below.

11.1.3.1.1 Contract 1-1: Site Preparation and Electrical Upgrades

Contract 1-1 would involve the construction of a new 28 kV underground power distribution grid around the perimeter of the property as well as a new Energy Center. Once the new underground power distribution system is connected to the existing plant, the existing aerial power distribution lines throughout the property would be removed. Tie-ins to existing equipment would be done in a phased manner to minimize disruptions to operations. The Region could consider adding site preparation for the Liquids Process Expansion as part of this contract.

11.1.3.1.2 Contract 1-2: Headwork, Chemical Building, and Odour Control

The existing headworks capacity is limited and is expected to reach its capacity around 2026, when the East to West Diversion project is completed. To accommodate the increase in flows, construction of a new headworks connecting to the existing 2,400 mm diameter influent sewer is required. To allow construction of the headworks facility while maintaining flows to the plant, new chambers would be required around the existing influent sewer. The new Inlet, Plants 2 and 3 Primary Clarifier Odour Control Facility (OCF), and the ferrous chloride facility could also be constructed as part of this contract. Depending on the phasing considerations for the new headworks, the existing headworks building could be maintained for a portion of the influent flow or decommissioned after commissioning of the new headworks.

11.1.3.1.3 Contract 1-3: New Plant 3

Contract 1-3 would include construction of the new primary clarifiers, aeration tanks, secondary clarifiers, a new blower building, and upgrades to increase the chemical storage and feed capacity of the disinfection system. It would also require demolition of the existing Plant 2 OCF. This construction can occur in parallel with the construction of the new headworks in Contract 1-2. However, the works must be staged to avoid interference with either a connection of the Plant 2 primary clarifiers to the new OCF or a temporary odour control facility. Provisions must be made in both Contracts 1-2 and 1-3 to clearly delineate the work area limits and work staging, as well as to facilitate a connection to the new OCF.

11.1.3.2 Engineering Assignment 2: New Digesters and Beneficial Gas Reuse

The new digester and beneficial gas reuse expansion engineering assignment would manage two independent construction contracts, as described below:

11.1.3.2.1 Contract 2-1: Site Preparation and Excavation

Due to the depth of the new digester structures, rock excavation will likely be required. Considering the additional effort and risk involved with rock excavation, the Region could consider executing this scope in a separate early contract prior to the construction of the new digesters.

11.1.3.2.2 Contract 2-2: New Digesters and Beneficial Biogas Reuse

Four new digesters would be constructed as part of Contract 2-2. The new digesters need to be online and commissioned prior to demolishing and replacing existing Digesters 1 and 2. With the additional capacity provided by the new digesters, the replacement of the two existing digesters can be deferred to a separate contract. This contract would also include construction of the sidestream treatment facility, as well as the beneficial biogas reuse expansion.

11.1.3.3 Engineering Assignment 3: Operations Building

The construction of the new Operations Building is separated out from the other contracts as it does not require specialized civil, mechanical, and electrical contractors. Due to the increased number of required staff, the Operations Building should be constructed in time for the commissioning of New Plant 3.

11.1.3.4 Engineering Assignment 4: Existing Digester Replacement

The demolition and replacement of existing Digesters 1 and 2 can be delayed due to the additional capacity provided by the new digesters. The existing Digesters 1 and 2 would be replaced within the existing area. During detailed design, a condition assessment of the existing digesters is recommended to determine existing structures that can be re-used or re-purposed as part of the replacement project.

11.1.3.5 Engineering Assignment 5: Drying Facility

This engineering assignment would manage a single construction tender for the construction of a new drying facility. This contract could be delayed by continuing to leverage G.E. Booth WRRF's available incineration capacity and by using third-party biosolids management firms for offsite biosolids management.

The Region may consider different methods of implementation for the drying facility. Several agencies implementing drying technologies have selected Design, Build, Operate and Maintain (DBOM) or Design, Build, Finance, Operate and Maintain (DBFOM) contracts. With these approaches, the operating entity retained would also be responsible for the management and marketing of the dried product. There are also other forms of alternative delivery models that the Region could consider. It is recommended that a preliminary design (30% detailed design) be completed at a minimum to support alternative delivery procurement.

11.2 Proposed Schedule for Construction

The proposed schedule is shown in **Figure 11-2**, with key delivery dates listed below:

- The wastewater treatment expansion is required in time for the entire 150 MLD diversion planned for 2031.
- The new digesters, and beneficial biogas reuse expansion will be required for 2031.
- The existing Digesters 1 and 2 can be replaced after commissioning of new digesters and be operational for 2033.
- Through leveraging both available incineration capacity at G.E. Booth WRRF until the end of its useful life and third-party vendors for biosolids management, the drying facility can be delayed to 2035.

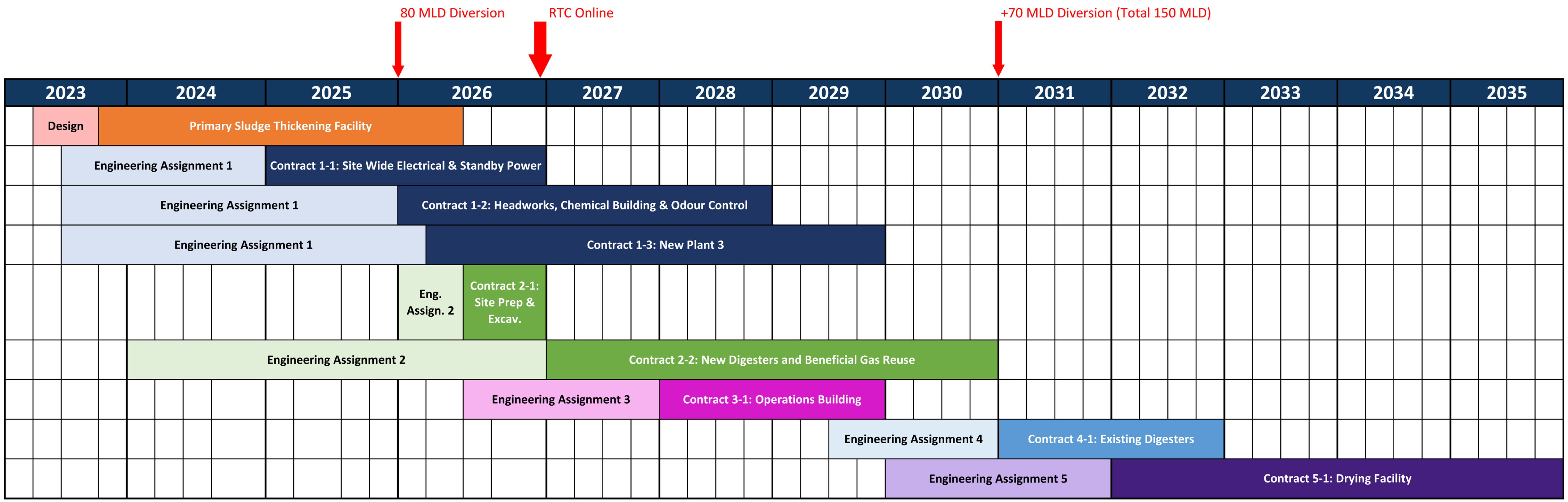


Figure 11-2: Proposed Engineering Assignment and Contract Schedule

11.3 Planning for Beyond 2041

Although population growth forecasts beyond 2041 are not known or confirmed, potential requirements for expansion beyond the 2041 planning period were taken into consideration when determining the conceptual site layout. This allowed for efficient use of the site for the Plant 3 expansion, while providing flexibility should a Plant 4 expansion be required in the future. Facilities for the Plant 3 expansion were located closely together to preserve space within the site. In addition, the Plant 3 expansion is planned with flexibility to integrate new technologies for capacity intensification. Peel is continuing to monitor future wastewater requirements in their system to identify long term needs, including space requirements at the Clarkson WRRF. Based on the results, it is recommended that Peel consider purchase of additional land adjacent to the Clarkson WRRF.

The Region should also continue to monitor biosolids management market changes and identify new treatment requirements to allow biosolids beneficial use. The Region should also consider the future sludge management approach at the G.E. Booth WRRF (beyond 2041) to update the biosolids management strategy at the Clarkson WRRF from a regional perspective.

11.4 Permits and Approvals

Table 11-2 summarizes a list of permits and approvals that will be required for the Clarkson WRRF expansion. These permits and approvals will be sought during the detailed design of the project.

Table 11-2: Preliminary Approvals and Permitting Requirements for Detailed Design

Permitting and Approval Agency	Permit / Approval Required	Permit / Approval Description
Ministry of Heritage, Sport, Tourism and Culture Industries (MHSTCI)	No further approvals	• The Stage 2 AA is currently being reviewed by First Nations communities prior to submission and to the Ministry of Heritage, Sports, Tourism and Cultural Industries (MHSTCI). Once confirmation by the MHSTCI of the Stage 2 AA, the Region may proceed with construction. • Should previously undocumented archaeological resources be discovered during construction, the Region of Peel will cease construction until the MHSTCI 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 Clarkson 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 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.

Permitting and Approval Agency	Permit / Approval Required	Permit / Approval Description
Ministry of Natural Resources and Forestry (MNRF)	Scientific Collectors Permit from MNRF under Fish and Wildlife Act for the wildlife removal/rescue	• Expansion facilities will encroach on the non-provincially significant wetland (Meadow Marsh Wetland) and which will be relocated and restored elsewhere onsite. Relocation of wildlife as part of the removal of the wetland features will be required and MNRF
Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA),	Applications under Nutrient Management Act (NMA) for land application approval (by third-party management firms)	• The solids management facilities will be designed to produce biosolids that meet the NMA Act requirements. • Third-party Management 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.
Credit Valley Conservation Authority	Application under the Development, Interference with Wetlands and Alterations to Shorelines and Watercourses	• A permit from CVC will be required to relocate and restore the non-provincially significant wetland. The relocation/restoration plan will be confirmed through the detailed design stage. • Erosion and sedimentation control (ESC) plans for the site will also be developed as part of the detailed design phase. • If dewatering activities are required during construction, a dewatering plan is to be submitted to CVC for review, along with the ESC plan. • Feature-based water balance for the headwater drainage feature (HDF), as outlined in CVC's SWM Guidelines. The overall objective of the feature-based water balance is to maintain the quantity (volume, timing, and spatial distribution) of the surface water and groundwater contributions from the pre-development to post-development condition per the preferred alternative involving alteration of a portion of the HDF.

Permitting and Approval Agency	Permit / Approval Required	Permit / Approval Description
Credit Valley Conservation Authority	Site Plan Approvals	• An approval from CVC will be required to confirm that the proposed stormwater management (SWM) strategy put forward in the SWM Report addresses CVC's stormwater management criteria. The site-specific criteria will be confirmed at the detailed design stage however it is expected that the site will be required to 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
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 Digesters 1 and 2 • A demolition permit is required under City of Mississauga Demolition Control By-Law.
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

Permitting and Approval Agency	Permit / Approval Required	Permit / Approval Description
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.

11.5 Stakeholder Communications

Peel will continue to communicate and engage with key stakeholders through the design and construction process. Approval agencies identified in **Table 11-1**, will continue to be engaged to receive approvals prior to construction. Negotiations with third-party management firms will also continue through design for biosolids product management. As indicated, the Region may consider a Design, Build, Operate and Maintain (DBOM) agreement or a Design, Build Finance, Operate and Maintain (DBFOM) agreement to implement the drying improvements. Construction schedules will also be communicated to the local community.

11.6 Risk Management

From study outset, 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 has been developed to minimize risks. Following the Class EA process, pre-identified risks will continue to be monitored and managed as **Table 11-3.**

Table 11-3: Clarkson WRRF Preferred Design Concept: Risks Management During Design, Construction, and Operation

Risk Description	Risk Strategy Implementation Plan
Construction	• Detailed geotechnical, hydrogeological and ESA investigations to be completed during detailed design • Separate contracts and staging of works
Operational	• Additional operator training for BNR; but design retains flexibility to operate as CAS similar to existing for maximize resiliency. • For drying facility, opportunity to consider Qualified Third-party for any combination of design, build, finance, operate, maintain, and market dried fertilizer product
Long-Term Sustainability	• Continue to monitor long-term wastewater treatment needs to ensure adequate space is available at Clarkson WRRF to meet long-term needs. If additional space is required, consider purchase of additional land adjacent to the Clarkson WRRF. • Continue negotiations with third-party management firms for biosolids products (both digested/dewatered cake and dried product) during design to develop reliable, cost-efficient contracts • During design consider opportunities for intensification within existing facilities leveraging developing technologies (aerobic sludge granulation, MABR, etc.)

Risk Description	Risk Strategy Implementation Plan
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
Procurement	• Planned as two separate engineering assignments (liquids and biosolids) for coordinated delivery of multiple contracts within a tight schedule. • Multiple parallel design-bid-build (DBB) contracts with time-space separation • Drying facility and new digesters are in close proximity introducing risk of completing as separate construction contracts. With careful delineation and sequence planning, it should be possible to deliver as separate contracts opening up opportunity to have drying facility as DBOM, DBFOM or similar including product marketing.
Third-Party Management Firm	• Several discussions with Third-party management firms; all have indicated interest in managing Peel Biosolids either through an on-site facility at Clarkson or through their own off-site facilities. Some indicated they will expand their operations to service Peel with a long-term contract (10-year or similar) commitment. This has been demonstrated already with Clarkson currently managing approximately 50% of biosolids cake through third-party management firms. • Engage Third-party management firms early in design
Biosolids Market Availability	• Discussions with third-party management firms indicated interest in receiving some or all of Clarkson biosolids. • Market review indicates that markets area available, particularly on agricultural land. • Recommend diversified approach with multiple management firms and multiple outlets is recommended for Clarkson to mitigate risks of a single management firm or outlet. • Long-term regulations are unknown and add some uncertain in terms of contaminants of emerging concern (i.e., PFAS, etc.); however, anticipate this to be well into the future for Canada.

Risk Description	Risk Strategy Implementation Plan
Schedule (Need to have expansion in place by 2029)	• Schedule is achievable. However, there is minimal float in overall schedule to issue RFP to retain consultants for engineering assignments, complete design, tendering and construction of this large capital program. Will require careful monitoring and mitigation plans to reduce schedule risk. • Recommend multiple parallel contracts with time-space separation to reduce risk of one contract delaying others. • Pre-purchase equipment • Capital phasing plan; multiple contracts
Community Concerns	• Continue to communicate with local public regarding schedule for construction • Traffic Management Plan to be developed for construction • Ensure third-party management firms have Traffic Management Plans in place for transporting biosolids that minimize impacts to communities

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 Municipal Engineers Association (MEA) Municipal 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 Municipal Class EA consultation requirements for Schedule C projects.

To fulfill the consultation requirements of the MEA Municipal Class EA and enhance the overall Class EA process, the Clarkson 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.

Peel's overall Communications, Consultation and Engagement Program was driven by five 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.
- 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 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 O**.

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:

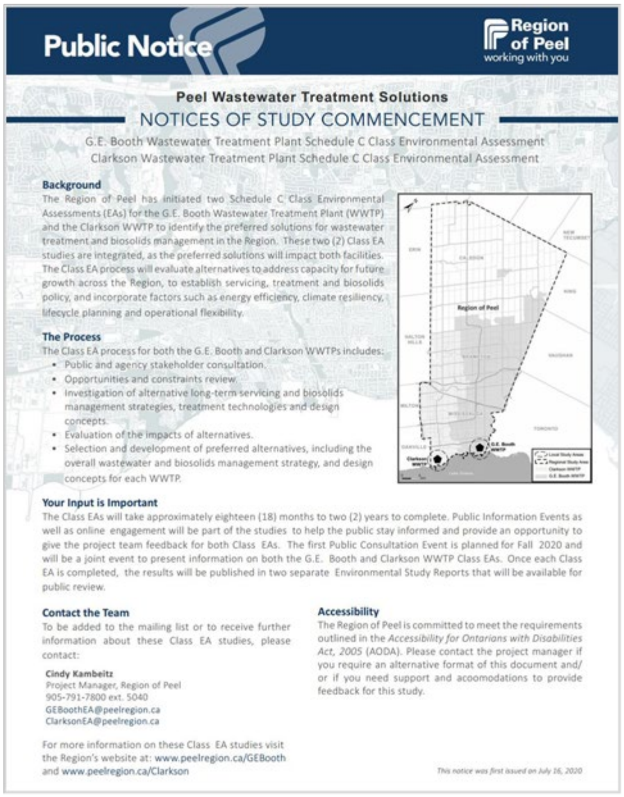
- City of Mississauga
- Credit Valley Conservation (CVC)
- Ministry of Environment, Conservation and Parks (MECP)
- Ministry of Heritage, Sports, Tourism and Culture Industries (MHSTCI)

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 distribution to 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 P**.

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 undated 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 Webpage. 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 Clarkson 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

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.

Documentation of the notifications, presentation materials, and comments/responses for each PIC are provided in **Volume 4 Appendix Q**, 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 Clarkson WRRF Class EA and G.E. Booth 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 Clarkson WRRF Class EA and G.E. Booth 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
Live event: May 11, 2022 Comment Period: May 16, 2022, to May 26, 2022	To present and receive input on: • Evaluation of design concepts • Recommended Design Concept Measure to mitigate impacts and minimize risks	Live virtual PIC, with display panels	June 9, 2022

12.6.1 Virtual PIC 1

12.6.1.1 Notice of Virtual PIC 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.

12.6.1.1.1 Virtual PIC 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 Q**), 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 PIC 2

12.6.2.1 Notice of Virtual PIC 2

The Notice of 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 PIC 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 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 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-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 28th, 2020, in the form of a summary handout which is included in **Volume 4 Appendix Q**.

12.6.3 Virtual PIC 3

12.6.3.1 Notice of Virtual PIC 3

The Notice of PIC #3 was issued via mail and email to the master list of stakeholders used during the first and second PIC, updated to remove any stakeholders as requested, as well as include stakeholders who requested future notification after the first or second PIC through the various project communication platforms. The notice was issued on April 28, 2022. The notice was also posted on the project webpages and published in the local Mississauga newspaper, “The Mississauga News”. The Notice of Virtual PIC 3 was issued via mail and/or email to approximately 210 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 three occasions; May 4, 2022, May 10, 2022, and May 25, 2022.

12.6.3.2 Virtual PIC 3 Event

A live facilitated virtual PIC was held on May 16, 2022, to allow stakeholders to ask questions directly of the Project Team. The purpose of the public information event was to present the findings of Phase 3 of the Class EA process 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.

Although only 3 stakeholders attended the live PIC, approximately 60 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 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

- Landscaping of the site following construction

Similar to Virtual PIC 2, 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 Q**.

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 R**.

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 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: A second formal virtual meeting was held with City staff on April 13, 2022, to present the Phase 3 assessment of alternative design concepts for expansion of the Clarkson WRRF, and the preliminary recommended alternative. City staff had no further comments at the time.
- Review of Draft ESR: The City was contacted on October 19, 2022, to discuss the final results and filing of the ESR. As requested, a summary of the ESR findings, along with the preferred design concept, impacts, and measures to mitigate impacts was provided to City staff for review. No additional comments were received.

The City of Mississauga is generally supportive of the Clarkson WRRF expansion, provided that impacts on natural and surrounding park features are mitigated, the overall plan considers the City's Southdown District Stormwater Servicing and Environmental Management Master Plan (July 2022), 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 (CVC)

In response to the Notice of Commencement, CVC provided detailed comments on the Clarkson 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 21, 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 preferred design concept was selected and more detailed natural feature investigations were undertaken, the project team met with CVC to discuss impacts, mitigation measures, and restoration measures on April 4, 2022. Based on the information received, the project team updated the preferred design concept to avoid natural features on site to the extent possible, and further developed mitigation measures.
- Final Input on Mitigation and Compensation Measures: CVC was contacted on October 14, 2022 and provided with an updated Natural Heritage Characterization Report (GEI, October 2022) (**Volume 2 Appendix 2A**), which reflected the additional information requested by the CVC per their comments provided on May 5, 2022. CVC was also provided the Natural Heritage Impact Assessment Report (GEI, October 2022) (**Volume 2 Appendix 2B**) on October 26, 2022, which provided additional details related to the environmental mitigation measures proposed on site. A follow-up meeting was held on November 10, 2022, to discuss the ESR findings, conceptual design of the Clarkson WRRF expansion, and the proposed mitigation measures included within the provided reports, prior to finalizing the ESR. The CVC indicated that the provided reports met their requirements and offered suggestions to continue to develop mitigation and restoration measures during detailed design.
- Review of Draft ESR: At the meeting on November 10, 2022, CVC requested a copy of the Draft ESR which was subsequently provided to CVC representatives on November 17, 2022. Further comments from CVC were provided to the project team on December 19, 2022. Responses were provided to CVC's comments on December 21st, 2022 with the requested updates incorporated into the ESR document.

CVC is generally supportive of the Clarkson 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 (MECP)

At the commencement of the project, the Ministry of the Environment, Conservation, and Parks (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.
- November 22, 2021: 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.
- October 18, 2022: A summary of the Phase 3 process, the recommended design concept, measures to mitigate impacts, and net effects were presented to the MECP. Final comments on the draft assimilative capacity study were also received, as well as final agreement on the proposed effluent limits and objectives. The MECP also provided information related to finalizing the ESR.

A draft of the ESR was provided to the MECP on December 14, 2022 for their review and comment prior to finalizing and filing of the ESR. Key appendices were also provided including the RWIA (**Volume 2 Appendix B**), the AQIA (**Volume 2 Appendix C**) and the AIA (**Volume 2 Appendix D**). MECP provided comments on the AQIA on April 14, 2023 which were incorporated into the ESR document. MECP will continue to be engaged through detailed design to ensure their requirements are met and appropriate approvals received.

12.7.4 Ministry of Heritage, Sports, Tourism and Culture Industries (MHSTCI)

The Ministry of Heritage, Sports, 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 Archaeological Assessments (AA) were completed for the Clarkson WRRF. After being reviewed, updated, and accepted by the Mississaugas of the Credit First Nations (MCFN) and the Huron-Wendat First Nation, MHSTCI was provided final copies of the Stage 1 AA’s and Marine AA for final signoff.

MHSTCI was also notified that a Stage 2 AA was recommended for planned expansion areas on the Clarkson WRRF that were identified as having potential for archaeological resources. The Clarkson WRRF Stage 2 AA (along with the Clarkson WRRF Stage 1 AA) are provided in **Volume 2 Appendix E**. The Stage 2 AA cleared the Clarkson WRRF expansion area of archaeological resource potential and was submitted to the MHSTCI for review. If unknown archaeological resources are discovered during construction, the Region will stop construction and consult with MHSTCI regarding measures to mitigate or remove.

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

These Communities continued to receive project updates and notices throughout the Class EA. In addition, based on recommendations from the MECP, the First Nations Communities were also provided with 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 S**.

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 2 Archaeological Assessments (AAs), and provide comments, prior to submitting to the MHSTCI, 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 Clarkson WRRF Class EA, and particularly the results of the AAs. In reviewing the Stage 1 AA, the MCFN indicated that there was potential for archaeological resources on a larger area of the site than initially identified by the Project Team archaeologists. In response to the MCFN comments, the Stage 1 AA was updated to include the additional area.

A Stage 2 AA was then completed. Although the MCFN were invited to participate in the Stage 2 AA, they were not able to attend due to scheduling conflicts, and limited resources. However, they reviewed the Stage 2 AA and did not have questions or comments about the archaeological work conducted or the content of the report.

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 (FN) indicated early in the process that they wished to participate in the Class EAs. The Huron-Wendat FN 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 FN in the Stage 1 and 2 AAs was also provided to the Region. Although the Huron-Wendat FN were invited to participate in the Stage 2 AA, they were not able to attend due to scheduling conflicts. However, they reviewed the Stage 2 AA and did not have any comments about the archaeological work conducted. The Huron-Wendat FN 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 (SNGR)

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 through the EA process (i.e., received notices of PICs, the project websites). No comments were received during the process. However, at the draft ESR stage, the Haudenosaunee Development Institute (HDI), which is a department of the Haudenosaunee Confederacy Chiefs Council, responded that they did not support the project, nor the Region's overall wastewater and water servicing strategy as identified in the 2020 Master Plan. Senior management at Peel Region have been working 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.

12.9 Comments on the Draft ESR by the MECP

The MECP received a copy of the Draft ESR for review and provided comments in a letter to the Region dated December 20, 2022. As per the letter, the Ministry indicated that it is:

"*…generally satisfied with the report, and that with the implementation of mitigation measures, any adverse environmental effects will be avoided, or where avoidance is not possible, minimized. The ministry supports the preferred solutions for the Clarkson WRRF, which should result in positive environmental impacts by implementing processes and technologies that reduce reliance on the transportation and incineration of sludge, reduce greenhouse gas emissions, and provide beneficial products for land application.*"

The Ministry did however have specific comments and information requests on the draft ESR, relating primarily to the air quality assessment, and the receiving water assessment. Details on the comments received and the responses are provided in **Volume 4 Appendix T**. This final ESR has been updated to reflect these comments.

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 input incorporated into the ESR document where appropriate.

Table 12-2: Comments and Responses

Stakeholder	Comment/Concern	Response
Government Agencies		
City of Mississauga	Interested in how projects may impact City Parks, and other surrounding City land uses. Interested in the concept plan and stormwater management plan.	The preferred design concept has been developed to minimize risks to parks and other surrounding land uses, through odour, noise, and air emission controls, as well as stormwater management and site grading. The Region will continue to communicate with the City of Mississauga during detailed design to receive site plan approval and building permits.
Credit Valley Conservation (CVC)	CVC's concerns relate to ensuring that the WRRF expansion continue to protect property from flooding and erosion, protect natural areas, and protect aquatic and natural habitats.	The project team revised the preferred design concept to avoid natural areas on site to the extent possible in response to CVC input. The Region will continue to work with the CVC to develop restoration plans on site and to receive approvals during design.
Infrastructure Ontario (IO)	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 were also 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. 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 were updated to reflect comments received from the MECP. Impacts to natural, social, and cultural environments are expected to be minimal and will be mitigated. Species at Risk (SAR) are not expected to be impacted as a result of the expansion. There is limited SAR on site, and the area of concern has been avoided and buffers are also provided. There is a non-provincially significant wetland on-site and the Region is working with the CVC to relocate on-site. Odour and noise impacts will also be mitigated. The Region will continue to work with the MECP during detailed design to obtain the required permits and approvals. The MECP reviewed the Draft ESR and indicated that they were in general agreement with the preferred undertaking, and measures to mitigate impacts. The Minister also provided comments and information requests, which were addressed and reflected in the ESR.
Ministry of Heritage, Sports, Tourism and Culture Industries (MHSTCI)	MHSTCI is interested in any technical cultural heritage studies being undertaken at each WRRF.	MHSTCI were provided copies of the Stage 1 AA and Stage 2 AA. 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 MHSTCI regarding measures to mitigate or remove.
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.

Stakeholder	Comment/Concern	Response
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 and 2 AAs. The Clarkson WRRF Stage 1 AA was updated as per MCFN comments, and no comments were provided regarding the Stage 2 AA.
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 and 2 AAs. They have no concerns regarding the Stage 2 AA or the expansion project.
Six Nations of the Grand River.	No comments.	N/A.
Haudenosaunee Development Institute (HDI), a department of the Haudenosaunee Confederacy Chiefs Council	No comments through EA process. Indicated at the Draft ESR stage that they did not support the project, as well as Peel's overall water and wastewater servicing program.	Region senior management have been working 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.
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 Peel's overall wastewater management strategy, Water Efficiency and I/I Control Programs have been included as reducing flows to the wastewater collection system 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 Peel'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 Clarkson 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 Clarkson 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.

The preferred alternative includes:

- Diversion of flows through the East-to-West Trunk sewer to alleviate current capacity challenges at the G.E. Booth WRRF, while taking advantage of surplus capacity at the Clarkson WRRF.
- Expanding the existing Clarkson WRRF from a rated capacity of 350 MLD to 500 MLD by the year 2029. The expansion will include providing additional preliminary treatment, primary treatment, and disinfection capacity by using the same existing technologies at the plant and providing additional secondary treatment capacity through the implementation of BNR.
- Digested/dewatered sludge produced at the Clarkson WRRF will no longer be trucked to the G.E. Booth WRRF for incineration. Additional solids treatment capacity will be provided at the Clarkson WRRF through the construction of additional digesters and a drying facility.
- Biosolids produced through the new solids treatment processes at the Clarkson WRRF will be a digested/dewatered cake product and a dried product that will be collected and distributed for beneficial land use by third-parties.
    - The digested/dewatered cake can be applied directly on agricultural lands, or further treated by third-party management firms for use as a fertilizer.
    - The dried product can be used directly as a fertilizer.

Consideration of potential impacts and mitigation was included as part of the evaluation of alternatives to identify net effects. Overall, the preferred alternative will have neutral to positive net effects on the environment and community. Total phosphorus 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. The Natural Heritage Characterization and Impact assessments have shown that there are limited natural habitats and species at risk on and surrounding the site. The expansion has been planned to avoid and protect these areas. There will be some encroachment on a non-provincially significant wetland on site and some tree removals will be required. Landscaping plans will include relocating the wetland on-site to preserve the feature, as well as tree replanting along the southern frontage of the Clarkson WRRF to maintain a buffer between the plant and the parklands south of Lakeshore Blvd. Stage 1 and 2 archaeological assessments were undertaken as part of the Class EA and have cleared the expansion areas of archaeological potential.

The design will include measures to control air emissions, odour, and noise. The Air Quality Impact Assessment (AQIA) and Acoustic Impact Assessment (AIQ) indicate that with these controls the expanded WRRF will comply with all applicable standards and criteria. The expansion facilities will be designed to complement the aesthetics of the existing buildings on site, 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.

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. Treatment of solids at the Clarkson WRRF means less reliance on incineration resulting in lower GHG emissions on a regional basis. Beneficial land use of dried product also provides carbon credits from the replacement of commercial fertilizer. The new BNR treatment process will reduce chemical usage and lower aeration requirements, thereby resulting in lower energy use and GHG emissions. Finally, biogas recovery from anaerobic digesters will be used to reduce natural gas consumption or to generate electricity and heat for process operations.

Consultation with the public, government agencies, Indigenous Communities, and other stakeholders was undertaken throughout the course of the Class EA study and to date, there were no comments received that have not already been addressed or cannot be addressed as the project proceeds through detailed design. Particular emphasis was placed on consulting and engaging with the Mississaugas of the Credit First Nation (MCFN) and the Huron-Wendat First Nation as the site is located on their traditional lands. These communities were engaged through the Class EA, including review and input into archaeological assessments. No concerns were 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, hydrogeological, environmental site assessments (ESAs), and subsurface utility investigations (SUE).
- Develop plans to manage stormwater, dewatering, truck traffic, and excess soils during detailed design.
- Implement the approved mitigation and monitoring measures during design and construction.
- Establish contracts with third-party management firms to transport, store, use, or distribute the biosolids products produced at the Clarkson WRRF.
- Continue to monitor environmental, regulatory, and market trends to effectively plan for meeting wastewater treatment and biosolids management needs beyond the year 2041.

The Region of Peel is planning to begin design on the Clarkson WRRF expansion project upon approval of this Schedule C Class EA, and to complete construction of this project by the year 2029