Ontario Clean Water Agency (OCWA)

Havelock Wastewater Treatment Plant Schedule C Municipal Class Environmental Assessment

Environmental Study Report

Thursday, April 27, 2023

T001546A

CIMA+

500-5935 Airport Road
Mississauga, ON L4V 1W5
T 905 695 1005   **F** 905 695 0525
cima.ca

Contact

Mina Yousif, M.Eng., P.Eng., PMP
mina.yousif@cima.ca
T 905 695 1005, 5776

Engineering for **people**

Environmental Study Report

Class Environmental Assessment for the Havelock Wastewater Treatment Plant

Project No. T001546A

Prepared by:

Marisa Scott, P.Eng.

Verified by:

Gustavo Arvizu, M.Eng., P.Eng., ENV SP

Mina Yousif, M.Eng., P.Eng., PMP

Table of Contents

List of Tables

List of Figures

List of Appendices

Appendix H: Comment Log

1 Introduction

The Township of Havelock-Belmont-Methuen (Township) is a small community located in central-eastern Ontario, in the County of Peterborough. The Village of Havelock is a community within the Township with a population of approximately 1,518 people. The Village is serviced by the Havelock Wastewater Treatment Plant (WWTP) located at 719 Old Norwood Road and operated by the Ontario Clean Water Agency (OCWA). The wastewater treatment system originally consisted of two sewage lagoons, which were taken out of service in 2009. A new mechanical treatment plant was constructed in 2009 consisting of a sequencing batch reactor treatment system followed by tertiary effluent filtration and ultraviolet disinfection. Treated effluent is discharged to the nearby Plato Creek in accordance with the requirements defined in Certificate of Approval (C of A) number 7399-7YTUGW, issued on December 22, 2009. The Havelock WWTP not only services the urban area of the Village of Havelock but also receives septage from rural areas of the Township. The septage received is stored in the septage holding tank at the plant and is slowly pumped to the raw wastewater pumping station wet well where it mixes with the incoming sewage.

In 2018, a Functional Servicing Study for the Township of Havelock-Belmont-Methuen (Engage Engineering Ltd., 2018) was completed to assess the impact of a new mixed-used development area on the Township's water, wastewater and stormwater infrastructure. The report concluded that the new development would lead to an increase in wastewater flows to the WWTP and that the resulting flows would exceed the rated capacity of the Havelock WWTP.

A strategic wastewater servicing approach is necessary to ensure the wastewater infrastructure satisfies the needs of future growth, while maintaining the desired level of service to existing residents. As a result, the Township, in association with OCWA, completed a Schedule C Municipal Class Environmental Assessment (Class EA) Study to identify the preferred wastewater servicing strategy to support growth in the Township.

This Environmental Study Report (ESR) documents the findings of the Class EA Study.

2 Study Area

The Study Area for this Class EA covers the municipal boundaries of the Township. A Study Area boundary map is shown in **Figure 1.** The Havelock WWTP is located at 719 Old Norwood Road. Infrastructure upgrade/expansion alternatives are limited to the WWTP's existing site boundaries as shown in **Figure 2.**

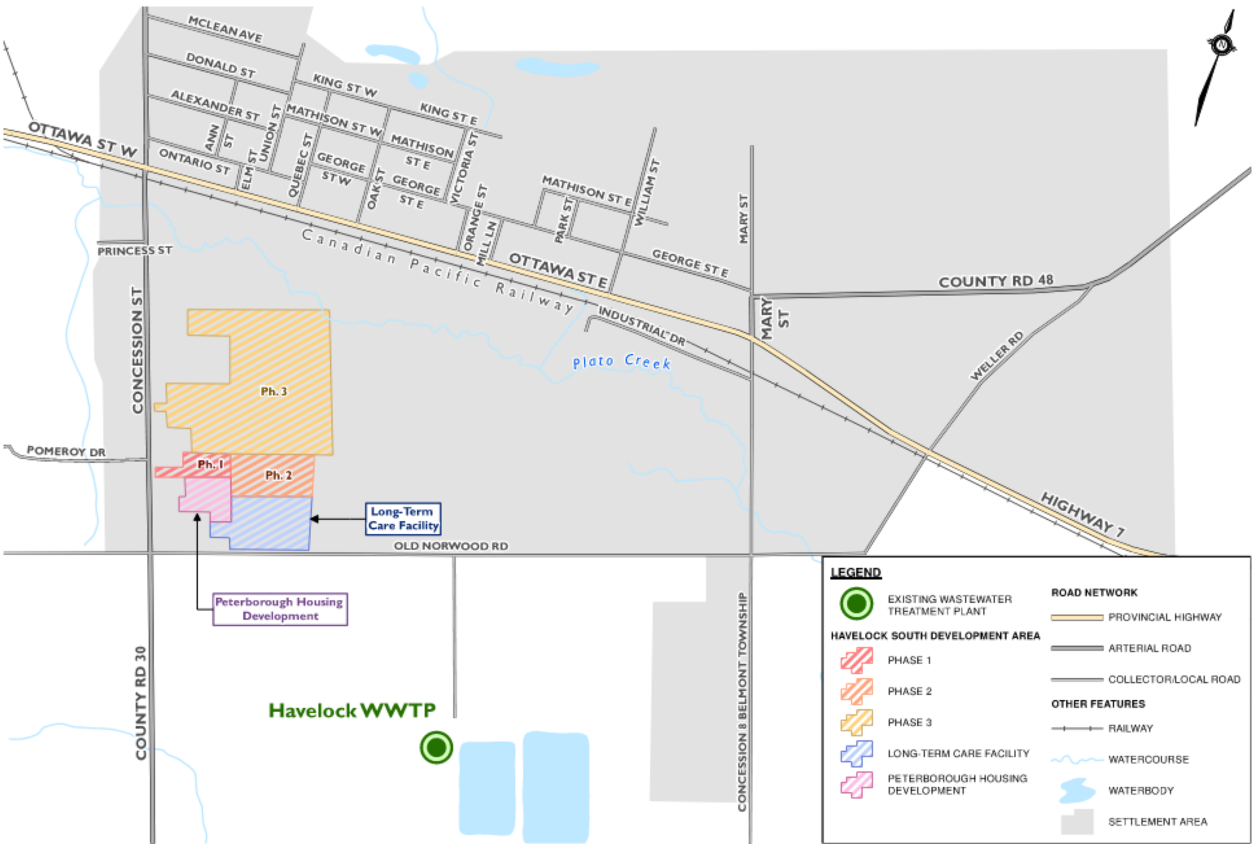

Figure 1: Class EA Study Area

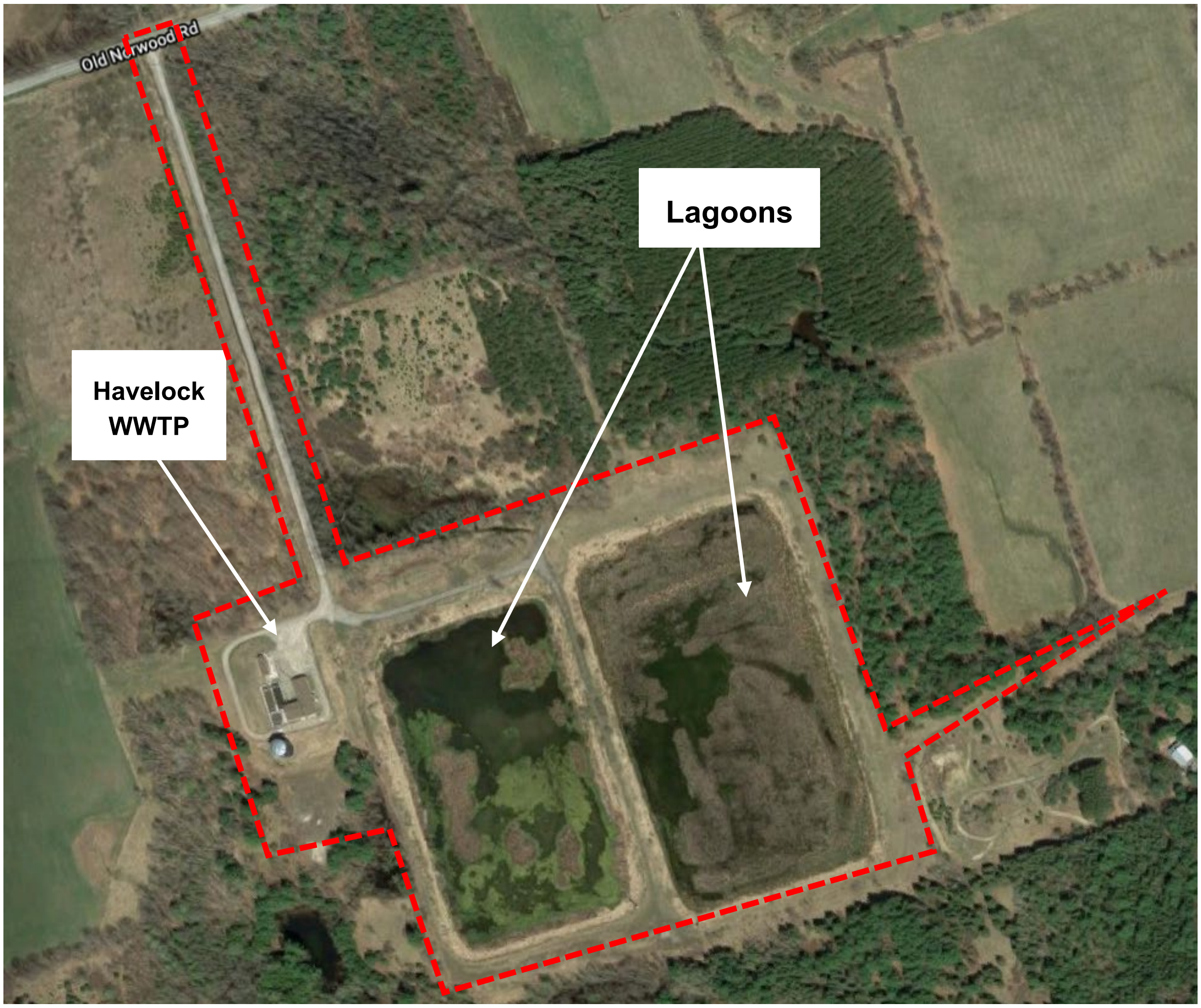

Figure 2: Havelock WWTP Site

3 Environmental Assessment Process

This section describes the Environmental Assessment (EA) process and the specific requirements associated with this Study.

3.1 Environmental Assessment Act

Ontario's Environmental Assessment Act, R.S.O. 1990 (henceforth referred to as the EAA) was passed in 1975 and proclaimed in 1976. The planning of major municipal projects or activities is subject to the EAA and requires the proponent to complete an EA, including an inventory and description of the existing environment in the area affected by the proposed activity (Ontario, 2021).

The EAA defines the environment broadly as:

- 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 or combination of the foregoing and the interrelationships between any two or more of them

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

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

1. A description of the purpose of the undertaking including:

- The undertaking
- The alternative methods of carrying out the undertaking
- Alternatives to the undertaking

2. A description of:

- The environment that would be affected or that might reasonably be expected to be affected, directly or indirectly, by the undertaking or alternatives to the undertaking

- The effects that would be caused or that might reasonably be expected to be caused to the environment by the undertaking or alternatives to the undertaking
- The actions necessary or that may reasonably be expected to be necessary to prevent, change, mitigate or remedy the effects upon or the effects that might reasonably be expected upon the environment by the undertaking or alternatives to the undertaking
- An evaluation of the advantages and disadvantages to the environment of the undertaking, the alternative methods of carrying out the undertaking and the alternatives to the undertaking

3.2 Principles of Environmental Planning

The EAA (Ontario, 2021) sets a framework for a systematic, rational and replicable environmental planning process that is based on five key principles, as follows:

1. **Consultation with affected parties –** Consultation with the public and government review agencies is an integral part of the planning process. Consultation allows the proponent to identify and address concerns cooperatively before final decisions are made. Consultation should begin as early as possible in the planning process.
2. **Consideration of a reasonable range of alternatives –** Alternatives should include functionally different solutions 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 the proposed undertaking to the evaluation of alternative methods.
5. **Provision of clean and complete documentation of the planning process –** This would 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.

3.3 Municipal Class Environmental Assessments

The Municipal Class Environmental Assessment process was approved by the Minister of the Environment in 1987 to satisfy the requirements of the EAA for municipal projects having predictable and preventable impacts. The Class EA approach streamlines the planning and approvals process for municipal projects which have the following characteristics:

- Are recurring
- Are similar in nature
- Are limited in scale
- Have a predictable range of environmental impacts
- Involve environmental impacts that can be mitigated

The Municipal Class Environmental Assessment document, prepared by the Municipal Engineers Association (MEA, 2015), outlines the procedures to be followed to satisfy Class EA requirements for water, wastewater and road projects. The process includes five phases:

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

Since projects undertaken by municipalities can vary in their complexity and potential environmental impacts, projects are classified in “Schedules” as follows (MEA, 2015):

- **Schedule A:** Generally, includes normal or emergency operational and maintenance activities. The environmental effects of these activities are usually minimal and, therefore, these projects are pre-approved. (i.e., no public consultation is required)
- **Schedule A+:** These projects are pre-approved. However, the public is to be advised prior to project implementation.
- **Schedule B:** Generally, includes improvements and minor expansions to existing facilities/infrastructure. There is the potential for some adverse environmental impacts and, therefore, the Proponent is required to proceed through a screening process including consultation with those who may be affected.

  - Typical projects that follow a Schedule B process include projects requiring watercourse crossings, projects requiring property acquisition, construction of watermains and sewers outside of existing road allowances and construction of pumping stations and water reservoirs/ elevated storage tanks.
- **Schedule C:** Generally, includes the construction of new water and wastewater treatment facilities and major expansions to existing facilities.

It is important to note that the Schedule assigned to a particular project is proponent-driven. For example, even if a project can be categorized as Schedule A, the proponent can decide to comply with the requirements of a Schedule B or C of the MEA process based on the magnitude of anticipated impacts or the special public and agency consultation requirements specific to that particular project (MEA, 2015).

Public and agency consultation are integral to the Class EA planning process, with minimum consultation requirements established depending on the project's Class EA Schedule classification.

The Minister of the Environment, Conservation and Parks has the authority and discretion to make an Order under Section 16 of the Environmental Assessment Act. A Section 16 Order may require that the proponent of a project going through a Class EA process:

1. Submit an application for approval of the project before they proceed; or,
2. Meet further conditions in addition to conditions in the Class EA.

The public can ask the Minister to make a Section 16(6) Order if:

1. They have outstanding concerns that a project going through a Class EA process may have a potential adverse impacts on constitutionally protected Aboriginal and treaty rights; and,
2. They believe that an Order may prevent, mitigate or remedy this impact.

If the public wants to request a Section 16 Order for a project, on the grounds that an an Order may prevent, mitigate or remedy potential adverse impacts on constitutionally protected, Aboriginal and treaty rights, you must make the request before the public comment period is complete. Additional information on how to request an Order can be found under the following link:

https://www.ontario.ca/page/class-environmental-assessments-section-16-order

An amendment to the Class EA process was recently approved. However, this Class EA Study followed the process outlined in the 2015 version of the MEA document.

3.4 Municipal Class EA Schedule

This project is proceeding in accordance with the Class EA process in the MEA document (MEA, 2015). This Class EA Study is being completed as a Schedule C project. This project generally fits the description listed under Item 2 of “Schedule C Municipal Water and Wastewater Projects” in Appendix A of the MEA Class EA document:

2. *Construct new sewage treatment plant or expand existing sewage treatment plant beyond existing rated capacity including outfall to receiving water body.*

Schedule C projects require the completion of Phases 1 through 4 as defined the Class document (MEA, 2015) and described in **Section 3.3** above.

4 Planning Framework

The *Planning Act* (Ontario, 1990) establishes the rules for land use planning in Ontario and describes how land uses may be defined in the province's communities. It also permits municipalities to pass bylaws governing the allocation of water and wastewater services for the development of subdivisions. The 2020 *Provincial Policy Statement* (PPS) (Ontario, 2020), issued under Section 3 of the *Planning Act*, provides policy direction on provincial matters related to improved land use planning and development.

Provincial and local plans impacting the Township must remain consistent with the *PPS*. Where the policies of the provincial and local plans address the same matters as the policies of the *PPS*, applying the specific policies of the provincial and local plan satisfies the general requirements of the *PPS*. Alternately, where matters in the *PPS* do not overlap with policies in provincial and local plans, the policies of the *PPS* must be satisfied. The *PPS* contains policies relevant to wastewater infrastructure planning including, but not limited to:

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

More specifically, the *PPS* 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
    - Protects human health and the natural environment
- Promote water conservation and water use efficiency; and,
- Integrate servicing and land use considerations at all stages of the planning process.

4.1 Peterborough County Official Pan

The Township of Havelock-Belmont-Methuen is part of Peterborough County. Therefore, it is subject to the *Peterborough County Official Plan* (County of Peterborough, 2022), guided by the Planning Act. The County's Official Plan has been adopted locally and is pending approval by the province. The role of the County, as reflected in the *Peterborough Official Plan*, is to provide high level, long-term policy direction matters related to County growth, structure, services, resources, and the environment.

The County and its local Municipalities will strive to meet the population and employment forecasts as established by the Province from Schedule 3 of the *A Place to Grow: Growth Plan for the Greater Golden Horseshoe* (Ontario, 2020). The forecasted population for County of Peterborough to 2051 is 82,000.

Per the *Official Plan* (County of Peterborough, 2022), 6% of the forecasted population growth is allocated to Havelock. This value will be used for this Class EA to estimate population growth projections in the Township.

Per Section 5.4.1 of the *Official Plan* (County of Peterborough, 2022), development will be focused in the delineated built up areas in areas with existing or planned public service facilities (i.e., municipal water and wastewater infrastructure).

4.2 Township of Havelock-Belmont-Methuen Official Plan

The *Township's Official Plan* (HBM, 2015) establishes detailed policies for the municipality in conformity with the overall strategic direction of the *Peterborough County Official Plan*.

The *Township's Official Plan* notes that:

- 4.1.2 Full municipal sewage and water services are the preferred form of servicing for the Havelock Urban Area. Lot creation will only be permitted if sufficient reserve water and sewage plant capacity is available to accommodate the development;
- 4.1.2.1 Plans for expansion or for new services are to serve growth in a manner that supports achievement of the intensification target and density targets in this Plan.

5 Wastewater Regulatory Framework

5.1 Federal Legislation and Policy

5.1.1 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 but helps advise 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.

5.1.2 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 evidence-based environmental policy making by researching, reporting and developing guidelines and standards. Guidelines relevant to this Study are reviewed in the following subsections.

5.1.2.1 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.

5.1.2.2 Wastewater Systems Effluent Regulations

The *Wastewater System Effluent Regulations* (WSER), developed under the *Fisheries Act*, 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*. *WSER* governs the final discharge point of the wastewater effluent from a facility that is designed to collect an average day volume of influent of 100 m^3/d or more. The regulations outline the monthly concentration limits for the discharge of effluent to a waterbody and minimum requirements for wastewater effluent sampling. This *WSER* is used as a foundation for wastewater regulations set out by the province of Ontario.

5.1.3 Fisheries Act

The *Fisheries Act*, enacted in 1985, 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 are responsible for the enforcement and management of fisheries resources. The following sections of the Act are relevant to this Class EA Study 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.

5.1.4 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, such as construction, that may impact migratory birds or nests, including when and where activities may occur.

5.1.5 Species at Risk Act

The *Species at Risk Act (SARA),* established in 2002*,* 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.

If a species listed on Schedule 1 is found within the study area, further effort and consultation with Environment Canada will be required to ensure that the habitat is not negatively impacted.

5.2 Provincial Legislation and Policy

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

5.2.1 Endangered Species Act

The *Endangered Species Act* (ESA) was originally written in 1971 and amended in 2008. Like 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), these species are included in the provincial list of endangered and threatened species in compliance with the ESA. The ESA 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.

5.2.2 Clean Water Act

The *Clean Water Act (CWA)*, adopted in 2006, establishes watershed-based processes dedicated to protecting sources of water that have been identified by a municipality as being a future or current source of drinking water for a community.

The *Drinking Water Source Protection Program* was established under the CWA. The program resulted in the development of local Source Protection Plans for Source Protected Areas. Conservation Authorities are responsible for the development of the *Drinking Water Source Protection Program* and its Plans, which identifies actions and locally developed policies to protect existing and future sources of municipal residential drinking water systems.

Water resources in the Township are comprised of a complex interrelated system made up of aquifers, groundwater recharge and discharge areas, rivers, streams, ponds, wetlands and lakes. Groundwater and surface water are important resources to the Township as groundwater aquifers are the primary source of drinking water supplies.

The source protection committee recognizes four types of vulnerable areas within source protection areas (SPAs) including:

- Wellhead Protection Areas
- Highly Vulnerable Aquifers
- Significant Groundwater Recharge areas
- Intake Protection Zones

Relevant Source Water Protection Plans must be reviewed when establishing a new or increasing an existing wastewater effluent discharge to ensure that there is no adverse affect to current or potential drinking water sources.

5.2.3 Environmental Protection Act & Ontario Water Resources Act

The *Environmental Protection Act (EPA)*, established in 1999, is the primary pollution control legislation in Ontario and is used interchangeably with the *Water Resources Act* described below 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 this Act. ECAs sets out rules of operation of a WWTP such as effluent limits that are intended to protect the natural environment. This Act also 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 (NBMCA, 2022).

5.2.3.1 Water Management - Policies, Guidelines, PWQO

To support municipalities in meeting the *Environmental Protection and Ontario Water Resources Act*, the Ministry of Environment, Conservation and Parks (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.

MECP Procedure B-1-5

Procedure B-1-5 establishes receiving-water based effluent requirements for point source discharges to surface waterbodies. The procedure specifies the use of Provincial Water Quality Objectives (PWQO) as a starting point in determining effluent criteria to be enforced within an ECA for new and expanded effluent discharges. This procedure states that by incorporating receiving water quality-based limits into enforceable control documents such as the ECA, the guidelines for water quality management become legally enforced. Violations of an effluent limit typically lead to a requirement for the discharger to undertake a study and report on the causes and impacts of the violations.

Surface waters in Ontario can be subject to the requirements of five Policies depending on their water quality conditions:

- **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 PWQO.
- **Policy 2** applies to water bodies with quality that does not currently meet PWQO and shall not be further degraded. Policy 2 states that “all practical measures shall be taken to upgrade the water quality to the 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.

At the onset of the Class EA, it was confirmed during the MECP kick-off meeting on June 4, 2021, that the Havelock WWTP's effluent receiving body, Plato Creek, is subject to Policy 2 for total phosphorus. Meeting minutes for this meeting can be found in **Appendix A**.

6 Existing Conditions

6.1 Wastewater Treatment Plant Overview

The Havelock WWTP has a current rated average day flow capacity of 1,200 m^3/day and a peak flowrate capacity of 3,000 m^3/day. Treated water is discharged to Plato Creek according to the requirements of the Environmental Compliance Approval (ECA) number 7399-7YTUGW, issued on December 22, 2009. Existing liquid treatment processes at the WWTP include screening and grit removal, secondary treatment using sequencing batch reactors (SBRs), tertiary filtration, and ultraviolet (UV) disinfection. The plant currently doses coagulant upstream of the SBRs and upstream of the filters for enhanced phosphorus removal.

Solids handling process at the Havelock WWTP include aerobic digestion and biosolids storage.

Figure 3 shows the site layout for the Havelock WWTP.

The WWTP was constructed next to two wastewater treatment lagoons, which provided wastewater treatment for the community before the construction of the existing WWTP. The Havelock WWTP was constructed in 2009 to accommodate higher wastewater flows and the lagoons were cleaned and decommissioned.

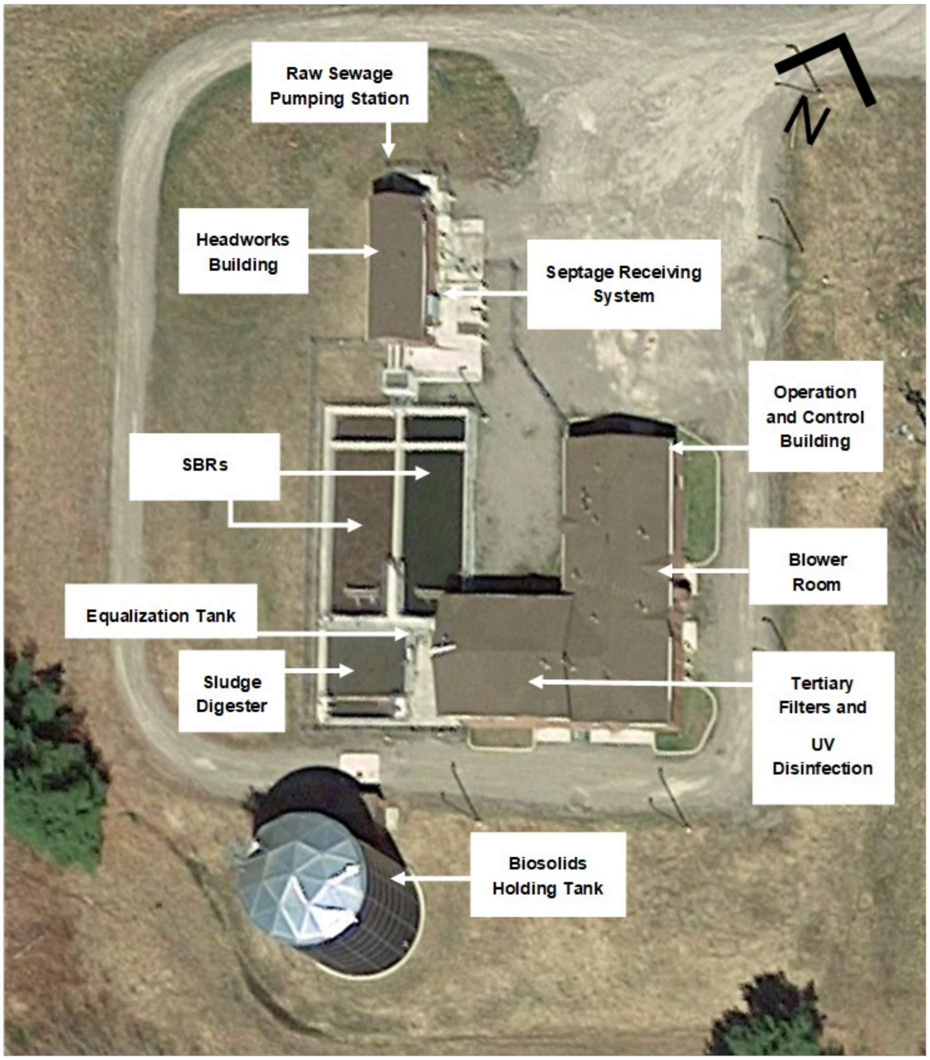

Figure 3: Havelock WWTP Site Layout

6.1.1 Sanitary Collection and Inlet Distribution Chamber

A wastewater pumping station at the intersection of Ottawa Street and Mill Lane collects sanitary flows from the serviced population in the Village of Havelock. The pumping station is equipped with two submersible pumps, in a duty/standby configuration, each rated at 35 L/s at total dynamic head (TDH) of 25.6 m. The collected wastewater is pumped to a high point on County Road 30 from where it flows by gravity to an interceptor manhole at the inlet distribution chamber in the Havelock WWTP. The wastewater flows into the raw wastewater pumping station wet well on site.

6.1.2 Raw Wastewater Pumping Station

The raw wastewater pumping station is an in-ground wet well structure equipped with two submersible pumps, one duty and one standby, with a firm capacity of 35 L/s at a TDH of 8 m. Raw wastewater is pumped to the headworks building where there are two parallel channels, one duty and one standby, that include screening and grit removal. There is also an overflow connected to a bypass sewer which ultimately discharges to Plato Creek in case of a complete pumping station failure. Septage, supernatant from the aerobic digester and the biosolids holding tank, and backwash from the tertiary filters are all discharged to the raw wastewater pumping station and mix with the raw influent.

6.1.3 Septage and Hauled Waste Receiving Facility

A septage receiving facility is located next to the raw wastewater pumping station. Hauled waste trucks discharge through an inlet connection. The septage passes through a grinder before being stored in a 106 m^3 septage storage tank. A submersible pump rated at 5 L/s at a TDH of 7 m is used for septage transfer to the raw wastewater pumping station.

6.1.4 Sequencing Batch Reactors (SBRs)

An SBR accomplishes equalization, aeration, and clarification in a single tank, in a timed sequence. To ensure continuous operation, two or more SBRs are constructed in parallel. SBRs operate in cycles consisting of filling, reacting (aeration), settling (sedimentation/clarification), decanting and idling steps. The Havelock WWTP is equipped with two SBR reactors with a combined average day flow capacity of 1,200 m^3/day and a peak flow capacity of 3,000 m^3/day. The operation of the SBRs is controlled automatically by a Supervisory Control and Data Acquisition (SCADA) system. A coagulant (alum) is injected into the SBRs to facilitate phosphorous removal. Each SBR includes the following major ancillary equipment:

- Aeration system
- Submersible waste sludge pumps
- Decanter assembly
- PLC control panel

6.1.5 Aeration

The aeration system includes four blowers in total, each rated for 416 m^3/hr at 53.8 kPa. Two blowers operating in parallel as duty supply air to the SBRs. One blower supplies air to the sludge digester and one blower provides standby capacity for the SBRs and sludge digester.

6.1.6 Sludge Digestion

The waste sludge pumps in the SBRs transfers sludge to a two-stage aerobic sludge digester. Primary aerobic sludge digestion takes place in a 258 m^3 tank, and secondary aerobic sludge digestion takes place in an 82 m^3 tank; both tanks are equipped with membrane diffusers for aeration. Two submersible sludge transfer pumps, in a duty /standby configuration, pump the digested sludge to a biosolids holding tank (1,575 m^3 capacity).

6.1.7 Equalization Tank

An equalization tank with a volume of 209.25 m^3 is adjacent to the sludge digester. The SBRs decant secondary treated effluent into the equalization tank to ensure a uniform feed rate to the filters downstream. Three submersible transfer pumps, two duty and one standby, each with a rated capacity of 14 L/s at 8 m TDH, convey the flow to the filters for further treatment.

6.1.8 Tertiary Filtration

The total suspended solids (TSS) and Total Phosphorus (TP) concentrations in the secondary effluent are reduced with the help of sand filtration technology combined with chemical precipitation. There are three continuous up-flow sand filter modules (2 duty, 1 standby) operating in parallel with a combined peak capacity of 2,765 m^3/d.

6.1.9 Ultraviolet (UV) Disinfection

Filtered effluent is disinfected using UV reactors in a channel located downstream of the tertiary filters. Two (duty/standby) high-intensity UV banks are arranged in series with a total of 24 lamps per UV unit to facilitate disinfection. Disinfected effluent is discharged to the nearby Plato Creek via a 375mm sewer.

6.1.10 Standby Power

The Havelock WWTP is equipped with a 150-kW standby power diesel generator with a diesel storage tank.

6.2 Effluent Criteria

The existing effluent design objectives and compliance limits for the Havelock WWTP, as outlined in the ECA, number 7399-7YTUGW, issued on December 22, 2009, are listed in **Table 1.** The operating objectives are based on monthly averages and are what the plant is designed to meet, while the limits are used to assess compliance.

Table 1: Havelock WWTP Existing Objectives and Compliance Limits

Effluent Parameters	Effluent Design Objectives Concentration (mg/L)	Compliance Limits Concentration (mg/L)	Compliance Limits Loading (g/d)
Carbonaceous Biological Oxygen Demand ($CBOD_5$)	6.6	10	12
Total Suspended Solids (TSS)	6.6	10	12
Total Phosphorous (TP)			
July 1 – Oct 31	0.1	0.14	0.17
Nov 1 –June 30	0.2	0.30	0.36
Total Ammonia Nitrogen (TAN)			
May 1 – Oct 31	2.0	3.0	
Nov 1 – April 30	3.3	5.0	
E. Coli	133 counts/100mL	200 counts/100mL	

6.3 Existing Service Population

The estimated 2021 serviced population within the urban boundaries of the Village of Havelock is approximately 1,518 people, corresponding to 584 residential sewer service connections, based on information provided by the Township and OCWA. A household population count of 2.6 persons/household was assumed, which aligns with the Ontario average provided by Statistics Canada (Statistics Canada, 2021).

No development has occurred in the Township since the beginning of this Class EA Study. Therefore, it is assumed that population has remained constant since 2018.

6.4 Historical Wastewater Flows

The historical average wastewater flows to the Havelock WWTP from 2018 to 2022 are listed in **Table 2.** The five-year average day flows received at the Havelock WWTP was 866 m^3/d, corresponding to 72% of the plant's rated capacity. Historical peak hourly and peak instantaneous flows could not be determined as only daily wastewater flow data was available.

Table 2: Havelock WWTP Historical Influent Flows (2018-2022)

Year	2018	2019	2020	2021	2022	Avg.	Max
Average Day Flow (m^3/d) [1]	1,221	869	761	757	721	**866**	
Historical Per Capita Average Day Flow (L/cap/d) [2]	805	573	501	499	475	**571**	
Maximum Month Flow (MMF) (m^3/d) [3]	1,811	1,263	1,247	932	1,167	**-**	**1,811**
Maximum Day Flow (MDF) (m^3/d) [4]	2,400	1,552	1,585	1,460	1,504	**-**	**2,400**

1. Average day flow = total volume of wastewater treated at the plant in a year divided by 365 days.
2. Per capita average day flow = average day flow divided by service population.
3. Maximum month flow = largest volume of wastewater treated at the plant during a monthly period.
4. Maximum day flow = largest volume of wastewater treated at the plant during a 24-hour period.

As noted above, the annual average day flows in 2018 exceeded the rated capacity of the plant. Furthermore, during wet weather flow conditions, monthly flows have exceeded the capacity of the plant. In fact, since 2017, monthly flows have approached or exceeded the plant's rated capacity on multiple occasions as follows:

- May 2017 – 1,411 m^3/d
- February 2018 – 1,333 m^3/d
- March 2018 – 1,375 m^3/d
- April 2018 – 1,811 m^3/d
- May 2018 – 1,549 m^3/d
- June 2018 – 1,281 m^3/d
- December 2018 – 1,212 m^3/d
- April 2019 – 1,248 m^3/d
- May 2019 – 1,263 m^3/d
- March 2020 – 1,247 m^3/d
- March 2021 – 1,205 m^3/d
- March 2022 – 1,167 m^3/d
- April 2022 – 1,111 m^3/d

The difference between wastewater flows during wet weather and dry weather conditions (evidenced by the difference between average day and maximum day flows) is indicative of significant Inflow and Infiltration (I&I) in the collection system.

The Township has been proactively investigating the sources of I&I and repaired a significant source of inflow in 2019. The corresponding reduction in I&I is reflected in the decreasing trend in flows to the plant observed over the past five years (see **Table 2**). However, there is still a significant amount of I&I in the system.

6.4.1 Comparison between Water Demands and Wastewater Flows

Figure 4 shows a comparison between drinking water demands (blue line) and the corresponding wastewater flows (green line).

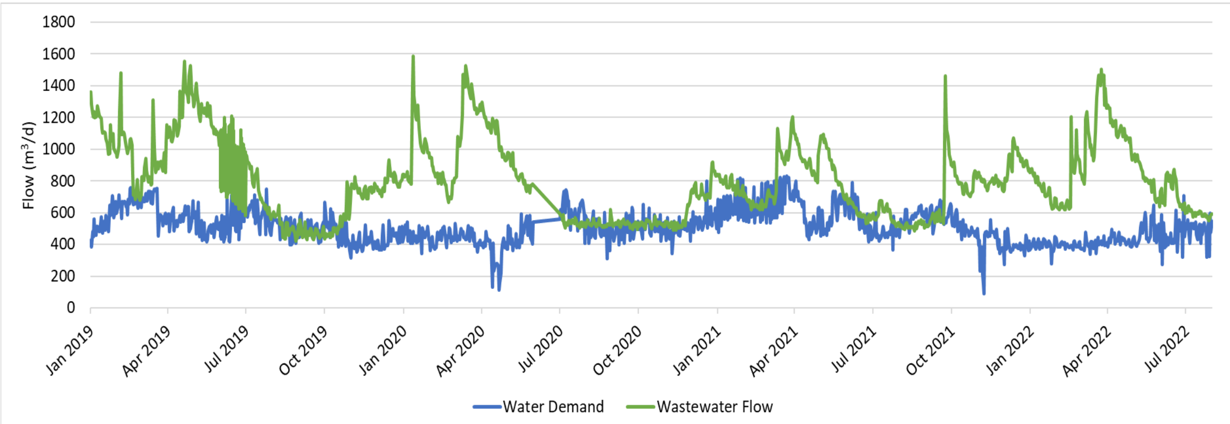

Figure 4: Water Demand and Wastewater Flows (2019-2022)

As observed above, wastewater flows are significantly higher than water demands during wet weather and snow melt periods indicating the presence of I&I. Based on a population of 1,518, the five-year per capita average day water demand was 336 L/cap/d (versus 571 L/cap/d per **Table 2**).

6.4.2 Historical Septage Flows

The Havelock WWTP not only services the urban area of the Village of Havelock but also receives septage from rural areas of the Township. The septage received is stored in the septage holding tank at the plant and is slowly pumped to the raw wastewater pumping station wet well where it mixes with the incoming sewage and recycle streams from various processes in the plant. The average septage volumes received from 2018 to 2022 are listed in **Table 3**.

Table 3: Havelock WWTP Historical Septage Volume Received (2018-2022)

Month	Average Volume of Septage Received (m^3)
January	78.5
February	82.4
March	124.6
April	118.8
May	0.0
June	0.0
July	0.0
August	0.3

Month	Average Volume of Septage Received (m^3)
September	3.3
October	0.0
November	35.0
December	113.1

The WWTP was originally designed to treat up to 35 m^3/d of septage. However, according to plant operators, the plant is unable to treat septage at this rate. Instead, the septage is blended with the incoming flow at a rate of 5 m^3/d. It should be noted that the plant's capacity to treat septage is dependent on the septage characteristics, i.e., more septage can be treated when it is of lower strength.

6.5 Historical Wastewater Characteristics

Limited data on influent wastewater characteristics is available as regular sampling is done at the pumping station wet well which combines influent wastewater with septage and plant recycle streams.

The results of wastewater sampling upstream of the Havelock WWTP for the month of June 2021 are shown in **Table 4.**

Table 4: Upstream Wastewater Sampling Results from June 2021

Parameter	Average Conc. (mg/L)
BOD_5	118
TSS	113
TKN	28
TP	3

Historical average septage characteristics are provided in **Table 5** below.

Table 5: Historical Septage Characteristics (2018-2022)

Parameter	2018	2019	2020	2021	2022	Avg.
BOD_5 Conc. (mg/L)	1,542	2,150	3,843	1,008	1,050	1,919
TSS Conc. (mg/L)	3221	7,458	9,310	3,939	2,620	5,153
TKN Conc. (mg/L)	462	463	462	255	210	362
TP Conc. (mg/L)	87.2	141.0	101.3	45.1	28.7	76.2

As noted above, samples are taken monthly from the WWTP wet well. These samples are a combination of influent sewage blended with septage and plant process recycle streams. The average historical characteristics of the blended wastewater are listed in **Table 6.** The addition of septage significantly increases the average pollutant concentrations in the wastewater treated at the plant when compared to the concentrations measured upstream (see **Table 4)**. When septage is stronger, less septage can be blended into the wet well to ensure that overall concentrations are kept to within the loading capacity of the plant.

Table 6: Historical Blended Wastewater Characteristics – Annual Average Concentrations (2018-2022)

Parameter	2018	2019	2020	2021	2022	Avg.
BOD_5 Conc. (mg/L)	226	140	160	211	117	171
TSS Conc. (mg/L)	217	193	163	234	172	196
TKN Conc. (mg/L)	37	22	25	24	25	26
TP Conc. (mg/L)	3.0	2.1	2.2	3.2	2.3	2.6

6.6 Historical Treated Effluent Performance

The Havelock WWTP historical final effluent concentrations are summarized in **Table 7.**

Table 7: Havelock WWTP Historical Effluent Characteristics (2018 – 2022)

Parameter	Avg Conc. (mg/L)
Carbonaceous Biological Oxygen Demand ($CBOD_5$)	2.4
Total Suspended Solids (TSS)	2.9
Total Phosphorous (TP)	
Jul 1 to Oct 31	0.07
Nov 1 to June 30	0.08
Total Ammonia Nitrogen (TAN)	
May 1 to Oct 31	0.12
Nov 1 to Apr 30	0.28
E. Coli (CFU / 100 mL)	4.7

The plant has consistently met its effluent criteria with discharges well below the treatment objectives defined in **Table 1.**

6.7 Assimilative Capacity of Plato Creek

WSP (formerly Golder Associates Ltd.) carried out an assimilative capacity study (ACS) of Plato Creek for this Class EA Study. The final report *'Havelock WWTP Assimilative Capacity Study'* dated September 2022 is included in **Appendix B**. The purpose of the ACS was to estimate the assimilative capacity of Plato Creek to accommodate the effluent discharges from the Havelock WWTP.

The objectives of the ACS were to:

1. Characterise existing water quality and flow conditions in Plato Creek; and,

2. Establish the proposed effluent objective/limit concentrations for the Havelock WWTP expansion.

The ACS evaluated the assimilative capacity of Plato Creek with respect to dissolved oxygen, CBOD5, unionized ammonia, temperature, total phosphorus, pH, E. Coli and total suspended solids. The ACS concluded that the main parameters of concern are unionized ammonia and total phosphorus.

The limits and objectives for BOD, TSS and E. Coli to be adopted for the plant expansion were defined in consultation with the MECP and they are consistent with typical values for other plants in Ontario.

Total ammonia nitrogen limits defined were based on the lowest achievable concentrations given technological limitations. Limits were established for the winter (November to April) and summer (May to October).

The existing ECA establishes total phosphorus loading limits for the dry (July to October) and wet (November to June) seasons (0.17 and 0.36 kg/d, respectively). These loading limits were used to estimate the required effluent concentrations given the increased flow capacity, i.e., to maintain the same loading while increasing flow capacity, the concentration will need to be reduced.

Two effluent discharge regimes were evaluated as part of the ACS: 1) continuous discharge and 2) no discharge during August and September with continuous discharge during the remaining months. August and September are historically the periods of lowest flow in Plato Creek and thus when the Creek is most sensitive to phosphorus discharges. The corresponding effluent objects and limits for the two options are summarized in **Table 8** and **Table 9**, respectively.

Table 8: Effluent Objectives and Limits for Continuous Discharge Year-Round

Parameter	Seasonal Period	Effluent Objectives Max Monthly Mean Concentration	Effluent Limits Max Monthly Mean Concentration
$cBOD_5$ (mg/L)	N/A	6.0	10
TSS (mg/L)	N/A	6.4	8.5
Total Ammonia (mg/L as N)	Jun to Oct	0.8	1.0
Total Ammonia (mg/L as N)	Nov to May	3.0	3.9
TP (mg/L)	Jun to Oct	0.08	0.11
TP (mg/L)	Nov to May	0.17	0.23
pH	N/A	6.5 to 9.5	6.5 to 9.5
E. coli (CFU/100ml)	N/A	100	100

Table 9: Effluent Objectives and Limits for Continuous Discharge with Lagoon Storage in August and September

Parameter	Seasonal Period	Effluent Objectives Max Monthly Mean Concentration	Effluent Limits Max Monthly Mean Concentration
$cBOD_5$ (mg/L)	N/A	6.0	10
TSS (mg/L)	N/A	6.4	8.5
Total Ammonia (mg/L as N)	Jun to Oct[1]	0.8	1.0
Total Ammonia (mg/L as N)	Nov to May	3.0	3.9
TP (mg/L)	N/A	0.13	0.18
pH	N/A	6.5 to 9.5	6.5 to 9.5
E. coli (CFU/100ml)	N/A	100	100

1. No discharge permitted during August and September

The alternative solutions evaluated as part of this Class EA were developed based on the two discharge regimes above.

6.8 Natural Environment

WSP completed a natural environment assessment of the study area in June 2022, focusing on the existing Havelock WWTP site and Plato Creek. The report is included in **Appendix C.** The natural environment assessment characterized existing conditions on the site and in the study area and assessed potential environmental impacts resulting from the expansion to the Havelock WWTP upgrades on existing environmental features and functions.

The natural environment assessment consisted of a background review, a species at risk screening and field surveys (general wildlife and habitat assessments, aquatic habitat assessments, breeding bird surveys and an assessment of significance and impact). The findings of the natural environment assessment are summarized in **Table 10** below.

Table 10: Assessment of Significant Natural Heritage Features

Natural Heritage Feature	Observations
Wetlands	There are no provincially significant wetlands (PSWs) on the WWTP site or in the study area. A PSW overlaps the discharge study area, but not the assessed reach of Plato Creek.
Significant Woodlands	No significant woodlands were identified within the study area.

Natural Heritage Feature	Observations
Significant Valleylands	No significant valleylands were identified within the study area.
Areas of Natural and Scientific Interest	No Areas of Natural and Scientific Interest were identified within the study area.
Habitat for Threatened or Endangered Species	Based on the Species at Risk screening, 14 species designated threatened or endangered under the Endangered Species Act have moderate or high potential to occur on the site and/or in the study area. However, only Blending's turtle, spotted turtle and eastern hog-nosed snake were considered to require further detailed investigation/mitigation prior to construction activities.
Significant Wildlife Habitat	Based on a desktop review and field surveys, three types of Significant Wildlife Habitat were assessed to have potential to occur on the site or in the study area and were evaluated for potential significance: bat maternity colonies, amphibian breeding habitat, and habitat of special concern and rare wildlife species. Further field investigation determined that no further analysis is warranted.
Fish habitat	The expansion is not likely to have any significant impacts to fish habitat related to channel forming flow and sediment transport.

6.9 Social/Cultural Environment

6.9.1 Stage 1 Archaeological Assessment

In October 2021, WSP completed a Stage 1 archaeological assessment in support of the Class EA Study. The report is included in **Appendix D.**

As part of this assessment, an inventory of known archaeological sites within 1 km and previous archaeological fieldwork results within 50 m of the study area was generated, which were used to identify zones of archaeological potential.

The findings of the Stage 1 archaeological assessment are shown in **Figure 5.** Areas described as having archaeological potential (green) would require a Stage 2 archaeological assessment.

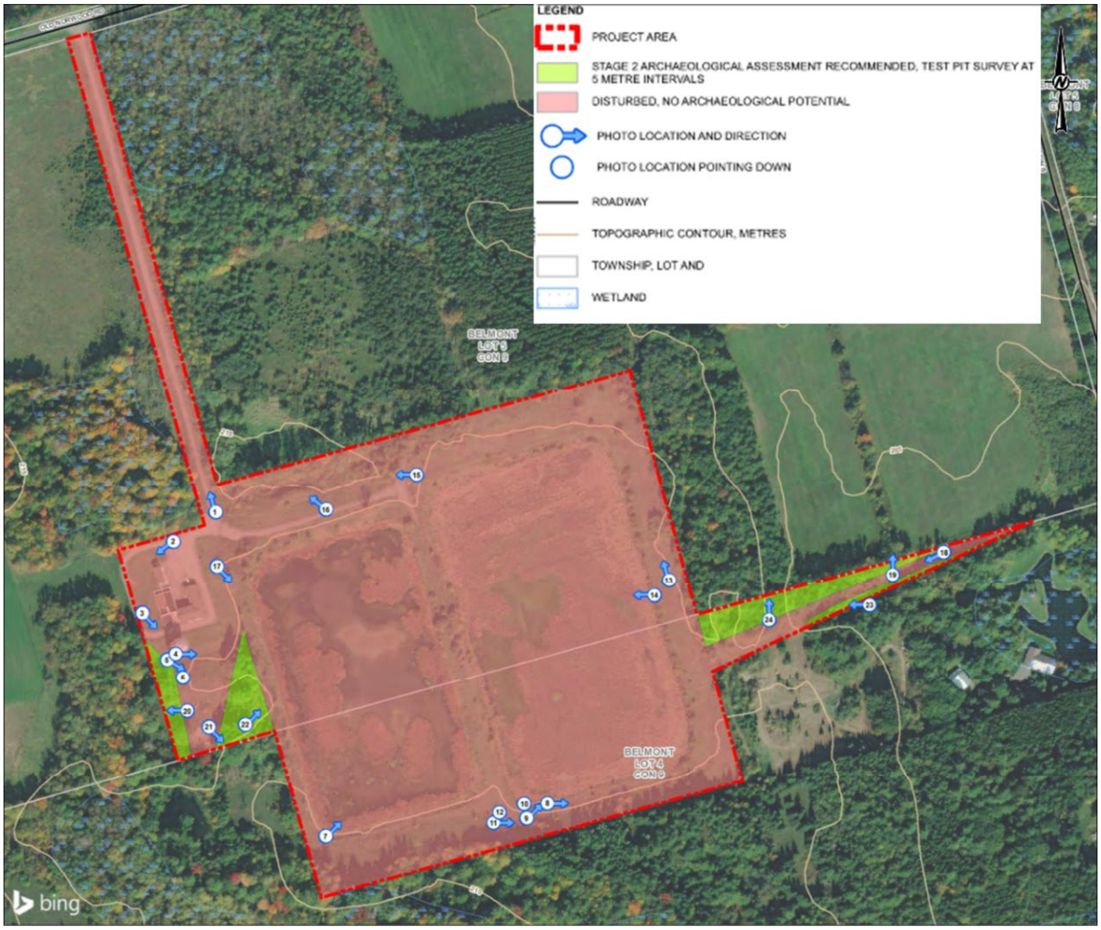

Figure 5: Stage 1 Archaeological Assessment Results (Golder, 2021)

6.9.2 Cultural Heritage Screening Report

WSP also completed a Cultural Heritage Screening Report (CHSR) to identify from desktop sources, all known and potential built heritage resources and cultural heritage landscapes within the study area and determine whether subsequent cultural heritage studies would be required in support of the preferred solution selected through the Class EA Study.

Background research and desktop analysis of the project area was done based on the Ministry of Heritage, Sport, Tourism and Culture Industries (MHSTCI) Criteria for Evaluating Potential for Built Heritage Resources and Cultural Heritage Landscapes (2016) checklist. The review identified:

- No protected heritage properties designated under Part IV of the Ontario Heritage Act
- No protected heritage properties designated under Part V of the Ontario Heritage Act

- No properties listed (not designated) on the Township of Havelock-Belmont-Methuen heritage register
- No properties with buildings or structures 40 or more years old of potential cultural heritage value or interest (CHVI)

Therefore, no further cultural studies were recommended. The CHSR is included in **Appendix E.**

7 Future Requirements

7.1 Growth Projections

According to the *County of Peterborough Official Plan* (County of Peterborough, 2022), the County (which the Township is part of) is anticipated to grow by an overall population of 82,000 by the year 2051. Six percent (6%) of this growth is assigned to the Village of Havelock corresponding to a total of 1,092 people. This would increase the total wastewater service population in the Township to approximately 2,600 people by 2051.

There is a proposed development project on the south side of the Village of Havelock (**Figure 6**). This project includes three phases of residential development, a long-term care facility, and the Peterborough Housing Development project. In 2018, the Township retained Engage Engineering Ltd. to complete a Functional Servicing Study (FSS) for the project. The population growth projections associated with this development project are shown in **Table 11.** It is anticipated that the development would be completed within the next five to 10 years.

Table 11: Havelock South Development Area - Population Projections

Planned Developments	Residential Homes	Population Equivalent
Phase 1[1,]	2	7
Phase 2[1]	23	81
Phase 3[1]	101	353
Long-term Care Facility	-	136
Peterborough Housing Development	-	64
Total	**-**	**641**

1. Population equivalents are based on a household density of 3.5 persons/household as per the 2018 Functional Servicing Study (Engage Engineering Ltd., 2018) and City of Peterborough Engineering Design Standards (County of Peterborough, 2022)

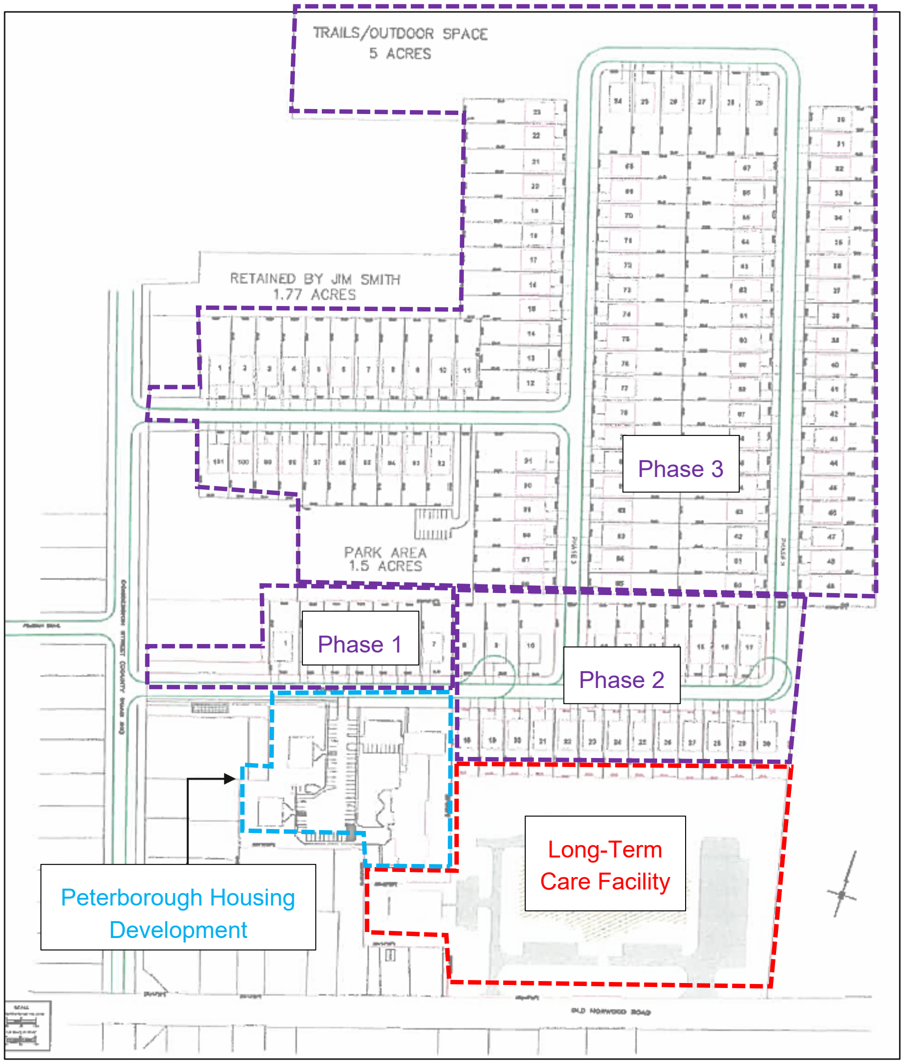

Figure 6: Havelock South Development Area Preliminary Concept Plan (Engage Engineering Ltd., 2018)

Table 12 below shows the population projections for the Village of Havelock. These include the growth associated with the Havelock South Development Area project and additional growth forecasted to reach the 2051 projections in the County's Official Plan.

Table 12: Wastewater Flow Projections to 2051

Year	Service Population
2023	1,518
2028[1]	2,159
2031	2,223
2041	2,404
2051	2,600

1. Assumed completion year of Havelock South Development Area Project

7.2 Wastewater Flow Projections

For the purposes of this Class EA Study, it was assumed conservatively that existing development would continue to produce wastewater flows equal to the five-year average day flow from 2018 to 2022.

Future development would be serviced by new sewers designed to meet current design standards, thus minimizing I&I. The City of Peterborough Engineering Design Standards value of 450 L/cap/d for average day flow was adopted to estimate flows from future development. This value is within the range recommended in the MECP Design Guidelines for Sewage Works (MECP, 2008) and is conservative.

A daily average septage flow of 12 m^3/d was also assumed.

Wastewater flow projections to 2051 are listed in **Table 13**.

Future wastewater flows were estimated using the formula below:

Total flows = Flows from Existing Development + Septage + Flows from Future Development

Table 13: Wastewater Flow Projects to 2051

Year	Projected Average Day Wastewater Flows[1] (m^3/d)
2023	870
2028[2]	1,220
2031	1,250
2041	1,330
2051	1,400

1. Values include 12 m^3/d of septage

To accommodate the 2051 service population forecast, the Havelock WWTP would require an expansion to 1,580 m^3/d. This would provide sufficient capacity to accommodate projected flows while providing a capacity buffer (i.e., in 2051, the WWTP would operate at approximately 90% capacity).

7.3 Design Criteria

The flow design criteria used for this Class EA Study are summarized in **Table 14.**

Table 14: Future Design Flows

Parameter	Design Flow (m^3/d)	Peaking Factor
Average Day Flow	1,580	
Maximum Day Flow	3,989	2.5[1]

Parameter	Design Flow (m^3/d)	Peaking Factor
Maximum Month Flow	3,009	1.9[1]
Peak Hour Flow[2]	4,424	2.8
Peak Instantaneous Flow[2]	5,056	3.2

1. Based on historical data from 2018-2020
2. Estimated based on peaking factors observed at WWTPs of similar size

An average daily design flow of 12.0 m^3/d for septage was assumed.

As noted in **Section 6.5,** raw wastewater samples are taken from the raw wastewater pumping station wet well. These samples include influent wastewater, septage and recycle streams from the plant. Therefore, they were not used to define concentration design criteria.

Per capita loadings were estimated based on available sample data from wastewater upstream of the plant. The estimated loadings are generally within the typical range provided in MECP guidelines (MECP, 2008) and Metcalf & Eddy (Metcalf & Eddy, 2014). The estimated loadings were used to define future raw wastewater concentrations. The per capita loadings and the estimated concentrations are shown in **Table 15** below.

Table 15: Mass Loadings and Concentrations in Residential Wastewater

Constituents	Mass Loading (g/cap/d) [1]	Concentration (mg/L) [2]
$cBOD_5$	**68** (35-65)	112
TSS	**64** (35-75)	105
TKN	**16** (9-18)	26
TP	**2** (1-2)	3

Notes:

1. Based on Table 22-2 of MECP Guidelines for Sewage Works (MECP, 2008)
2. Estimated as the product of the per capita mass loading and the total service population divided by the design flow of 1,580 m^3/d.

To be conservative, septage concentrations recommended in MECP guidelines were adopted as follows. The design septage concentrations should be confirmed during the design.

Table 16: Typical Septage Concentrations

Constituents	Septage (mg/L)[1]
$cBOD_5$	7,000
TSS	15,000
TKN	700
TP	250

Notes:

1. Based on Table 19-2 of MECP Guidelines for Sewage Works (MECP, 2008)

To adequately size the plant to accommodate the forecasted wastewater flows and septage, blended design concentrations were derived by accounting for the loading generated from influent wastewater and that from septage. For example, the design TSS concentration was calculated as follows:

$$Concentration\ TSS = \frac{C_{TSS_{Influent\ WW}} \cdot Q_{Influent\ WW} + C_{TSS_{Septage}} \cdot Q_{Septage}}{Q_{Influent\ WW} + Q_{Septage}}$$

$$Concentration\ TSS = \frac{105\,\frac{mg}{L} \cdot 1{,}580\,\frac{m3}{d} + 15{,}000\,\frac{mg}{L} \cdot 12\ m3/d}{1{,}580\,\frac{m3}{d} + 12\,\frac{m3}{d}} = 219\,\frac{mg}{L}$$

The design average blended wastewater concentrations are shown in **Table 17** below.

Table 17: Raw Blended Wastewater and Septage Concentration Design Criteria

Parameter	Influent Concentration (mg/L)
$cBOD_5$	165
TSS	219
TKN	32
TP	5

Effluent limits and objectives were recommended by the Assimilative Capacity Study (ACS) as discussed in **Section 6.7.** The two discharge regimes described in the ACS (continuous discharge and continuous discharge with storage in August and September) were considered in the development of alternative solutions.

8 Phase 1 – Problem Definition

Phase 1 of the Municipal Class EA planning process requires the proponent to develop a clear statement of the problem/opportunity to be addressed.

The problem/opportunity statement for this Class EA Study was defined as follows:

Population growth is forecasted in the Township. Additional wastewater treatment capacity is required to service this growth.

The Havelock WWTP is operating at around 70% of its rated capacity. However, the capacity of the plant has been exceeded multiple times during snow melt and wet weather flow conditions.

The WWTP was originally designed to receive septage from rural areas in the Township. Given existing constraints, the plant's capacity to treat septage is limited.

Therefore, the Havelock WWTP requires additional capacity to handle peak flows, treat septage and accommodate the forecasted growth while ensuring reliable and efficient operation.

It should be noted that the problem statement presented during Public Information Center 1 was revised to provide a more nuanced understanding of the issues faced at the Havelock WWTP.

The Class EA will evaluate long-term solutions to address the problem.

9 Phase 2 – Alternative Solutions

Phase 2 of the Class EA process involves evaluating alternative solutions to address the problem the problem statement outlined in **Section 8**.

9.1 Phase 2 Evaluation Methodology

These solutions were reviewed based on adherence to the Problem Opportunity Statement and overall implementation feasibility. The specific 'must meet' screening criteria applied to evaluate alternatives are listed in **Table 18**.

Table 18: "Must-Meet" Screening Criteria

Must-meet Criteria	Description
Does the alternative address the issues identified in the problem statement?	Does the alternative solution address the wastewater servicing capacity constraints? Does this alternative solution adhere to provincial and municipal Official Plans?
Does the alternative use existing infrastructure in the Havelock WWTP?	Does the alternative solution maximize use of the existing infrastructure in the Havelock WWTP?

An alternative was carried forward for further evaluation only if it met both of the criteria above. Conversely, any alternative that failed to meet any of the criteria was screened out from further evaluation.

9.2 Alternative Solutions

During Phase 2 of the Class EA process, the following alternative wastewater solutions were identified:

- Do Nothing
- Limit Community Growth
- Reduce Inflow and Infiltration (I/I)
- Expand the Existing Havelock WWTP
- Construct a New WWTP on the Existing Site
- Construct a New WWTP on a New Site

9.3 Evaluation of Alternative Solutions

A summary of the screening process is shown in **Table 19.**

Table 19: Alternative Solutions

Alternative Solution	Does it address the issues identified in the problem statement?	Use of existing infrastructure in the Havelock WWTP	Considered for Evaluation?
Do Nothing: Havelock WWTP would continue to operate as is and risk operating out of compliance. The Havelock South Development would not be serviceable by municipal wastewater infrastructure.	**No,** it does not meet existing/future capacity needs. The plant would continue to have limited capacity to accommodate septage. Historically, flows have exceeded the capacity of the plant during wet weather conditions as stated in **Section 6.4**. This alternative would lead to potential non-compliance.	**Yes**	**No**
Limit Community Growth: Limit community growth as to not trigger the need for new infrastructure.	**No,** it does not comply with the County of Peterborough Official Plan growth targets. The plant would continue to have limited capacity to accommodate septage. Historically, flows have exceeded the capacity of the plant during wet weather conditions as stated in **Section 6.4**. This alternative would lead to potential non-compliance.	**Yes**	**No**
Reduce Inflow and Infiltration: This alternative involves significantly reducing I&I to reduce flows to the Havelock WWTP.	**No,** this Alternative does not provide a complete solution to the problem/opportunity statement. A comprehensive trunk sewer rehabilitation program was started in 1998. Most recently, the Township completed sewer repairs in 2018 and this has resulted in reduced flows to the Havelock WWTP as reflected in the flow data from 2018 to 2022. However, it would be very difficult to reduce the amount of I&I in the system such that the need for a capacity expansion to the Havelock WWTP is avoided. Additional comprehensive I&I studies would be required and maintenance holes and sewers found to be subject to excessive I&I would need to be relined or replaced. This alternative would be considered as part of the preferred solution.	**Yes**	**No – not as stand alone alternative**

Alternative Solution	Does it address the issues identified in the problem statement?	Use of existing infrastructure in the Havelock WWTP	Considered for Evaluation?
Expand the Existing Havelock WWTP: Expansion of the Havelock WWTP, at the current site to 1,580 m^3/d.	**Yes,** it does meet existing/future capacity needs. The plant would have capacity to accommodate septage. The plant would have capacity to handle wet weather flow conditions.	**Yes,** the existing infrastructure at the plant would continue to be used.	**Yes**
Construct a New WWTP on the Existing Site: Build a new 1,580 m^3/d WWTP within the existing Havelock WWTP site. The existing Havelock WWTP would be decommissioned.	**Yes,** it does meet existing/future capacity needs. The plant would have capacity to accommodate septage.	**No,** the existing plant infrastructure would be abandoned and a new facility would be constructed.	**No**
Construct a New WWTP on a New Site: Build a new WWTP on a new site. The existing Havelock WWTP would be decommissioned.	**Yes,** it does meet existing/future capacity needs. The plant would have capacity to accommodate septage.	**No,** the existing plant infrastructure would be abandoned and a new facility would be constructed.	**No**

10 Phase 3 – Alternative Design Concepts

Phase 3 of the Class EA process involves examining alternative design concepts to implement the Phase 2 preferred solution.

10.1 Wastewater Technology Review

This Section identifies potential technology alternatives to implement the preferred alternative solution for long-term wastewater servicing identified in **Section 9.3**, i.e., “Expanding the Existing Havelock WWTP.”

The approach to expansion of the Havelock WWTP is dependent mainly on the treatment technologies selected. Thus, initially, a long list of technology alternatives was defined.

The major unit processes at the Havelock WWTP and the corresponding long list of technology alternatives are listed in **Table 20.**

Table 20: Major Unit Processes in Wastewater Treatment Currently used at the Havelock WWTP

Unit Process and Function (Metcalf & Eddy, 2014)	Havelock WWTP – Existing Technologies	Long List of Alternative Treatment Technologies
Equalization and Storage: Dampening of flowrate variations to achieve a constant or nearly constant flowrate. Used to reduce peak flows to downstream processes.	The Havelock WWTP currently does not have influent flow equalization. There is an existing equalization tank before filtration and UV disinfection.	1. No additional equalization 2. Use existing lagoon(s) for influent equalization 3. Use existing lagoon(s) for secondary effluent storage 4. Use existing lagoon(s) for final effluent storage
Preliminary Treatment: Includes screening and grit removal to remove large debris and heavy, abrasive, inorganic solids. This process protects downstream equipment from excessive wear and operational issues and reduces solids handling requirements in downstream processes.	Preliminary treatment at the Havelock WWTP consists of two bar screens and gravity grit channels (duty/standby). The duty channel is equipped with a mechanical bar screen, while the standby is equipped with a manual bar screen.	Replace the existing manual bar screen with a new mechanical screen and use both grit channels as duty. A new grit channel by-pass is to be constructed.
Secondary Treatment: Involves processes to encourage biological activity to remove soluble BOD_5 and ammonia as well as suspended and non-settleable colloidal solids, nitrogen, and phosphorus. Secondary treatment processes may be modified to biologically remove nitrogen and phosphorus.	The Havelock WWTP has two Sequencing Batch Reactors, which achieve secondary treatment.	1. Conventional Activated Sludge 2. Ballasted Activated Sludge 3. Biological Phosphorus Removal 4. Membrane Bioreactor 5. Membrane Aerated Biofilm Reactor 6. Integrated Fixed Film Activated Sludge (IFAS) / Moving Bed Bioreactor 7. Sequencing Batch Reactor 8. Aerobic Granular Sludge 9. Biological Aerated Filter
Tertiary Treatment: Includes processes such as filtration and disinfection. Filtration is typically required for facilities with low effluent TSS and TP limits (TP concentration of less than 0.5 mg/L).	The effluent from the SBRs is treated in three deep bed filters operating in parallel.	1. Deep Bed Filter 2. Disc Filter 3. Membrane Filtration 4. Two-stage Filtration
Disinfection: Disinfection involves the destruction and/or inactivation of pathogens in the effluent prior to discharge to the receiving water.	The effluent from the filters is disinfected using ultraviolet radiation.	1. Ultraviolet (UV) Disinfection 2. Ozone 3. Peracetic Acid (PAA) 4. Chlorination/dechlorination
Digestion: The process of biologically degrading organic matter in sludge, thereby reducing the concentrations of volatile solids and pathogens.	Sludge generated from the SBR is sent to an aerobic digester.	Add additional aerobic digestion as required.

Unit Process and Function (Metcalf & Eddy, 2014)	Havelock WWTP – Existing Technologies	Long List of Alternative Treatment Technologies
Biosolids Storage: Sufficient storage is required to account for periods when land application is not permitted (Dec to April).	Biosolids are stored in an above grade tank.	Add additional biosolids storage as required.

The long list of technology alternatives for each unit process was screened based on "must-meet" criteria listed in **Table 21** to develop a short list of wastewater technologies. The short list of technologies was then combined to develop alternative wastewater treatment design concepts which were evaluated in detail.

Table 21: "Must-Meet" Screening Criteria

Must-meet Criteria	Description
Compliance	Can the technology reliably meet effluent quality objectives and discharge policies under existing and projected load conditions? Is the technology recognized by the MECP as a proven and reliable technology?
Use of existing infrastructure in the Havelock WWTP	Does the alternative solution maximize use of the existing infrastructure in the Havelock WWTP?
Technical Feasibility	Can the technology be implemented within the existing site boundaries without impacting the ability of the existing facility to meet its effluent criteria during construction?

Each alternative was evaluated either as fully meeting (highlighted in green), partially meeting (highlighted in yellow), or not meeting the criteria (highlighted in red).

An alternative was carried forward for further evaluation only if it fully or partially met both above criteria. Conversely, any alternative that failed to meet any of the criteria was screened out from further evaluation.

10.1.1 Equalization and Storage Options

Four options were considered to develop design concept alternatives for further evaluation:

1. **No Equalization:** This concept involves upgrading the plant without use of the existing lagoons for equalization or storage. This concept would involve continuous

discharge to Plato Creek. Therefore, the plant would need to achieve the lower phosphorus effluent concentration limits listed in **Table 8** (i.e., TP discharge objective of 0.08 mg/L).

2. **Use Existing Lagoons for Influent Equalization:** This concept involves utilizing the existing decommissioned sewage lagoons for temporary raw wastewater storage to accommodate high incoming flows exceeding the capacity of the downstream processes. Flows exceeding a certain flow threshold (i.e., the hydraulic capacity of downstream processes) would be diverted to the equalization lagoons. The raw wastewater stored in the lagoons would be fed back through the headworks during low flow conditions. This approach would reduce the required size of the treatment process equipment and maximize the value of the existing infrastructure. This concept would involve continuous discharge to Plato Creek. Therefore, the plant would need to achieve the lower phosphorus effluent concentration listed in **Table 8**.
3. **Use Existing Lagoons for Secondary Effluent Storage:** This concept involves utilizing the existing decommissioned sewage lagoons for storage upstream of the existing filters, i.e., secondary treated effluent from the SBRs would be stored. This would be associated with the second effluent discharge regime considered by the ACS in which no discharges to Plato Creek would occur in August and September. Thus, the plant could be designed to meet the higher phosphorus effluent concentration listed in **Table 9** (TP discharge objective of 0.13 mg/L). Secondary effluent stored in the lagoons would be pumped to the existing filters prior to being disinfected and discharged to Plato Creek.
4. **Use Existing Lagoons for Final Effluent Storage:** This concept involves utilizing the existing decommissioned sewage lagoons for filtered and disinfected effluent storage in August and September. The plant would operate with a higher phosphorus effluent concentration limit (per **Table 9)**.

10.1.2 Secondary Treatment Technologies

The results of the secondary treatment technology screening are presented in **Table 22.** Based on the screening results, expansion of the plant using SBRs was deemed the preferred technology option to develop design concept alternatives. The SBR process is currently used at the Havelock WWTP and the plant was designed with provisions to construct a third SBR tank to facilitate capacity expansion.

10.1.3 Tertiary Filtration

Tertiary filtration technology alternatives were evaluated for each discharge scenario (continuous vs. no discharge during low creek flow periods) since a different total phosphorus limit would be required (see **Section 6.7**). The results of the tertiary filtration technology screening for each discharge scenario are presented in **Table 23** and **Table 24.**

One technology alternative was short-listed for each discharge scenario:

- **Continuous Discharge (TP Discharge Objective of 0.08 mg/L) – Dual-stage filtration.** This would involve utilizing the existing deep bed filters and adding a second stage of filters to operate in series.
- **Effluent Storage during Low Creek Flow Periods (TP Discharge Objective of 0.13 mg/L) – Deep bed filtration.** This technology is currently being used at the Havelock WWTP.

10.1.4 Disinfection

The results of the disinfection technology screening are presented in **Table 25.** Based on the results one technology was selected for consideration when developing alternative design concepts.

- **UV Disinfection:** UV disinfection is currently used at the Havelock WWTP.

Table 22: Havelock WWTP Secondary Treatment Technology Screening

No.	Technology Alternative	Compliance	Use of existing infrastructure in the Havelock WWTP	Technical Feasibility	Considered for Evaluation
1	Conventional Activated Sludge (CAS)	• Proven technology – used at facilities around the world. • Can reliably meet effluent criteria for BOD, TSS and TAN. • This process is typically used in medium to large size plants (20 MLD+).	• Little to no opportunity for infrastructure reuse.	• Primary and secondary clarification tanks required. • It would be very difficult to integrate new clarifiers with the operation of the SBRs.	**No**
2	Ballasted Activated Sludge	• High solids removal efficiency reducing footprint of secondary clarifiers relative to CAS. • No full-scale applications in North America. • Long-term O&M costs not well understood. • Risk of media washout/entrainment in waste solids. • MECP approvals may require site specific pilot testing.	• Little to no opportunity for infrastructure reuse.	• Process requires construction of primary and secondary clarifiers. • Requires additional equipment such as a shear mill or hydrocyclone, feeders and mix tanks. • Requires the addition of return activated sludge (RAS) and primary sludge lines.	**No**
3	Biological Phosphorus Removal – Using CAS	• Limited installations in Ontario. • More complex operating requirements. • Can reliably meet effluent criteria for BOD, TSS and TAN. • Requires tertiary treatment to meet required TP effluent criteria.	• Little to no opportunity for infrastructure reuse.	• Process requires construction of primary and secondary clarifiers. • Requires the addition of RAS and primary sludge lines.	**No**
4	Membrane Bioreactor	• Proven technology – used at facilities in Ontario and North America and around the world. • Ability to achieve very low TP concentrations in the effluent (<0.1 mg/L) without additional tertiary treatment.	• The existing SBRs/equalization tank have the potential to be retrofitted to accommodate the MBR process. • The existing screens would have to be replaced with finer screens which means a new Headworks facility would need to be constructed.	• To facilitate implementation, a new process train would be constructed to operate in parallel to the existing plant. Once commissioned, the existing tankage could be retrofitted to the MBR process or could be retained and the effluent from the two processes blended. • The existing configuration could be retained and a new MBR train constructed. The existing filters could continue to operate in the current configuration or used a blended approach with additional filters. The effluent from both systems could be blended. However, operating two different technologies in a plant is difficult and not ideal.	**No**
5	Membrane Aerated Biofilm Reactor	• Simultaneous nitrification/denitrification (reduced effluent nitrate). • Developing technology – no large full-scale applications in Ontario. Would require piloting.	• Little to no opportunity for infrastructure reuse.	• Secondary clarification likely required. • Requires the addition of RAS and primary sludge lines.	**No**

No.	Technology Alternative	Compliance	Use of existing infrastructure in the Havelock WWTP	Technical Feasibility	Considered for Evaluation
6	Integrated Fixed-Film Activated Sludge / Moving Bed Bioreactor	• Mature technology although not commonly used in North America. • Can reliably meet effluent criteria for BOD, TSS and TAN.	• Little to no opportunity for infrastructure reuse.	• Secondary clarification required. • Requires the addition of RAS (if implementing IFAS). • Implementation at existing facilities limited by hydraulic considerations.	**No**
7	Sequencing Batch Reactor	• SBR process is a widely used secondary treatment technology.	• Existing process would be retained. Additional tankage would be added in parallel.	• SBR process is currently utilized at the Havelock WWTP. The plant was designed to add a third SBR tank.	**Yes**
8	Aerobic Granular Sludge	• Provides simultaneous nitrification/denitrification and organic carbon removal with improved settling performance. • Developing technology may require additional coordination with the MECP and piloting.	• Little to no opportunity for infrastructure reuse. The existing SBR tanks are not deep enough to accommodate the AGS process.	• Would require construction of entirely new tankage.	**No**
9	Biological Aerated Filter	• Mature technology. • However, only a handful of installations in Ontario. • Can reliably meet effluent criteria for BOD, TSS and TAN.	• Little to no opportunity for infrastructure reuse.	• Primary clarification typically used upstream. • Would require construction of entirely new tankage.	**No**

Legend

Fully Meets Criteria	**Partially Meets Criteria**	**Does Not Meet Criteria**

Table 23: Havelock WWTP Phosphorus Reduction Technology Screening for Continuous Discharge – TP Discharge Objective of 0.08 mg/L

No.	Technology Alternative	Compliance	Use of existing infrastructure in the Havelock WWTP	Technical Feasibility	Considered for Evaluation
1	Deep Bed Filter	• Can achieve effluent TP concentration of 0.1 mg/L, provided a secondary effluent TP concentration of 1 mg/L or less. • Unable to meet a lower effluent objective of 0.08 mg/L (Parkson, 2022).	• Potential to keep existing filters and add additional filters in parallel to increase flow capacity. • New building/building expansion likely required to house new filters.	• Currently used at Havelock WWTP.	**No**
2	Disc Filter	• May be able to achieve effluent TP concentration of 0.08 mg/L. However, it would be difficult to obtain a performance guarantee from supplier.	• The existing filters would need to be removed. • New building/building expansion likely required to house new filters.	• Technology compatible with existing upstream and downstream processes at the Havelock WWTP. • Could be installed while maintaining plant in operation	**No**
3	Membrane Filtration	• Can achieve effluent TP concentration of 0.08 mg/L.	• The existing filters would be removed • Possible reuse of existing filter/disinfection building. • Fine screening required. Therefore, a new headworks building would need to be constructed.	• Membranes could potentially be installed in the space occupied by the existing deep bed filters. • A temporary filtration system might be required to allow installation of membranes without impacting plant operations.	**No**
4	Two-Stage Filtration	• Can achieve effluent TP concentration of 0.08 mg/L.	• Existing filters could likely be used in series with new second stage filtration system. • New building/building expansion likely required to house new filters.	• Technology compatible with other processes at the Havelock WWTP. • Could be installed while maintaining plant in operation.	**Yes**

Legend

Fully Meets Criteria	Partially Meets Criteria	Does Not Meet Criteria

Table 24: Phosphorus Reduction Technology Screening for Effluent Storage – TP Discharge Objective of 0.13 mg/L

No.	Technology Alternative	Compliance	Use of existing infrastructure in the Havelock WWTP	Technical Feasibility	Considered for Evaluation
1	Deep Bed Filter	• Can achieve effluent TP concentration of 0.1 mg/L (Parkson, 2022).	• Potential to keep existing filters and add additional filters in parallel to increase the plant's filtration capacity. • New building/building expansion would required to house the new filters.	• Currently used at Havelock WWTP. • This process can be implemented while maintaining existing plant in operation.	**Yes**
2	Disc Filter	• Can achieve effluent TP concentration of <0.1 mg/L (Aqua-Aerobic, 2022).	• The existing filters would be removed; new disc filters could potentially be installed in the tanks where existing filters are located. • New building/building expansion may be required to house the new filters.	• Technology compatible with other processes at the Havelock WWTP. • This process can be implemented while maintaining existing plant in operation.	**No**
3	Membrane Filtration	• Can achieve effluent TP concentration of <0.1 mg/L (Fleischer, 2006).	• Existing filters would be removed; new membranes can be installed in the existing filter tanks. • New building/building expansion might be required to house the related equipment. • Fine screening required. Therefore, a new headworks building would need to be constructed.	• Membranes could potentially be installed in the space occupied by the existing deep bed filters. • A temporary filtration system might be required to allow installation of membranes without impacting plant operations.	**No**
4	Two-Stage Filtration	• Can achieve effluent TP concentration of <0.1 mg/L.	• Existing filters would be used in series with new second stage filters. • New building/building expansion likely required to house new filters.	• Technology compatible with other processes at the Havelock WWTP. • However, this process would be unnecessary as the existing filtration system is able to meet the effluent criteria.	**No**

Legend

Fully Meets Criteria	Partially Meets Criteria	Does Not Meet Criteria

.

Table 25: Havelock WWTP Disinfection Technology Screening

No.	Technology Alternative	Compliance	Use of existing infrastructure in the Havelock WWTP	Technical Feasibility	Considered for Evaluation
1	Chlorination/ dechlorination	• Technology widely used in North America and internationally. • Can reliably meet effluent criteria for disinfection.	• Would require the construction of a new chlorine contact tank and potentially an effluent pumping station. • A new chemical building would be required for storage and chemical supply equipment.	• This process can be implemented while maintaining plant in operation.	**No**
2	UV Disinfection	• Technology widely used in North America and internationally. • Can reliably meet effluent criteria for disinfection.	• Can accommodate system within existing building.	• The process could be expanded within the existing building while maintaining plant in operation.	**Yes**
3	Ozonation	• Maturing technology for wastewater treatment. Limited operating installations. • Can reliably meet effluent criteria for disinfection.	• A new chemical building would be required for storage and chemical supply equipment. Requires additional facilities to house liquid oxygen, ozone generation/off gas destruction equipment, and contact tanks.	• This process can be implemented while maintaining plant in operation.	**No**
4	Peracetic Acid	• Newer technology not yet widely used at wastewater facilities. • Can reliably meet effluent criteria for disinfection.	• A new chemical building would be required for storage and chemical supply equipment. • Would require the construction of a new contact tank and potentially an effluent pumping station.	• This process can be implemented while maintaining plant in operation.	**No**

Legend

Fully Meets Criteria	Partially Meets Criteria	Does Not Meet Criteria

10.2 Phase 3 Alternative Design Concept Evaluation Methodology

The design concepts detailed in **Section 10.3** below were evaluated against four primary evaluation criteria, representing the most relevant short-term and long-term considerations for this project as listed below:

- Socio-cultural Considerations
- Natural Environment Considerations
- Technical Considerations
- Economic Considerations

Each of the primary evaluation criteria was further subdivided into specific factors or considerations, which are considered to capture the most representative aspects of this project. Specific indicators for each individual evaluation sub-criterion are described in **Table 26**.

Table 26: Evaluation Criteria, Rationale and Indicators

Criteria	Objective/Rationale	Indicators – What information is used in the evaluation?
Socio-Cultural Criteria		
Real Estate Considerations	Minimize the need for land acquisition	• Requirement for lands, easements, agreements, etc. • Land availability • Willingness of property owner(s) to sell
Aesthetic and Operational Impacts	Minimize long-term visual, odour and light impacts on adjacent residents and local users from new infrastructure and activities related to operation of facilities	• Current odour and air quality conditions of the areas within or near to proposed infrastructure that has potential for odour production • Odour production levels during facility operation/maintenance • Ability of equipment and treatment technology/process to reduce/eliminate odour production • Visual effects on sensitive receptors (adjacent neighbors and land users) • Distance between proposed infrastructure and the closest sensitive receptor(s) • Presence of existing natural or other features around proposed infrastructure that may help reduce visibility • Lighting needs of new infrastructure that may affect surrounding sensitive environments and receptors • Ability to maintain views of natural landscapes and prominent features (rural settings) • Opportunity to improve local character of the area through additional restoration or preservation.
Construction Impacts	Minimize short-term impacts on adjacent residents, road users and local uses resulting from noise, dust, vibration, sewage service and traffic disruption during construction of infrastructure	• Noise and dust production from construction equipment • Current noise conditions of the areas within or near to proposed infrastructure that has potential for noise production • Potential vibration effects on sensitive receptors (adjacent neighbors and area users) during excavation and construction • Potential traffic interruptions during construction
Archaeological / Cultural Heritage Features	Avoid sites with archaeological potential Avoid sites in close proximity to cultural heritage features	• Archaeological potential and presence of cultural heritage features within or in the vicinity of proposed works
Natural Environmental Criteria		
Effluent Receiving Water Body Assessment	Minimize risk for surface water and groundwater impacts and contamination, during construction and operation	• Potential for sediment discharge from construction activities • Characteristics, ecological functions and health of receiving waterbodies
Sensitive Features and Regulated Areas	Minimize disruption to aquatic/terrestrial living organisms	• Presence of natural heritage features including aquatic/terrestrial habitats, vegetation communities, environmentally sensitive features and areas, designated natural areas, species at risk, water resources, in or within vicinity of proposed works

Criteria	Objective/Rationale	Indicators – What information is used in the evaluation?
Greenhouse Gas Emissions	Minimize greenhouse gas emissions	• GHG emissions were evaluated considering the following GHG Emission Scopes: o Scope 1 corresponds to direct emissions from owned or controlled sources at the WWTP. Fugitive N_2O emissions from the biological treatment process were not considered. It was assumed that Scope 1 emissions would be equivalent for all alternatives. o Scope 2 represents indirect emissions resulting from purchased electricity, heating and cooling used at the plant. This includes electricity for process mechanical equipment. o 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. This includes chemicals used for phosphorus removal
Vulnerability to Climate Change	Maximize resiliency to extreme conditions	• Ability of treatment processes to adapt and respond to varying climatic conditions (e.g., increased precipitation events, reduced flow in receiving bodies, etc.)
Technical Considerations		
Operational Complexity	Improve operational efficiencies and minimize operational and monitoring requirements	• Requirement for additional resources and equipment • Need and extent of required modifications to existing equipment/processes • Frequency of additional checks and maintenance requirements
Ease of Implementation	Maximize integration with existing system, treatment processes and other infrastructure components	• Need for additional infrastructure, or modifications, expansions and upgrades of existing facilities, equipment and processes • Opportunity to decommission or provide alternate use for existing facilities • Integration or impact to existing utilities • Integration with other infrastructure elements within the community, current and planned
Redundancy and Flexibility	Potential risk to cease service during construction or emergency situations	• Presence of back-up infrastructure that would minimize or eliminate service disruptions
Constructability	Maximize ease of construction and facilitate integration with existing system(s)	• Length of construction period • Complexity, ease of phasing • Scalability, ability for expansion and upgrades • Ability to maintain wastewater servicing during construction • Ability to maintain existing utilities in service during construction
Regulatory Approvals	Minimize time to secure permits	• Potential design criteria and/or regulatory requirements imposed by review agencies (e.g., conservation authorities, MECP) • Number of permits and approvals needed to implement the works and expected length to secure them
Economic Considerations		
Capital and O&M Cost	Minimize capital cost plus operational and maintenance costs over the 20-year period	• Cost estimates

Specific indicators and a scoring approach were developed to assess the various alternatives. The overall scoring approach is summarized in **Table 27** below.

Table 27: Overall Scoring Approach

Score	Description
●	Potential impacts are negligible, no mitigation is required. Lowest cost. Most efficient operation/performance.
◕	Potential impacts are minor and can be easily mitigated through implementation of standard mitigation measures. Good performance.
◑	Potential impacts are moderate and implementation of a number of mitigation measures are required to reduce/eliminate the risks. Moderate cost. Acceptable performance.
◔	Potential impacts are major, and implementation of extensive mitigation measures are required to reduce/eliminate the risks. Low efficiency. Subpar performance.
○	Potential impacts are significant, and implementation of substantial mitigation measures are required to reduce the risks; however, risk cannot be completed eliminated. Highest cost. Inadequate operation/performance.

10.3 Wastewater Alternative Design Concepts

Four alternative wastewater design concepts were developed based on the short list of technologies. The design concepts are as follows:

1. **Design Concept 1** – Expand Mechanical Plant without use of Lagoons
2. **Design Concept 2** – Use Existing Lagoons for Raw Sewage Equalization
3. **Design Concept 3** – Use Existing Lagoons for Secondary Effluent Storage
4. **Design Concept 4** – Use Existing Lagoons for Tertiary Effluent Storage

The following sections document and evaluate the short-listed alternatives to identify the preferred solution.

10.3.1 General Expansion Requirements

Design concepts 1 to 4 have common upgrades that must be completed to bring the plant up to a rated capacity of 1,580 m^3/d including:

- Secondary treatment – increase capacity as outlined in **Section 10.3.1.1**
- Biosolids management – increase capacity as outlined in **Section 10.3.1.2**

10.3.1.1 Secondary Treatment

The preferred secondary treatment technology was SBR as it is currently used at the plant.

A conceptual design for the incorporation of a new SBR train has been developed. SBR design parameters are listed in **Table 28**. A new train with the same dimensions as the existing trains would be constructed.

It was determined that the existing 135 m^3 EQ tank is sufficient for the operation of all three trains, as the decant cycles would remain staggered and decant volumes per train would remain the same. Therefore, no EQ tank expansion is required. The three existing EQ pumps would be replaced to have a capacity corresponding to the proposed peak hour flow for each option.

Table 28: SBR Design Parameters

Parameter	Value
Number of New Trains	1
Length	21.5 m
Width	6.5 m
Depth	5.5 m
Top Water Level	4.9 m
Bottom Water Level	3.3 m
Sludge Blanket Depth	1.9 m
Design Decant Volume/Cycle	222 m^3
Decant Rate (Normal Cycle)	222 m^3/hr
Decant Rate (Peak Flow Cycle)	281 m^3/hr

Additional aeration requirements from the installation of the third SBR train would be met by replacing the four existing blowers with larger capacity units.

10.3.1.2 Biosolids Management

The Havelock WWTP expansion would require additional digestion capacity. The preferred technology to implement for digestion is aerobic digestion as it is the process currently in place at the plant. A new digester would be constructed on the south side of the new SBR train, adjacent to the existing aerobic digester.

The two digesters and the SBR's would provide a minimum SRT of 45 days, as per MECP Guidelines (MECP, 2008) based on a max month WWTP flow of 3,008 m^3/d.

The Havelock WWTP has an existing 1,575 m^3 biosolids holding tank. It is anticipated that the future annual biosolids production would reach 4,430 m^3/year (12 m^3/d). Based on a capacity of 240 days of storage, a total required volume of 2,913 m^3 would be provided.

Therefore, a new 1,340 m^3 biosolids tank complete with a mixing system would be required. The new tank would be of glass-fused-to-steel construction similar to the existing tank.

10.3.2 Design Concept 1 – Expand Mechanical Plant Without use of Lagoons

Design Concept 1 involves expanding the plant without use of the existing lagoons, following the design criteria outlined in **Table 14** to bring the WWTP to an average day flow rated capacity of 1,580 m^3/ d.

This alternative would be designed to meet the effluent criteria for continuous discharge as defined in **Table 8**. Therefore, the WWTP must be able to meet a total phosphorous effluent concentration of 0.08 mg/L. A process flow diagram of Design Concept 1 is shown in **Figure 7.**

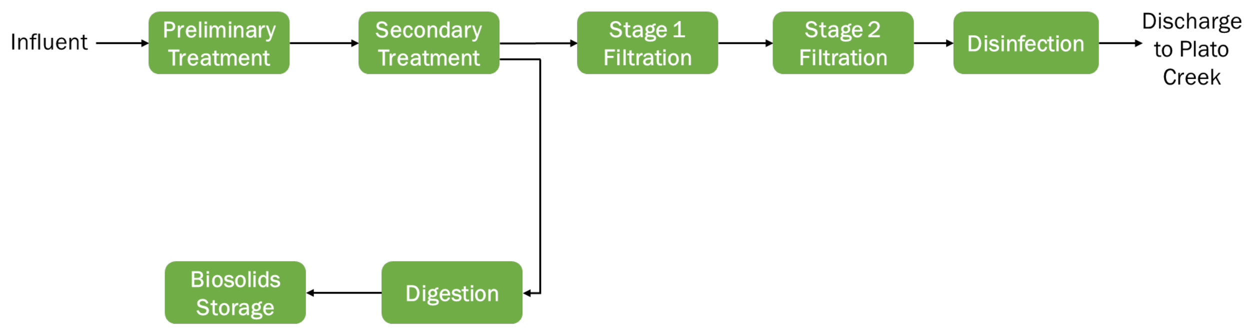

Figure 7: Process Flow Diagram of Design Concept 1

10.3.2.1 Site Layout

Works that would need to be completed as part of Design Concept 1 include the following:

- **Preliminary Treatment** – increase capacity as described in **Section 10.3.2.2;**
- **Secondary Treatment** – increase capacity by adding an additional SBR train as described in **Section 10.3.1.1;**
- **Tertiary Filtration** – increase capacity of filtration using two-stage filtration. This is described in more detail in **Section 10.3.2.3** below.
- **Disinfection** – increase UV disinfection capacity as described in **Section 10.3.2.4;**

- **Biosolids** – construct a new aerobic digester and biosolids storage tank to increase capacity as described in **Section 10.3.1.2;** and,
- **Other**: Civil, structural, building mechanical, instrumentation and control and electrical upgrades as required.

A conceptual layout for this alternative is shown in **Figure 8**. As shown below, the proposed new infrastructure would require the existing effluent line and sludge loading station to be relocated.

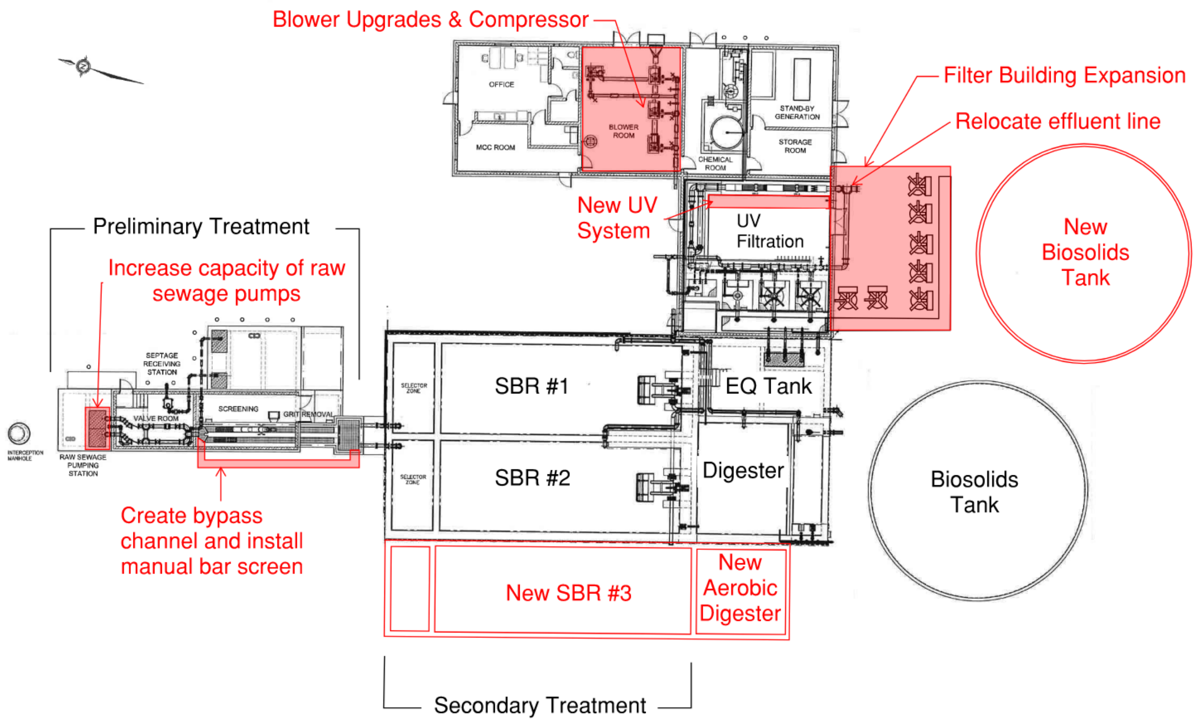

Figure 8: Conceptual Layout for Design Concept 1

10.3.2.2 Preliminary Treatment

The existing septage receiving station in the Headworks Building consists of a grinder, a 106 m^3 septage storage tank, and a submersible pump rated for 5 L/s to transfer septage from the storage tank to the raw sewage pumping station. The capacity of the septage receiving station is to remain as is, allowing for an average septage flow rate of 12 m^3/d to be transferred to the raw sewage pumping station to meet the current ECA requirements.

The existing raw sewage pumping station is equipped with two pumps (one duty, one standby) each rated for 35 L/s at 8 m TDH. These pumps would be replaced with new pumps, each rated for 58.5 L/s (5,056 m^3/d) at 8 m TDH. to accommodate the design peak instantaneous flow (PIF) to the WWTP, including return flows from the plant.

Screening would also be upgraded to provide a firm capacity equal to the PIF of 5,056 m^3/d. The existing Headworks Building includes two channels, one equipped with a mechanical bar screen rated for 3,000 m^3/d and one with a manual bar screen. A new mechanical bar screen would be installed in the existing manual bar screen channel. A new bypass channel would be constructed, and the existing manual bar screen relocated to this channel. The new screening system would thus operate with two mechanical bar screens as duty and one manual bar screen as standby.

The new bypass channel would be designed to operate as a third grit channel to provide firm capacity to meet the projected peak instantaneous flows.

A summary of the design basis for preliminary treatment is summarized in **Table 29** below.

Table 29: Preliminary Treatment – Design Concept 1

Parameter	Existing Capacity	Proposed Capacity	MECP Guideline Basis for Design
Raw Sewage Pumping			
Design Capacity	3,000 m^3/d	5,056 m^3/d	PIF
Screening			
Design Capacity	3,000 m^3/d	5,056 m^3/d	PIF

10.3.2.3 Tertiary Filtration

The existing continuous backwash sand filters are rated for a peak hourly flowrate of 2,765 m^3/d. Additional tertiary filters would be required to meet the new peak hourly flow of 4,424 m^3/d. Furthermore, two-stage filtration would be required to achieve the new TP effluent objective of 0.08 mg/L.

New Stage 1 filters would be installed at a higher elevation than the existing filters. The existing three filters and two new filters installed at the same elevation would be used as Stage 2 filters. Thus, flow from the EQ tank would be directed to the new Stage 1 filters, which would discharge to the Stage 2 filters and then connect to the disinfection system. The existing Operation and Control Building would be expanded to accommodate the new equipment and piping. Parameters for tertiary treatment are listed in **Table 30**.

Table 30: Tertiary Filtration Parameters – Design Concept 1

Parameter	Quantity	Total Capacity
Existing Design		
Stage 1 Filters	3	2,765 m^3/d
Stage 2 Filters		–
Proposed Design		
Stage 1 Filters	To be confirmed during design phase	4,424 m^3/d
Stage 2 Filters	5 (3 existing + 2 proposed)	4,424 m^3/d

10.3.2.4 Disinfection

The existing UV system consists of one duty and one standby reactor in series. To accommodate the increased capacity, the existing UV system would be removed and replaced with one of greater capacity. An additional UV system would be constructed in parallel. Design parameters for the new UV disinfection system are outlined in **Table 31**.

Table 31: Disinfection Treatment Parameters – Design Concept 1

Parameter	Proposed Design
Design Capacity	4,424 m^3/d (1)
Number of Channels	2
Total Number of Banks	4
Number of Modules per Bank	4
Number of Lamps per Module	6
Total Number of Lamps	96
UV Transmissivity	65%

Notes:

1. Based on peak hourly flow as per MECP guidelines

10.3.2.5 Operations and Control Building Extension

The proposed modifications would require an extension to the Operations and Control Building to accommodate the new filters and UV system. To minimize impact to the plant during construction, temporary filtration and disinfection skids would likely be required. A schematic layout of the building extension is shown in **Figure 9**.

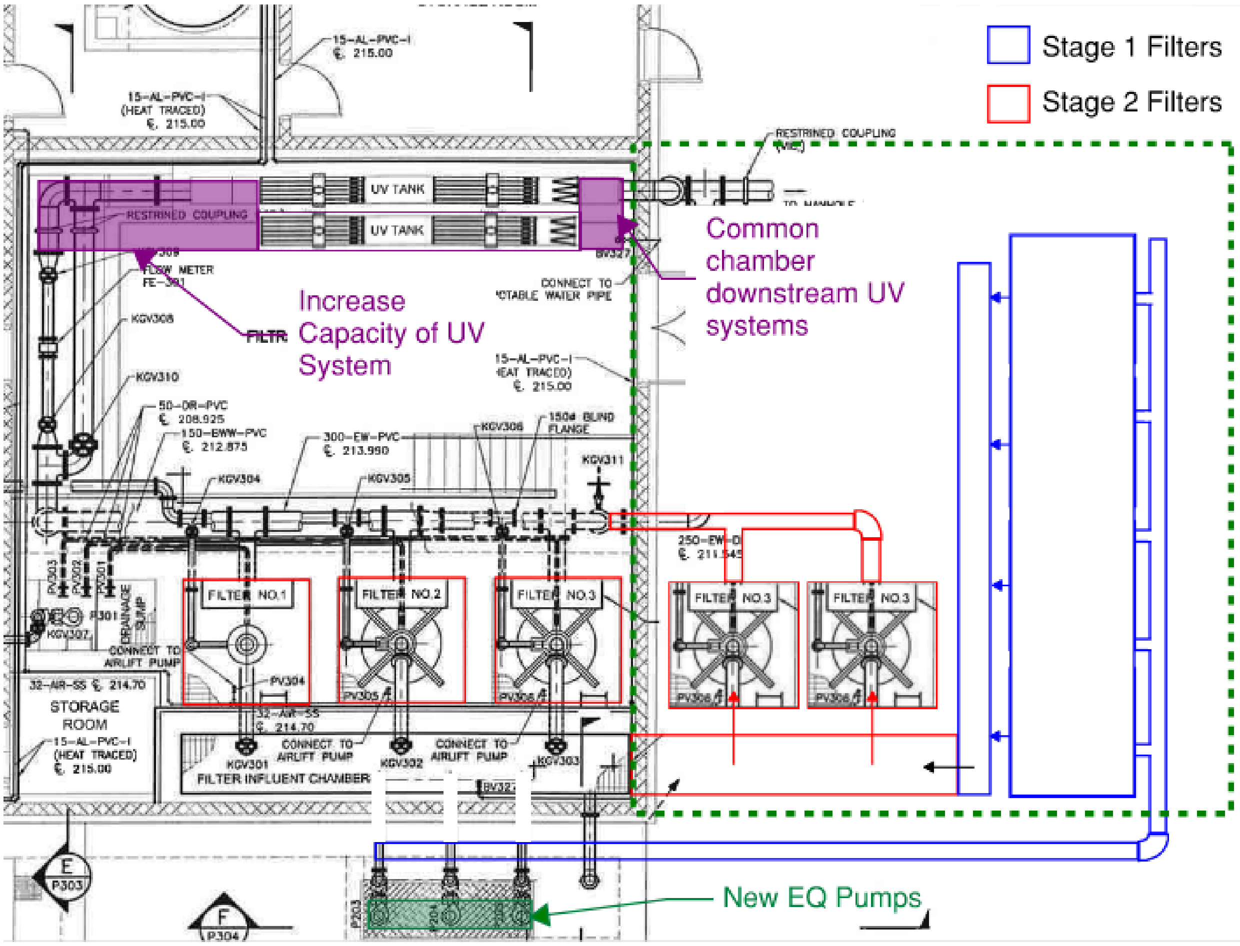

Figure 9: Conceptual Layout of Operation and Control Building Extension – Design Concept 1

10.3.3 Design Concept 2 – Use Existing Lagoon for Raw Sewage Equalization

Design Concept 2 involves expanding the plant and using one of the existing lagoons as an equalization lagoon, following the design criteria outlined in **Table 14** to bring the WWTP to a rated capacity of 1,580 m^3/d. During wet weather flow conditions, incoming sewage flows exceeding the current peak flow capacity of the filtration system (2,765 m^3/d) would be directed to the lagoon for storage. Once the high flow event has passed, stored sewage would then be discharged in a controlled manner back to the headworks.

As part of this concept, downstream processes would be designed to meet the effluent criteria for continuous discharge as defined in **Table 8**. Therefore, the WWTP must be able to meet a total phosphorous effluent concentration of 0.08 mg/L. A process flow diagram of Design Concept 2 is shown in **Figure 10**.

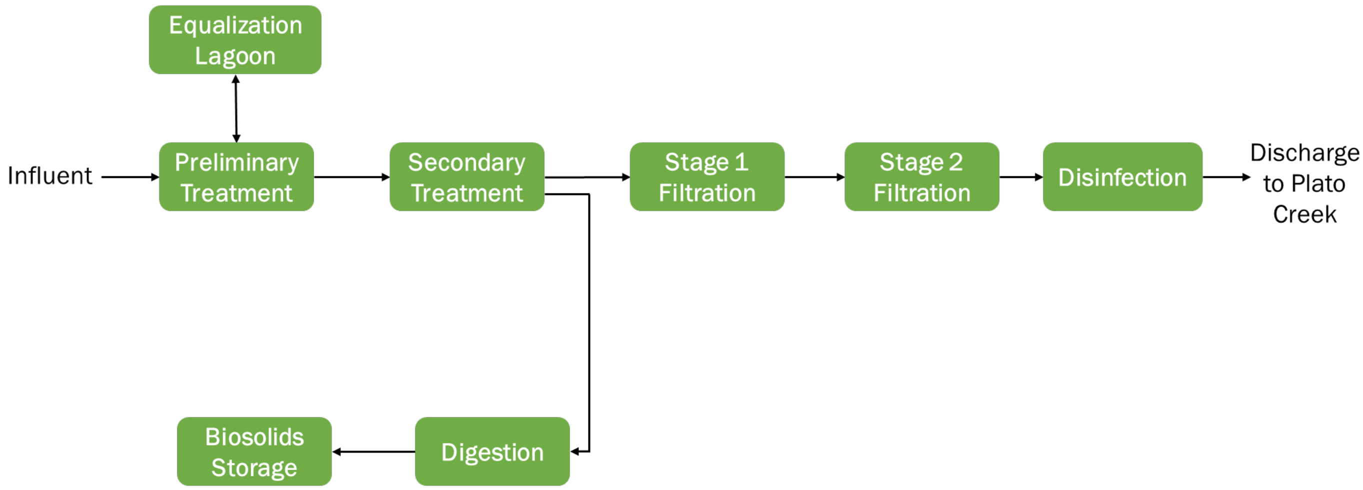

Figure 10: Process Flow Diagram of Design Concept 2

10.3.3.1 Site Layout

Works that would need to be completed as part of this design concept include the following:

- **Preliminary Treatment** – no capacity upgrades required. Upstream modifications would be required to direct flows exceeding the plant capacity to the equalization lagoon;
- **Equalization Lagoon** – Reline one of the existing lagoons to use for equalization as described in **Section 10.3.3.2**;
- **Secondary Treatment** – increase capacity by adding a new SBR train as per **Section 10.3.1.1**;
- **Tertiary Filtration** – add dual filters to meet new TP objective as per **Section 10.3.3.3**;
- **Disinfection** – no upgrades required;
- **Biosolids** – construct a new aerobic digester and biosolids storage tank to increase capacity as described in **Section 10.3.1.2;** and,
- **Other**: Civil, structural, building mechanical, instrumentation and control and electrical upgrades as required.

A conceptual layout of the lagoon modifications and WWTP upgrades for this alternative are shown in **Figure 11** and **Figure 12** below.

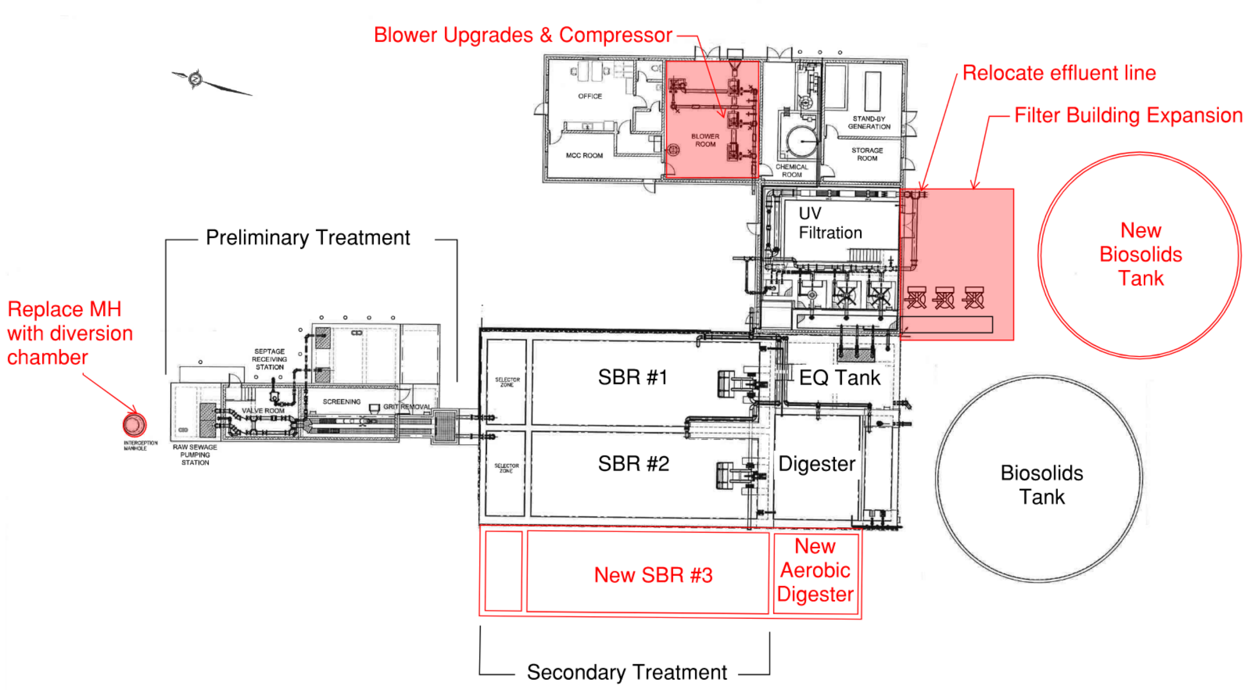

Figure 11: Conceptual Layout of Design Concept 2 – WWTP Upgrades

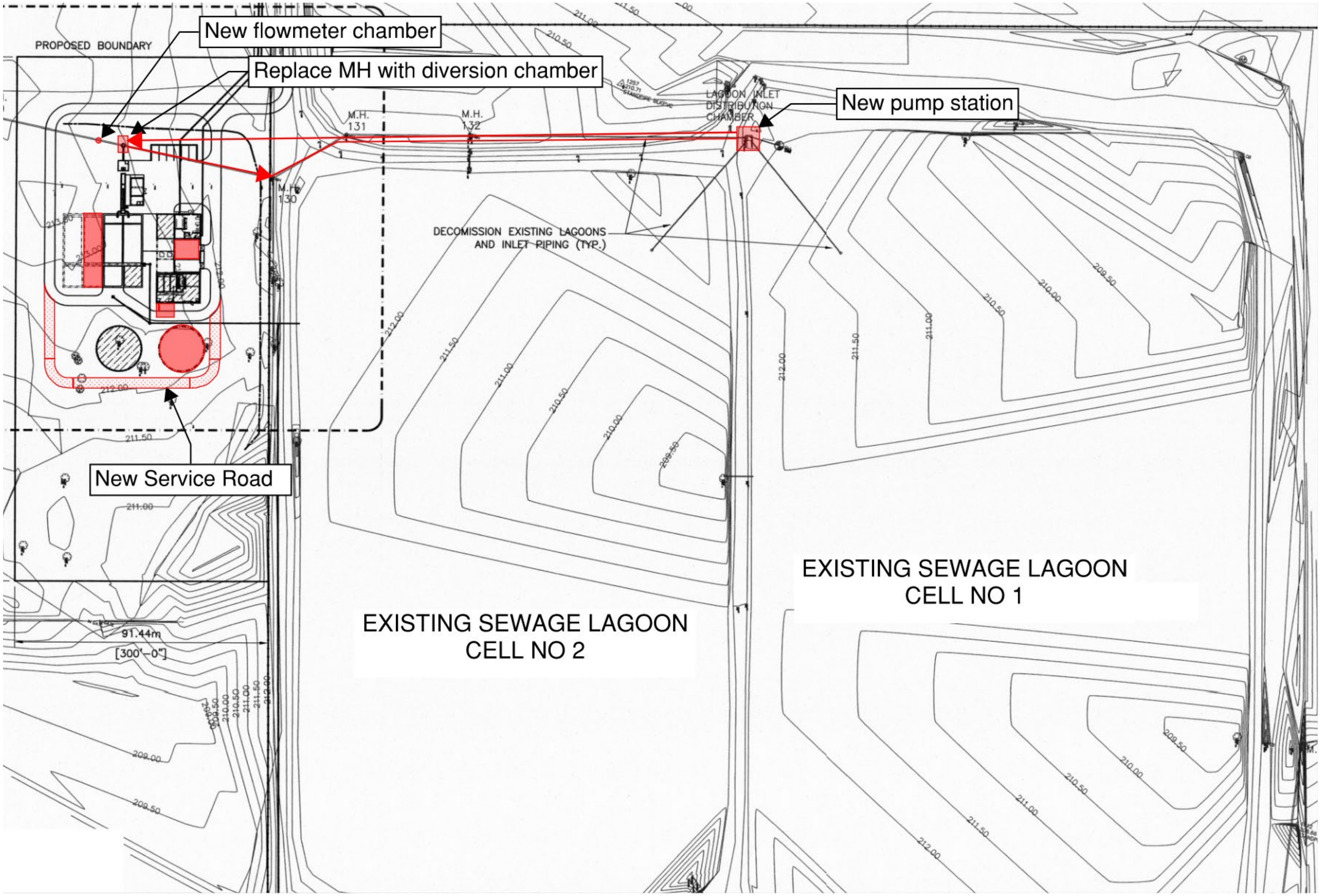

Figure 12: Conceptual Layout of Design Concept 2 – Lagoon Modifications

10.3.3.2 Lagoon Modifications

To repurpose the existing Lagoon Cell 2, it must be cleaned and relined with a geomembrane or clay liner. During detailed design the volume required for equalization will be determined. It is possible that new internal berms could be constructed to form a smaller lagoon. For the purposes of this evaluation, it was assumed that the entire lagoon would be utilized.

A new influent flow meter (e.g., Parshall flume) would be constructed upstream of the plant and connected to the existing influent sewer. The maintenance hole (MH) directly upstream of the raw sewage pumping station would be replaced with a new chamber equipped with a modulating gate. This modulating gate would control the volume of incoming raw sewage diverted to the equalization lagoon based on the upstream flow meter. Flows exceeding 2,765 m^3/d (the current capacity of the filters) would be diverted to the lagoon.

To empty the new equalization lagoon, a new pumping station and forcemain would need to be installed. This would allow raw sewage to be pumped from the lagoon back to the raw sewage pumping station during low flow conditions.

10.3.3.3 Tertiary Treatment

The existing continuous backwash sand filters are rated for a peak hourly flowrate of 2,765 m^3/d. Since the existing lagoon would be used for equalization as part of these upgrades, the WWTP would be able to maintain its existing peak hour flow capacity. Therefore, the overall capacity of the filters can remain at 2,765 m^3/d. However, two-stage filtration would be required to achieve the new TP effluent objective of 0.08 mg/L.

Three new Stage 1 filters would be located within an extension to the Operations and Control Building. The three existing filters would be used as Stage 2 filters. Flow from the EQ tank would be directed to the new Stage 1 filters, which would discharge to the Stage 2 filters and then connect to the existing disinfection system. The design parameters for tertiary treatment for this concept are listed in **Table 32**.

Table 32: Tertiary Filtration Parameters – Design Concept 2

Parameter	Quantity	Total Capacity
Existing Design		
Stage 1 Filters	3	2,765 m^3/d
Stage 2 Filters	–	–

Parameter	Quantity	Total Capacity
Proposed Design		
Stage 1 Filters	3	2,765 m^3/d
Stage 2 Filters	3	2,765 m^3/d

10.3.3.4 Filter and Disinfection Building Extension

The proposed modifications would require an extension to the Operation and Control Building to provide adequate space. A schematic layout of the building extension is shown in **Figure 13**.

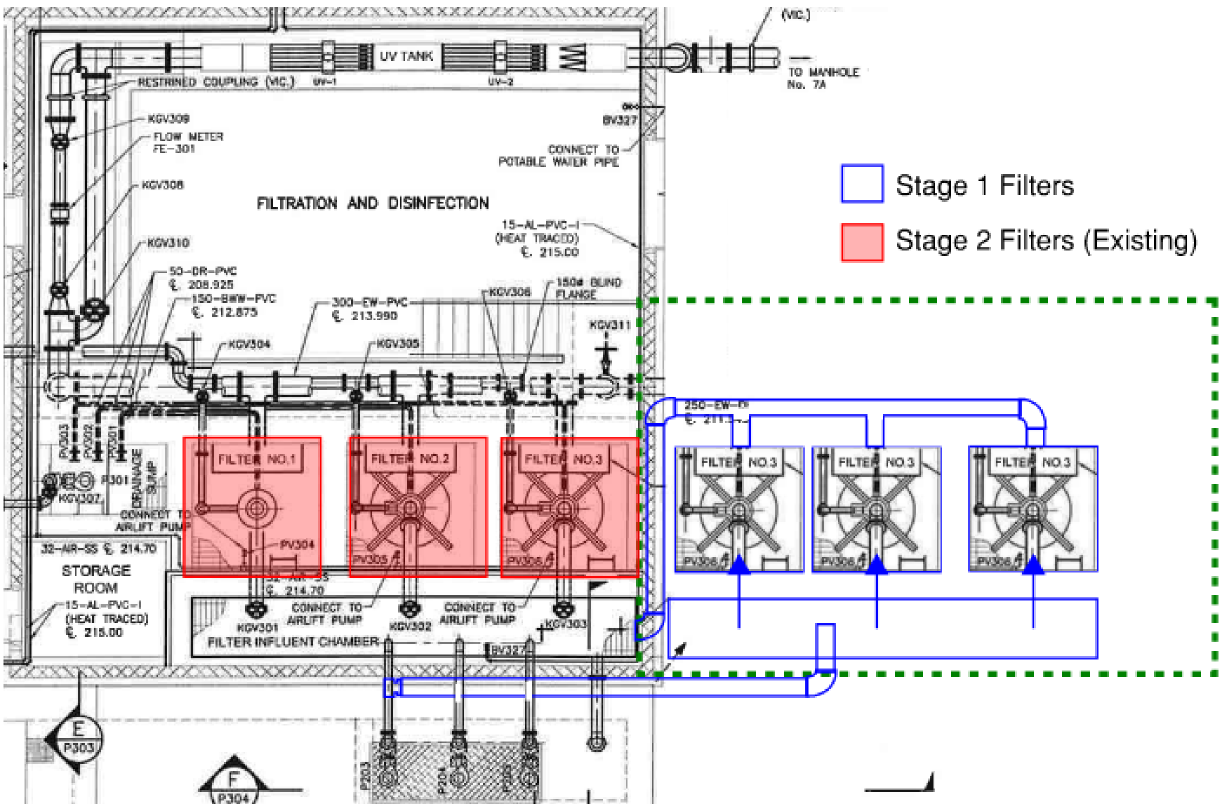

Figure 13: Conceptual Layout of Operation and Control Building Extension – Design Concept 2

10.3.4 Design Concept 3 – Use Existing Lagoons for Secondary Effluent Storage

Alternative 3 involves utilizing the existing the decommissioned sewage lagoons for storage of secondary effluent during the months of August and September, when the lowest flow conditions in Plato Creek occur. Since the WWTP would not discharge during August and September, the WWTP would be required to meet less stringent effluent discharge concentrations during the remaining months as outlined in **Table 9**.

The corresponding total phosphorus effluent concentration objective would be 0.13 mg/L.

After the storage period, secondary effluent in the lagoons would be pumped to the filter influent channel in a controlled manner. A process flow diagram of Design Concept 3 is shown in **Figure 14**.

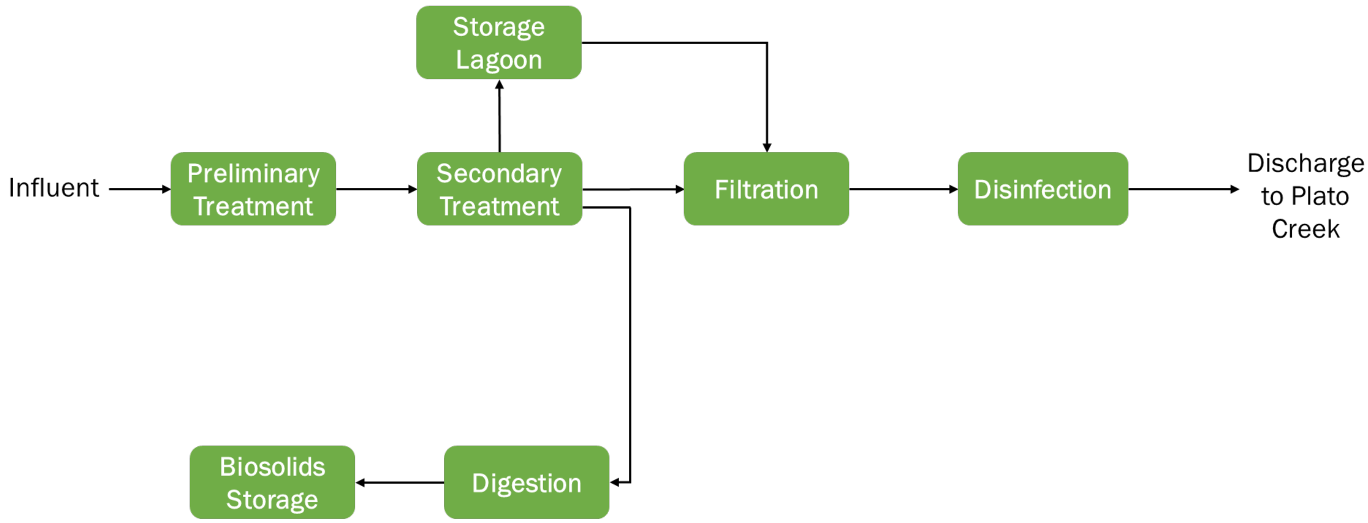

Figure 14 Process Flow Diagram of Design Concept 3

10.3.4.1 Site Layout

Works that would need to be completed as part of Design Concept 3 include the following:

- **Preliminary Treatment –** increase capacity as described in Section **10.3.2.2;**
- **Secondary Treatment –** increase capacity by adding additional SBR train as per Section **10.3.4.3;**
- **Effluent Storage Lagoons –** reline existing lagoons and use for storage of secondary treatment effluent as described in **Section 10.3.4.2**;
- **Tertiary Filtration –** increase capacity of existing single stage filtration as described in **Section 10.3.4.4;**
- **Disinfection –** increase UV disinfection capacity as described in **Section 10.3.4.5;**
- **Biosolids** – construct a new aerobic digester and biosolids storage tank to increase capacity as described in **Section 10.3.1.2;** and,
- **Other:** Civil, structural, building mechanical, instrumentation and control and electrical upgrades as required.

A conceptual layout of the lagoon modifications and WWTP upgrades for this alternative is shown in **Figure 15** and **Figure 16** below.

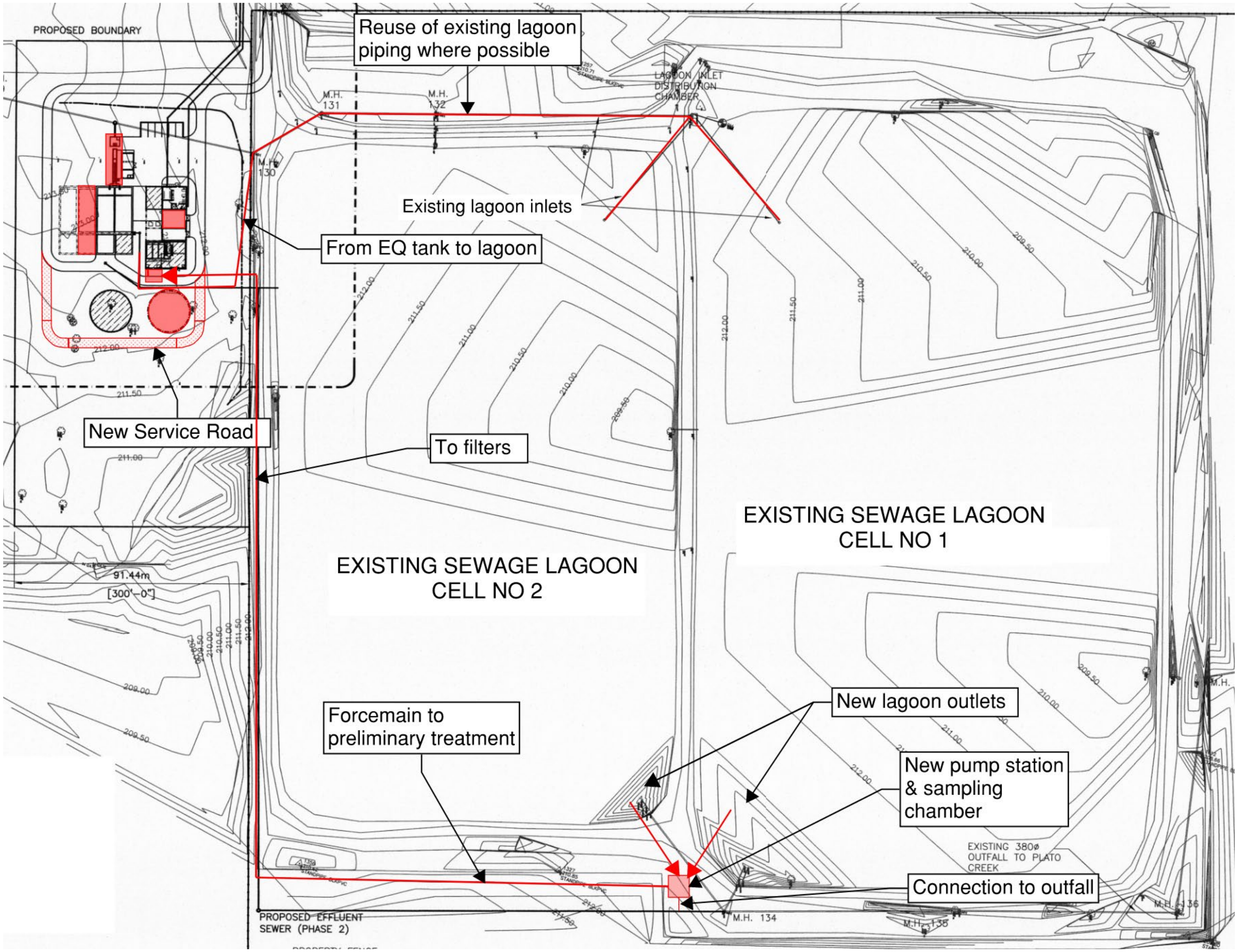

Figure 15: Conceptual Layout of Design Concept 3 – Lagoon Modifications

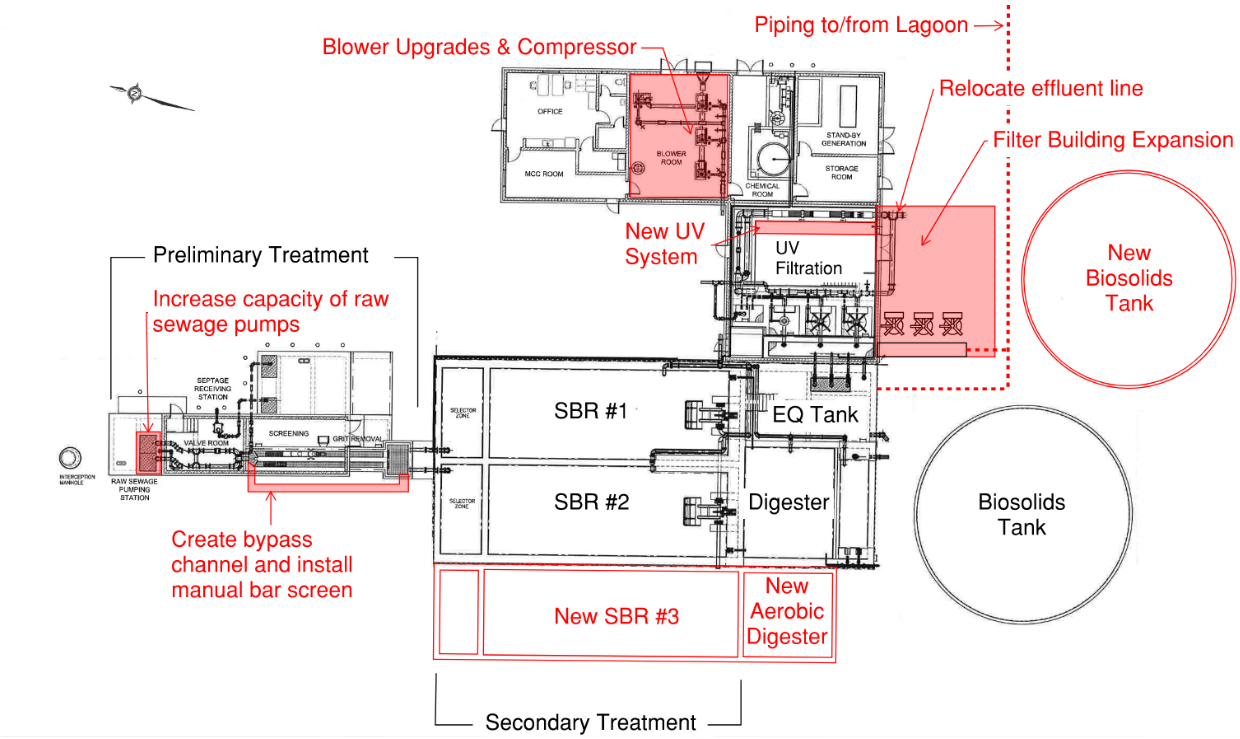

Figure 16: Conceptual Layout of Design Concept 3 – WWTP Upgrades

10.3.4.2 Lagoon Modifications

Secondary effluent would be pumped to the lagoons during the storage period (August to September) using the new EQ tank pumps.

To repurpose the existing wastewater lagoons, both must be cleaned and relined with a geomembrane or clay liner.

A new lagoon pumping station would be required to drain the lagoons. New lagoon outlets would be constructed as shown in **Figure 15**. The new pumping station would pump to the filter inlet channel.

Modifications would be made to the existing EQ Tank pump discharge lines so Operations would have the choice of pumping to the lagoon or to the filters. Conceptual piping modifications are shown in **Figure 15**.

10.3.4.3 Preliminary Treatment

No modifications to the existing septage receiving station in the Headworks Building would be required. 12 m^3/d of septage would be transferred to the raw sewage pumping station during average day conditions.

The existing raw sewage pumping station pumps would be replaced with new pumps, each rated for 58.5 L/s (5,056 m^3/d) to accommodate the design peak instantaneous flow (PIF) to the WWTP.

Screening would also be upgraded to provide a firm capacity equal to the PIF of 5,056 m^3/d. The existing Headworks Building includes two channels, one equipped with a mechanical bar screen rated for 3,000 m^3/d and one with a manual bar screen. A new mechanical bar screen would be installed in the existing manual bar screen channel. A new bypass channel would be constructed, and the existing manual bar screen relocated to this channel. The new screening system would thus operate with two mechanical bar screens as duty and one manual bar screen as standby.

The new bypass channel would be designed to operate as a third grit channel to provide firm capacity to meet the projected peak instantaneous flows.

A summary of the design basis for preliminary treatment is summarized in **Table 33** below.

Table 33: Preliminary Treatment – Design Basis for Expansion

Parameter	Existing Capacity	Proposed Capacity	MECP Guideline Basis for Design
Raw Sewage Pumping			
Design Capacity	3,000 m^3/d	5,056 m^3/d	PIF
Screening			
Design Capacity	3,000 m^3/d	5,056 m^3/d	PIF

10.3.4.4 Tertiary Filtration

The existing continuous backwash sand filters are rated for a peak hourly flowrate of 2,765 m^3/d. Additional tertiary filters would be required to accommodate simultaneously receiving flow from the SBRs and the lagoon (when it is drained), for a total of 6,004 m^3/d. This would require the installation of three (3) new continuous backwash sand filters, which would be installed within an extension to the existing Operation and Control Building. Single stage continuous backwash sand filters are capable of reliably achieving TP effluent concentrations of 0.1 mg/L (i.e., less than the required limit of 0.13 mg/L). Therefore, for this design concept, it would not be necessary to add a second stage of filters. Parameters for tertiary treatment are listed in **Table 34**.

Table 34: Tertiary Filtration Parameters – Design Concept 3

Parameter	Quantity	Capacity per Filter	Total Capacity
Existing Design			
Stage 1 Filters	3	922 m^3/d	2,765 m^3/d
Stage 2 Filters	–	–	–
Proposed Design			
Stage 1 Filters	6	1,000 m^3/d	6,004 m^3/d
Stage 2 Filters	–	–	–

10.3.4.5 Disinfection

The existing UV system consists of one channel with one duty and one standby system in series. To accommodate the increased capacity, an additional UV system would be constructed parallel to the existing system. Design parameters for the new UV disinfection system are listed in **Table 35**. The new UV system would be sized to handle the new peak hourly flow of 4,424 m^3/d and the return flow from the lagoon at 1,580 m^3/d for a total of 6,004 m^3/d.

Table 35: Disinfection Treatment Parameters – Design Concept 3

Parameter	Existing Design	Proposed Design
Design Capacity	3,000 m^3/d	6,004 m^3/d
Number of Channels	1	2
Total Number of Banks	2	4
Number of Modules per Bank	6	4
Number of Lamps per Module	4	6
Total Number of Lamps	48	96
UV Transmissivity		65%

10.3.4.6 Filter and Disinfection Building Extension

The modifications associated with Design Concept 3 would require an extension to the Operation and Control Building to accommodate the new filters and UV system. A schematic layout of the building extension is shown in **Figure 17.**

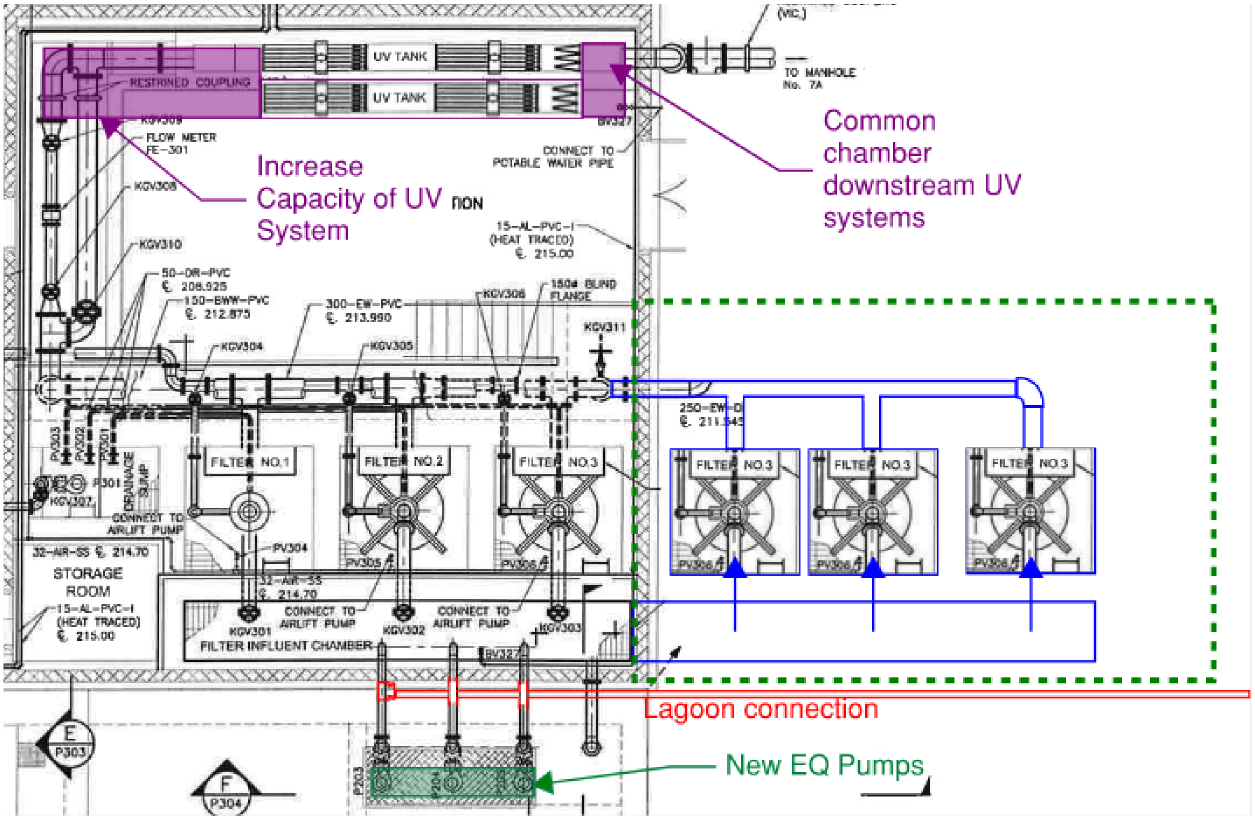

Figure 17: Conceptual Layout of Operation and Control Building Extension – Design Concept 3

10.3.5 Design Concept 4 – Use Existing Lagoons for Tertiary Effluent Storage

This concept is similar to Design Concept 3 in that it utilizes the existing decommissioned sewage lagoons during the months of August and September. However, this concept involves using the lagoons for storage of tertiary treated effluent. Similarly to Design Concept 3, the WWTP would be designed to meet effluent discharge concentrations listed in **Table 9**, which include a less stringent TP effluent concentration objective of 0.13 mg/L. A process flow diagram of Design Concept 4 is shown in **Figure 18**.

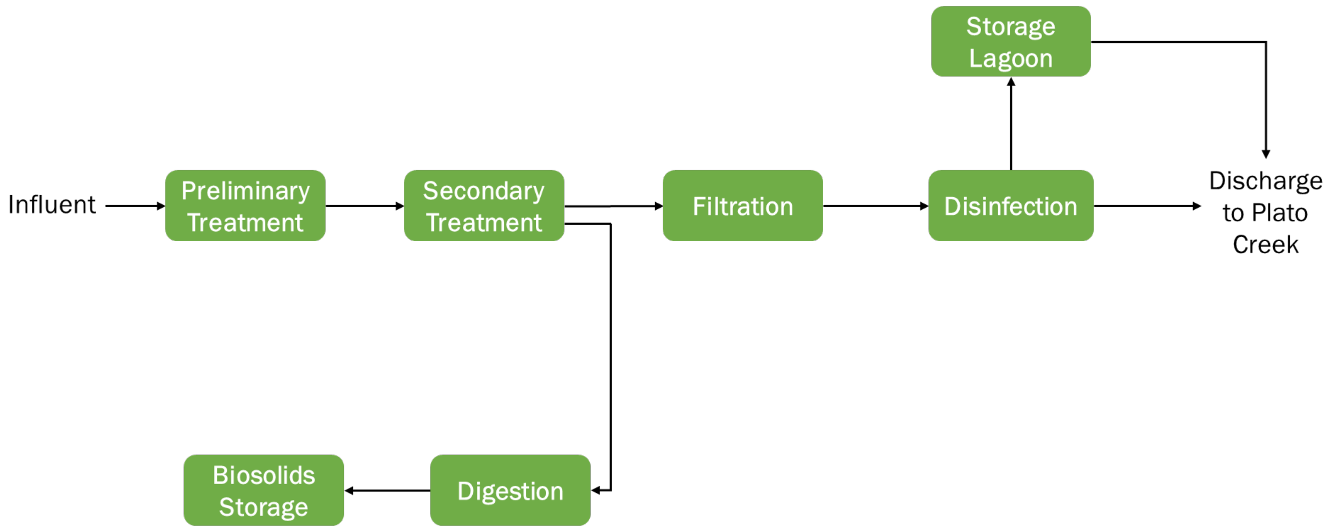

Figure 18: Process Flow Diagram of Design Concept 4

10.3.5.1 Site Layout

Works that would need to be completed include the following:

- **Preliminary Treatment** – increase capacity as described in **Section 10.3.5.3**;
- **Secondary Treatment** – increase capacity by adding a new SBR train as per **Section 10.3.1.1**;
- **Tertiary Filtration** – increase capacity of existing single stage filtration as described in **Section 10.3.5.4**;
- **Disinfection** – increase UV disinfection capacity as described in **Section 10.3.5.5**;
- **Effluent Storage Lagoons** – reline and reuse existing lagoons for storage of tertiary treatment effluent as described in **Section 10.3.5.2**;
- **Biosolids** – construct a new aerobic digester and biosolids storage tank to increase capacity as described in **Section 10.3.1.2;** and,
- **Other:** Civil, structural, building mechanical, instrumentation and control and electrical upgrades as required.

A process flow diagram and conceptual layouts of the lagoon modifications and WWTP upgrades for this alternative are shown in **Figure 19** and **Figure 20** below.

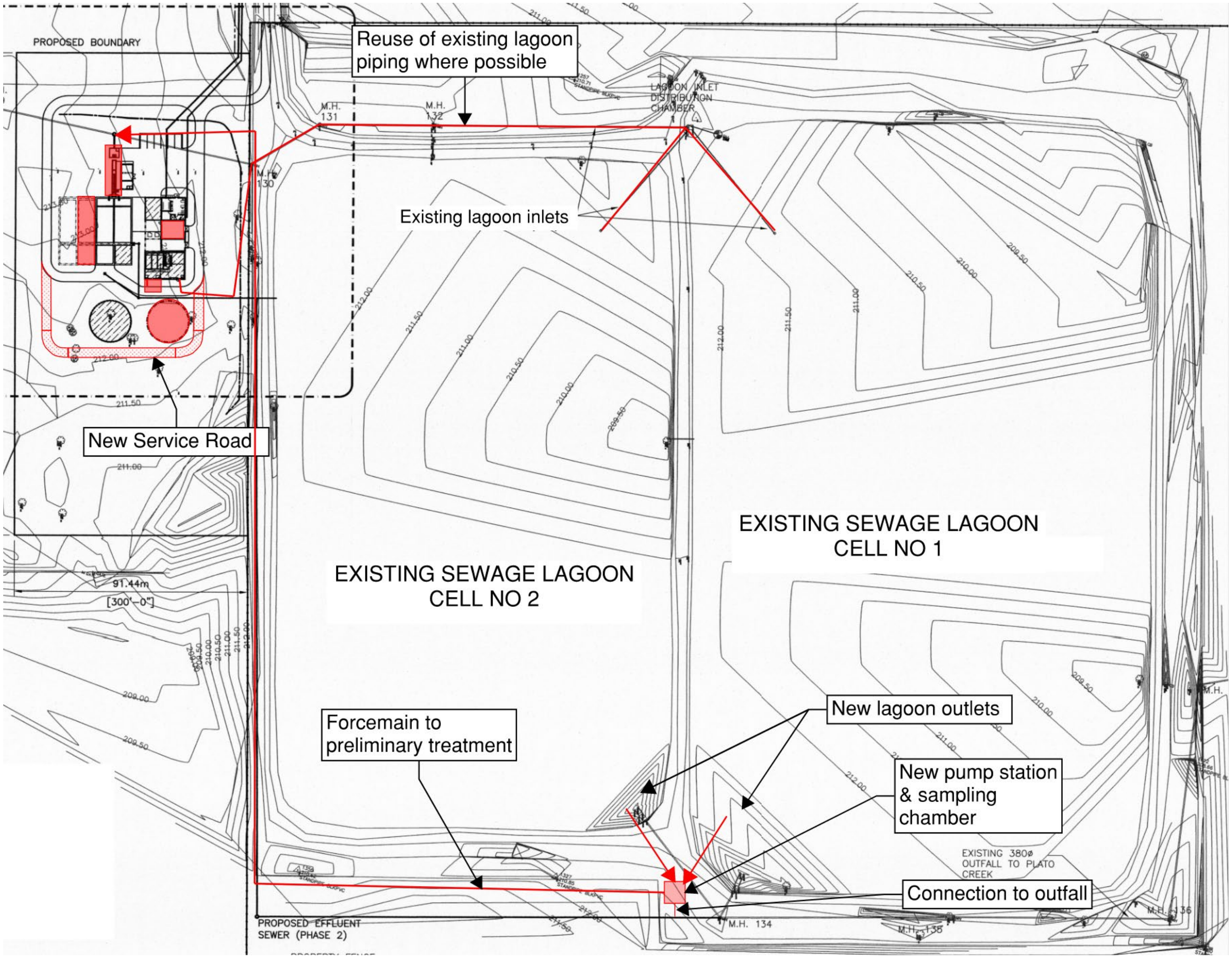

Figure 19: Conceptual Layout of Design Concept 4 – Lagoon Modifications

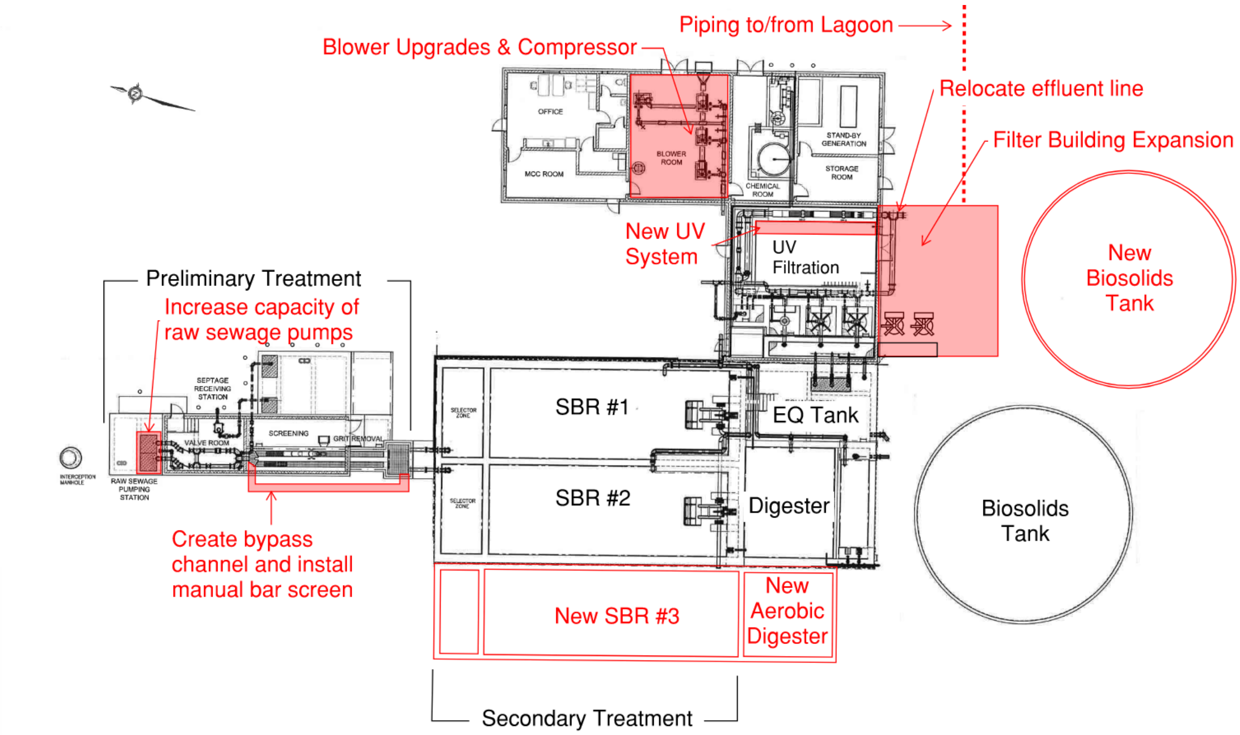

Figure 20: Conceptual Layout of Design Concept 4 – WWTP Upgrades

10.3.5.2 Lagoon Modifications

To repurpose the existing wastewater lagoons, they must be cleaned and relined with a geomembrane or clay liner.

Final effluent (filtered and disinfected) would flow by gravity from the UV system to the lagoon inlet. After the storage period, final effluent would be discharged from the lagoon using the existing outfall piping. A sampling and flow meter chamber at the outlet of the lagoon would be required.

A new pumping station would be required to drain the lagoons in case the effluent does not meet the limits set out in the ECA prior to discharge. The new pumping station would be located at the existing diversion chamber to utilize existing lagoon connections, if possible.

10.3.5.3 Preliminary Treatment

No modifications to the existing septage receiving station in the Headworks Building would be required. 12 m^3/d of septage would be transferred to the raw sewage pumping station during average day conditions.

The existing raw sewage pumping station pumps would be replaced with new pumps, each rated for 58.5 L/s (5,056 m^3/d) to accommodate the design peak instantaneous flow (PIF) to the WWTP.

Screening would also be upgraded to provide a firm capacity equal to the PIF of 5,056 m^3/d. The existing Headworks Building includes two channels, one equipped with a mechanical bar screen rated for 3,000 m^3/d and one with a manual bar screen. A new mechanical bar screen would be installed in the existing manual bar screen channel. A new bypass channel would be constructed, and the existing manual bar screen relocated to this channel. The new screening system would thus operate with two mechanical bar screens as duty and one manual bar screen as standby.

The new bypass channel would be designed to operate as a third grit channel to provide firm capacity to meet the projected peak instantaneous flows.

A summary of the design basis for preliminary treatment is summarized in **Table 36** below.

Table 36: Preliminary Treatment – Design Basis for Expansion

Parameter	Existing Capacity	Proposed Capacity	MECP Guideline Basis for Design
Raw Sewage Pumping			
Design Capacity	3,000 m^3/d	5,056 m^3/d	PIF
Screening			
Design Capacity	3,000 m^3/d	5,056 m^3/d	PIF

10.3.5.4 Tertiary Treatment

The existing sand filters are rated for a peak hourly flowrate of 2,765 m^3/d. Additional tertiary filters would be required to meet the new peak hourly flow of 4,424 m^3/d. This would require the installation of two new continuous backwash sand filters, which would be installed within an extension to the existing Operation and Control Building. Single stage continuous backwash sand filters are capable of reliably achieving a TP effluent concentration of 0.1 mg/L. Therefore, it would not necessary to add second stage of filtration. Parameters for the tertiary treatment associated with this design concept are listed in **Table 37**.

Table 37: Tertiary Treatment Parameters – Design Concept 4

Parameter	Quantity	Total Capacity
Existing Design		
Stage 1 Filters	3	2,765 m^3/d
Stage 2 Filters	–	–
Proposed Design		
Stage 1 Filters	6	4,424 m^3/d
Stage 2 Filters	–	–

10.3.5.5 Disinfection

The existing UV system consists of one duty and one standby reactor in series. To accommodate the increased capacity, an additional UV system would be constructed in parallel. Design parameters for the new UV disinfection system are outlined within **Table 38**.

Table 38: Disinfection Treatment Parameters – Design Concept 4

Parameter	Existing Design	Proposed Design
Design Capacity	2,765m^3/d	4,424 m^3/d [1]
Number of Channels	1	2
Total Number of Banks	2	4
Number of Modules per Bank	6	4
Number of Lamps per Module	4	6
Total Number of Lamps	48	96
UV Transmissivity		65%

Notes:

1. Based on peak hourly flow as per MECP guidelines

10.3.5.6 Filter and Disinfection Building Extension

The proposed modifications would require an extension to the Operation and Control Building to provide adequate space. A conceptual layout of the building extension is shown in **Figure 21**.

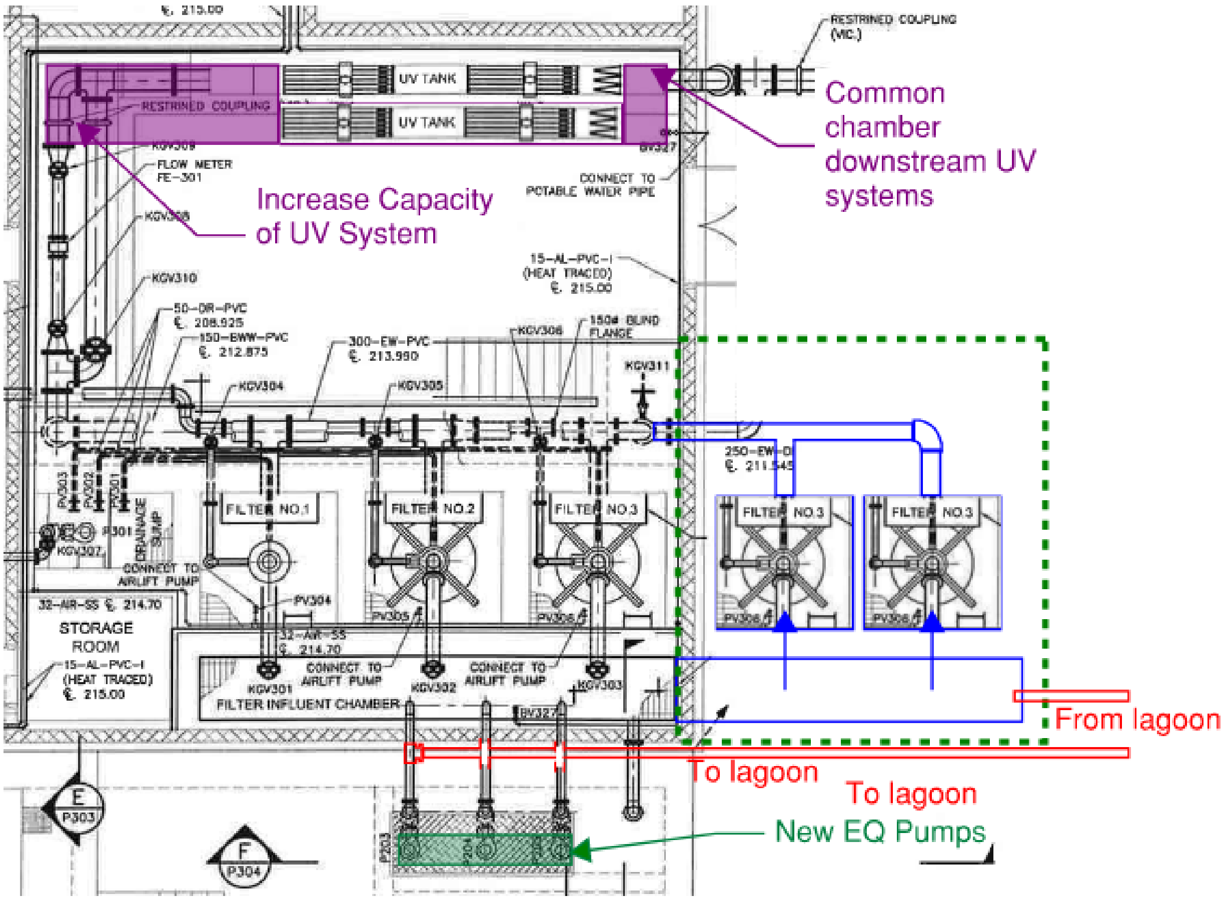

Figure 21: Conceptual Layout of Operation and Control Building Extension – Design Concept 4

10.4 Conceptual Cost Estimates

Class 5 conceptual cost estimates (-50%/+100% accuracy) for each design concept are provided in **Table 39**.

The estimates were based on equipment vendor quotes and historical tender values and include a 30% contingency allowance for details that would be confirmed through the design phase. The cost estimates are for comparative purposes only. A detailed breakdown stating assumptions is included in **Appendix F**.

Table 39: Conceptual Cost Estimate for Alternatives (2023 $)

Item	Design Concept 1	Design Concept 2	Design Concept 3	Design Concept 4
Civil				
Service Road Extension	$300,000	$300,000	$300,000	$300,000

Item	Design Concept 1	Design Concept 2	Design Concept 3	Design Concept 4
Effluent Line Relocation	$150,000	$150,000	$150,000	$150,000
Sludge Loading Relocation	$200,000	$200,000	$200,000	$200,000
Structural				
Operation and Control Building Extension	$370,000	$370,000	$173,000	$173,000
New Screen and Grit Bypass Channel	$100,000	-	$100,000	$100,000
Lagoon				
Lagoon Rehabilitation		$700,000	$1,400,000	$1,400,000
Earth Works		$600,000	$600,000	$600,000
Pump Station	-	$400,000	$400,000	$400,000
Yard Piping	-	$500,000	$500,000	$500,000
Process				
Raw Sewage Pumping	$75,000	-	$75,000	$75,000
Screening	$300,000	-	$300,000	$300,000
Secondary Treatment + Digester	$3,000,000	$3,000,000	$3,000,000	$3,000,000
EQ Tank Pumps	$100,000	$50,000	$100,000	$100,000
Tertiary Treatment	$2,500,000	$1,300,000	$1,300,000	$1,000,000
Disinfection	$700,000	-	$700,000	$700,000
Biosolids Storage	$1,013,000	$1,013,000	$1,013,000	$1,013,000
Temporary Equipment Rental (Bypass/Temporary UV system)	$300,000	$50,000	$300,000	$300,000
Other – Building Mechanical, Controls, Electrical	$2,000,000	$1,800,000	$2,000,000	$2,000,000
Subtotal	**$11,708,000**	**$11,303,000**	**$14,151,000**	**$13,851,000**
Engineering (20%)	**$2,341,600**	**$2,260,600**	**$2,830,200**	**$2,770,200**
Contingency (30%)	**$3,512,400**	**$3,390,900**	**$4,245,300**	**$4,155,300**
General Contractor's Overhead & Profit, Mob.,bond (20%)	**$2,341,600**	**$2,260,600**	**$2,830,200**	**$2,770,200**
Total (rounded to nearest thousand)	**$19,904,000**	**$19,215,000**	**$24,057,000**	**$23,547,000**

Life cycle cost for each design concept over a 20-year planning horizon are summarized in **Table 40**. The operation and maintenance values below are marginal values. Therefore, they only take into consideration the incremental costs of operating and maintaining the equipment installed in each design concept. The 20-year operation and maintenance costs are estimated assuming a discount rate equal to inflation. The values below assume that no equipment is replaced within the 20-year planning horizon.

Table 40: Life Cycle Cost Estimate (20-year planning horizon)

Item	Initial Capital Cost (2023 $)	20-Year Operation & Maintenance Cost (2023 $)	20-Year Life Cycle Cost
Design Concept 1	$19,904,000	$889,200	$20,793,200
Design Concept 2	$19,215,000	$963,300	$20,178,300
Design Concept 3	$24,057,000	$864,500	$24,921,500
Design Concept 4	$23,547,000	$864,500	$24,411,500

10.5 Evaluation of Alternative Design Concepts

An evaluation matrix **(Table 41)** was developed to score the four identified design concepts based on meet the criteria described in **Section 10.2**.

Table 41: Evaluation of Design Concepts

Criteria	Design Concept 1: Expand Mechanical Plant Without use of Lagoons	Design Concept 2: Use Existing Lagoon for Equalization	Design Concept 3: Use Existing Lagoons for Secondary Effluent Equalization and Storage	Design Concept 4: Use Existing Lagoons for Tertiary Effluent Equalization and Storage
Socio-Cultural Criteria				
Real Estate Considerations Minimize the need for land acquisition	● Land to be used as part of the upgrade is already owned by the Township.	● Land to be used as part of the upgrade is already owned by the Township.	● Land to be used as part of the upgrade is already owned by the Township.	● Land to be used as part of the upgrade is already owned by the Township.
Aesthetic and Operational Impacts Minimize long-term visual and odour on adjacent residents and local users from new infrastructure and activities related to operation of facilities	● This design concept would have the least long-term visual and odour impacts. The majority of the upgrades would be completed within a building, with only the new SBR visible.	◑ This design concept involves temporarilty storing raw sewage in an open lagoon. Odour are issues are more likely to occur compared to storing final effluent. However, a smaller volume would be stored. Also, the equalization lagoon would be farther away from residential areas.	◑ This design concept involves storing secondary effluent in an open lagoon. This may lead to odour issues as the effluent has not yet been fully treated.	◕ This design concept involves storing final effluent in an open lagoon. Odour issues are note expected.
Construction Impacts Minimize short-term impacts on adjacent residents, road users and local uses resulting from noise, dust, vibration, sewage service and traffic disruption during construction of infrastructure	● This concept would require less construction traffic than that required for the other options. Dust and noise would be mitigated and limited to the vicinity of the plant.	◕ This concept requires the cleaning of one decommissioned lagoon. This would lead to some additional construction traffic compared to Alternative 1. Construction traffic could lead to increased dust and noise for residents located near main roads.	◑ This concept requires the cleaning of two decommissioned lagoons. This would lead to additional construction traffic compared to Alternative 1 and 2. Construction traffic could lead to increased dust and noise for residents located near main roads.	◑ This concept requires the cleaning of two decommissioned lagoons. This would lead to additional construction traffic compared to Alternative 1 and 2. Construction traffic could lead to increased dust and noise for residents located near main roads.
Archaeological / Cultural Heritage Features Minimize disruption.	● Stage 1 archaeological investigations was performed within the area. A Stage 2 assessment would be required due to the construction of the new access road behind the biosolids storage tank.	● Stage 1 archaeological investigations was performed within the area. A Stage 2 assessment would be required due to the construction of the new access road behind the biosolids storage tank.	● Stage 1 archaeological investigations was performed within the area. A Stage 2 assessment would be required due to the construction of the new access road behind the biosolids storage tank.	● Stage 1 archaeological investigations was performed within the area. A Stage 2 assessment would be required due to the construction of the new access road behind the biosolids storage tank.

Criteria	Design Concept 1: Expand Mechanical Plant Without use of Lagoons	Design Concept 2: Use Existing Lagoon for Equalization	Design Concept 3: Use Existing Lagoons for Secondary Effluent Equalization and Storage	Design Concept 4: Use Existing Lagoons for Tertiary Effluent Equalization and Storage
Natural Environmental Criteria				
Effluent Receiving Water Body Assessment Minimize risk for surface water and groundwater impacts and contamination during construction and operation	● This design concept involves upgrading the existing plant within its property limits. No impacts to the effluent receiving water body are anticipated during construction and operation.	● This design concept involves upgrading the existing plant within its property limits. No impacts to the effluent receiving water body are anticipated during construction and operation.	● This design concept involves upgrading the existing plant within its property limits. No impacts to the effluent receiving water body are anticipated during construction and operation.	● This design concept involves upgrading the existing plant within its property limits. No impacts to the effluent receiving water body are anticipated during construction and operation.
Sensitive Features and Regulated Areas Minimize disruption to aquatic/terrestrial living organisms	● This design concept involves upgrading the existing plant within its property limits. No impacts to the effluent receiving water body are anticipated during construction and operation.	◕ This design concept involves rehabilitating one decommissioned lagoon. During the time that it has been out of service, aquatic/terrestrial living organisms have been allowed to grow within them. Further investigations would be required prior to the draining and cleaning.	◑ This design concept involves rehabilitating two decommissioned lagoons. During the time that they have been out of service, aquatic/terrestrial living organisms have been allowed to grow within them. Further investigations would be required prior to the draining and cleaning.	◑ This design concept involves rehabilitating two decommissioned lagoons. During the time that they have been out of service, aquatic/terrestrial living organisms have been allowed to grow within them. Further investigations would be required prior to the draining and cleaning.
Climate Change Minimize greenhouse gas emissions	◕ GHG emissions generated by treatment process and through the use of fossil fuels for heating/energy (Scope 1): This concept would result in GHG emissions to concepts 2, 3 and 4. GHG emissions from energy use (Scope 2): All alternatives would have similar GHG reduction credits from beneficial use of biosolids. GHG emissions from transportation: All concepts have similar trucking requirements.	● GHG emissions from processing: This concept has the lowest GHG emissions. GHG emissions from transportation: All concepts have similar trucking requirements. All alternatives would have similar GHG reduction credits from beneficial use of biosolids.	◕ GHG emissions from processing: This concept has similar GHG emissions to concept 1 and 4. GHG emissions from transportation: All concepts have similar trucking requirements. All alternatives would have similar GHG reduction credits from beneficial use of biosolids.	◕ GHG emissions from processing: This concept has similar GHG emissions to concept 1 and 3. GHG emissions from transportation: All concepts have similar trucking requirements. All alternatives would have similar GHG reduction credits from beneficial use of biosolids.

Criteria	Design Concept 1: Expand Mechanical Plant Without use of Lagoons	Design Concept 2: Use Existing Lagoon for Equalization	Design Concept 3: Use Existing Lagoons for Secondary Effluent Equalization and Storage	Design Concept 4: Use Existing Lagoons for Tertiary Effluent Equalization and Storage
Vulnerability to Climate Change Maximize resiliency to extreme conditions and climate change related impacts	◔ The plant would be vulnerable to extreme wet weather flow events. This could lead to plant bypasses and untreated discharges to the environment.	● The equalization lagoon would allow the plant to handle significant wet weather flow events without treatment performance.	◔ The plant would be vulnerable to extreme wet weather flow events. This could lead to plant bypasses and untreated discharges to the environment.	◔ The plant would be vulnerable to extreme wet weather flow events. This could lead to plant bypasses and untreated discharges to the environment.
Technical Considerations				
Operational Complexity Improve operational efficiencies and minimize operational and monitoring requirements	◕ This design concept involves using two-staged filters. This would require additional operator training. Additional operator training is also required for additional UV system.	● This design concept involves using two-staged filters. This would require additional operator training. This design concept involves the operation of an equalization lagoon. The operation of the lagoon can be automated to fill and drain at set incoming WWTP flows.	◑ This design concept involves the operation of a storage lagoon, which would require additional operator training. Additional monitoring would be required to ensure the lagoon filling and draining follow the timeline set out in the ACS. Additional operator training is also required for additional UV system.	◑ This design concept involves the operation of a storage lagoon. Additional monitoring would be required to ensure the lagoon filling and draining follow the timeline set out in the ACS. Additional operator training is also required for additional UV system.
Ease of Implementation Maximize integration with existing system, treatment processes and other infrastructure components	◕ Additional structures are required for the new grit bypass channel and large filter building expansion. This alternative cannot be constructed in phases.	● Additional structure is required for the large filter building expansion. This alternative can be constructed in phases.	◑ Additional structures are required for the new grit bypass channel and filter building expansion. Modifications to the existing EQ tank and UV system outfall must be made to connect to the lagoon. This alternative cannot be constructed in phases.	◕ Additional structures are required for the new grit bypass channel and filter building expansion. Modifications to the existing EQ tank and UV system outfall must be made to connect to the lagoon. This alternative option cannot be constructed in phases.

Criteria	Design Concept 1: Expand Mechanical Plant Without use of Lagoons	Design Concept 2: Use Existing Lagoon for Equalization	Design Concept 3: Use Existing Lagoons for Secondary Effluent Equalization and Storage	Design Concept 4: Use Existing Lagoons for Tertiary Effluent Equalization and Storage
Redundancy and Flexibility Potential risk to cease service during construction or emergency situations	◔ The construction of this design concept would require bypass pumping, filtration, and disinfection during construction. All new equipment would operate on duty/standby to provide redundancy. No flexibility provided without the use of lagoon storage/equalization.	● Staging and some bypass pumping would be required to implement this Alternative. Less disruptions are expected for filtration and disinfection compared to other Alternatives. All new equipment would operate on duty/standby to provide redundancy. Equalization lagoon would provide the WWTP flexibility with operation by reducing peak flows and providing emergency storage.	◕ The construction of this design concept would require bypass pumping, filtration, and disinfection during construction. All new equipment would operate on duty/standby to provide redundancy. Storage lagoon would not help reduce peak flows or act as emergency storage.	◑ The construction of this design concept would require bypass pumping, filtration, and disinfection during construction. All new equipment would operate on duty/standby to provide redundancy. Storage lagoon would not help reduce peak flows or act as emergency storage.
Constructability Maximize ease of construction and facilitate integration with existing system(s)	◑ The construction of this design concept would require deep excavation for the implementation of Stage 2 filters. Based on the number of filters required, this concept would require the largest expansion. Excavation would also be required for the new grit channel bypass and SBR train.	● The construction of this design concept would require deep excavation for the implementation of Stage 2 filters. One decommissioned lagoon would need to be cleaned and rehabilitated with some additional yard piping required to filing and draining the lagoon.	◔ The construction of this design concept would require excavation for the implementation of the new filters. Excavation would also be required for the new grit channel bypass and SBR train. Two decommissioned lagoons would need to be cleaned and rehabilitated. Extensive yard piping would be required to fill and drain the lagoons. Tying int the existing EQ tank and UV outfall would be difficult.	◔ The construction of this design concept would require a building expansion for two new filters. Excavation would also be required for the new grit channel bypass and SBR train. Two decommissioned lagoons would need to be cleaned and rehabilitated. Extensive yard piping would be required to fill and drain the lagoons. Tying int the existing EQ tank and UV outfall would be difficult.
Regulatory Approvals Minimize time to secure permits	● All of the technologies being implemented as part of this design concept are already in use at the WWTP. This would lead to easier regulatory approvals.	◕ This design concept requires the draining and cleaning of a decommissioned lagoon. This would likely lead to additional communication for regulatory approvals.	◑ This design concept requires the draining and cleaning of two decommissioned lagoons. This would likely lead to additional communication for regulatory approvals.	◑ This design concept requires the draining and cleaning of two decommissioned lagoons. This would likely lead to additional communication for regulatory approvals.

Criteria	Design Concept 1: Expand Mechanical Plant Without use of Lagoons	Design Concept 2: Use Existing Lagoon for Equalization	Design Concept 3: Use Existing Lagoons for Secondary Effluent Equalization and Storage	Design Concept 4: Use Existing Lagoons for Tertiary Effluent Equalization and Storage
Economic Considerations				
Capital Cost Minimize capital cost plus operational and maintenance costs over the 20-year period	● $19,904,000	● $19,215,000	◕ $24,057,000	◕ $23,547,000
O&M Cost Minimize operational and maintenance costs over the 20-year period	● $889,200	◑ $963,300	◕ $864,500	◕ $864,500
OVERALL SCORE	◕	● Preferred Design Concept	◔	◑

10.6 Preferred Design Concept

Design Concept 2 was identified as the preferred design concept for the Havelock WWTP expansion. This involves expanding the plant and using one of the existing lagoons as an equalization lagoon, following the design criteria outlined below in **Table 42.** During wet weather flow conditions, incoming sewage flows exceeding the current peak flow capacity of the filtration system (2,765 m^3/d) would be directed to the lagoon for storage. Once the high flow event has passed, stored sewage would then be discharged in a controlled manner back to the headworks.

Table 42: Design Flow Criteria

Parameter	Design Flow (m^3/d)	Peaking Factor
Average Day Flow	1,580	
Maximum Day Flow	3,989	2.5
Maximum Month Flow	3,009	1.9
Peak Hour Flow	4,424	2.8
Peak Instantaneous Flow	5,056	3.2

The design average blended wastewater concentrations are shown in **Table 43** below.

Table 43: Raw Blended Wastewater and Septage Concentration Design Criteria

Parameter	Influent Concentration (mg/L)
$cBOD_5$	165
TSS	219
TKN	32
TP	5

As part of this concept, downstream processes would be designed to meet the effluent criteria for continuous discharge as defined in **Table 44**.

Table 44: Effluent Design Criteria

Parameter		Effluent Objectives Max Monthly Mean Concentration	Effluent Limits Max Monthly Mean Concentration
$cBOD_5$ (mg/L)		6.0	10
TSS (mg/L)		6.4	8.5
Total Ammonia (mg/L as N)	Jun to Oct	0.8	1.0
	Nov to May	3.0	3.9
TP (mg/L)	Jun to Oct	0.08	0.11
	Nov to May	0.17	0.23
pH		6.5 to 9.5	6.5 to 9.5
E. coli (CFU/100ml)		100	100

Process upgrades related to the preferred design concept are listed in **Table 45**. Since equalization is being implemented as part of this concept, no capacity increases are required for preliminary treatment, tertiary treatment, and disinfection.

Table 45: Preferred Concept Required Works

Process	Description
Preliminary Treatment	No capacity upgrades required.
Secondary Treatment	Construct additional SBR train.
Tertiary Filtration	No capacity upgrades required. Add two-stage filters to meet new lower TP objectives.
Disinfection	No capacity upgrades required.
Equalization Lagoon	Clean and reline one existing lagoon to act as an equalization lagoon. Install upstream diversion chamber and flow meter chamber. Install pumping station.
Biosolids	Construct additional aerobic digester adjacent to existing. Construct additional biosolids storage tank.

11 Implementation Phasing

The implementation of the expansion can occur over two phases:

- **Phase 1:** Involves retrofitting one of the existing lagoons for influent equalization. This upgrade will not increase the plant's overall rated capacity.
- **Phase 2:** Involves expanding the rated capacity of the plant to 1,580 m^3/d including additional capacity to treat septage.

Completion of Phase 1 (using one of the lagoons for equalization) would help manage the issues currently experienced by the plant during wet weather flow conditions. High flows would be diverted to the lagoon to not overload the WWTP. The stored sewage would be pumped back to the plant headworks once the high flow period is over.

Using the lagoon for flow equalization would not increase the rated capacity of the plant. Therefore, Phase 1 would not require a change to the existing ECA effluent criteria. The Phase 1 upgrades would provide additional flexibility to manage septage at the plant.

It is recommended that Phase 1 be completed as soon as possible. No further development should be approved until Phase 1 is completed.

It is normally recommended to expand a plant once average daily flows are approximately 80% of the plant's rated capacity if additional population growth is forecasted.

Once Phase 1 is completed, the existing Havelock WWTP will be able to accommodate average daily flows corresponding to 420 additional people before reaching 90% of its rate capacity. This would translate to approximately 120 new units assuming a household density of 3.5 persons/unit with a per capita average day value of 450 L/cap/d. The 120 units correspond to the majority of Phase 1, 2, and 3 of the Havelock South Development.

The timing of **Phase 2** would be dependent on the rate of development and the success of I&I reduction measures in the collection system.

Figure 22 shows the timing of the Phase 2 upgrades under various flow conditions. The yellow line shows flow projections assuming flows from existing development remain the same as the historical average values. The red line shows the effect of reducing flows from existing development. Under this scenario, flows are assumed to be reduced by 2% starting in 2024 reaching a total reduction of 10% by 2028. This figure shows the potential effect of I&I reduction measures on the timing for the plant expansion.

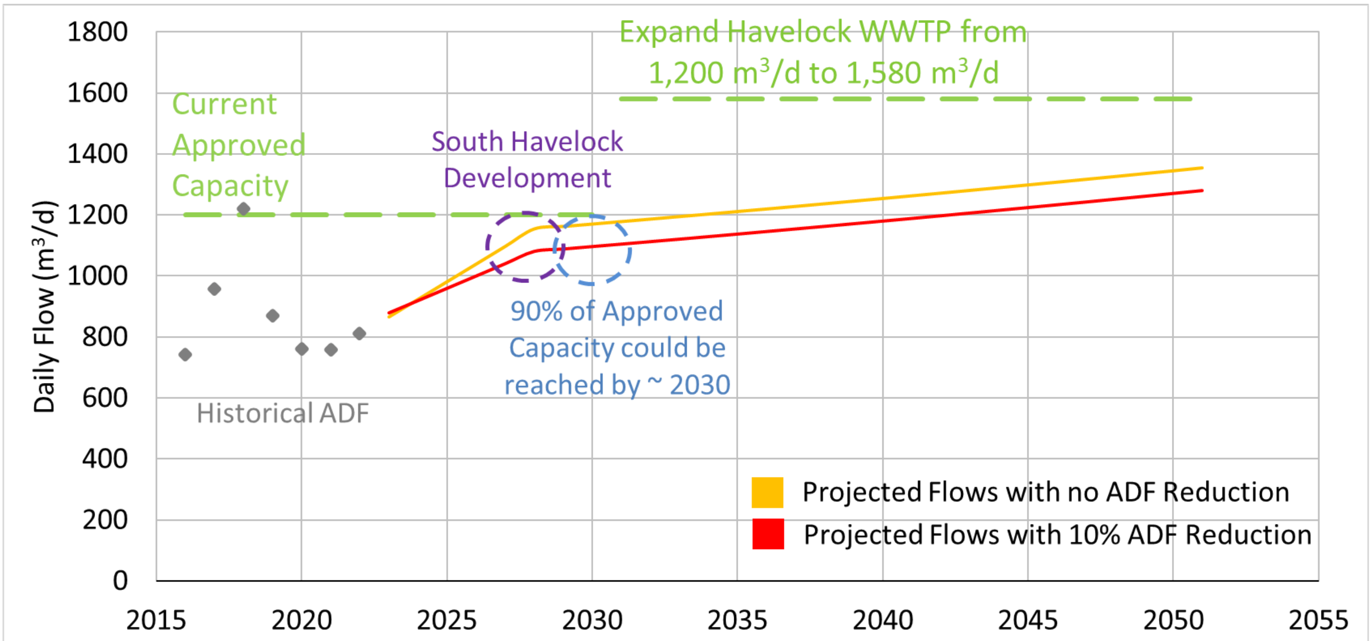

Figure 22: Projected Average Day Flows vs. Existing WWTP Capacity

Class 5 cost estimates (+100%/-50%) for each phase are provided in **Table 46** and **Table 47** below. These cost estimates are based on those presented in **Section 10.4.**

Table 46: Phase 1 Cost Estimate ($2023)

Item	Cost
Lagoon Rehabilitation	$770,000
Earth Works	$600,000
Pump Station	$400,000
Yard Piping	$500,000
Other – Building Mechanical, Controls, Electrical	$800,000
Subtotal	**$3,070,000**
Engineering (20%)	$614,000
Contingency (30%)	$921,000
General Contractor's Overhead & Profit, Mob., Bonding (20%)	$614,000
Total (rounded to nearest thousand)	**$5,219,000**

Table 47: Phase 2 Cost Estimate ($2023)

Item	Cost
Civil	
Service Road Extension	$300,000
Effluent Line Relocation	$150,000
Sludge Loading Relocation	$200,000

Item	Cost
Structural	
Operation and Control Building Extension	$370,000
Process	
Secondary Treatment + Digester	$3,000,000
EQ Tank Pumps	$50,000
Tertiary Treatment	$1,300,000
Biosolids Storage	$1,013,000
Temporary Equipment Rental (Bypass/Temporary UV system)	$50,000
Other – Building Mechanical, Controls, Electrical	$1,800,000
Subtotal	**$8,233,000**
Engineering (20%)	$1,646,600
Contingency (30%)	$2,469,900
General Contractor's Overhead & Profit, Mob., Bonding (20%)	$1,646,600
Total (rounded to nearest thousand)	**$13,996,000**

12 Mitigation Measures

When constructing any type of infrastructure, there is a potential for environmental impacts to occur as a result of the construction activities. Measures must be taken to either minimize or offset the negative effects. Actions taken to reduce the effects of a certain project on the environment are called “mitigating measures.”

The Class EA process requires development of mitigating measures after identification of the magnitude of the net negative impacts of the preferred solution. These measures are defined in such a way to allow the project to be undertaken at a reasonable cost, while at the same time protecting the environment against net negative impacts.

The WWTP expansion would have the potential for environmental impacts, and where these can be anticipated in the design stage, special provisions should be written into the construction specifications and/or incorporated in the design. The provisions would dictate the construction methods that are permitted and more importantly the construction methods that are not allowed. Unforeseen problems that arise during construction would be addressed on site, and judgment should be used to ensure that any resulting changes to the contract do not cause negative environmental impacts.

Staff responsible for inspecting the contractor’s work must be made aware of such provisions to ensure compliance during construction. It would be the responsibility of the contract administrator to ensure that inspectors enforce compliance with the environmental provisions, as well as the standard engineering provisions of the construction tender documents.

This project is also subject to permitting and approvals from regulatory agencies. The potential permit and approval requirements are listed in **Section 13** below and should be reviewed again during the detailed design stage. No additional impacts on natural social/cultural environments are expected beyond those resulting from current operations.

12.1 Natural Environment Impact Mitigation

The environment assessment of the study area completed by WSP (**Section 6.8**) included an evaluation of potential impacts to the natural environment. Suggested mitigation measures are outlined in the following sections.

A detailed survey of the site should be conducted for turtles or snakes in the project area. If any threatened or endangered species are found, approvals from MECP will be required.

12.1.1 General Best Management Practices

Standard Best Practices to be followed during Project activities to mitigate disturbance to natural features on site and adjacent areas include the following:

- Clearly demarcate and maintain the site boundaries during project activities;
- Implement sediment/erosion controls adjacent to natural features during project activities;
- Implement dust control measures in dry conditions;
- Avoid removal or disturbance to vegetation during the migratory bird nesting period (April 5 – August 26). If vegetation removal or disturbance during this period cannot be avoided, conduct a pre-clearing nesting survey by a qualified biologist;
- Avoid activities resulting in major noise and vibration levels during the migratory bird nesting period (April 5 – August 26), whenever possible;
- Avoid the storage of construction materials or equipment adjacent to sensitive natural features (e.g., woodland) to minimize disturbance to these features and resident wildlife;
- Ensure all equipment is cleaned prior to transportation and use on the site to avoid the spread or introduction of invasive species on the site.

12.1.2 Other Project Specific Mitigation

Mitigation specific to the Project would include:

- Scheduling draining of the lagoons in September, timed to avoid the migratory bird nesting period and amphibian breeding season, and before turtles, if present, go into hibernation;
- Conducting turtle relocation if any are present in the lagoons (subject to approvals from MECP);
- Conducting a fish salvage if fish are identified in the lagoons, in consultation with the MNRF to ensure all permitting and management requirements (e.g., euthanization) are met. Summer fish sampling in the lagoons should be completed to determine the presence of fish.

12.2 Social/Cultural Environnent Impact Mitigation

12.2.1 Traffic

There would be an increase in construction traffic for delivery of material and equipment to the site. Construction signage would be posted on the impacted roads to make motorists aware of the construction entrances.

12.2.2 Noise, Dust and Vibration

Noise, dust and vibration during construction projects is unavoidable. Potential sources of noise, dust, and vibration are truck traffic and regular construction activities. These impacts can generally be mitigated following the guidelines below:

- All truck traffic, excavation equipment and other activity that potentially generates significant noise levels should be restricted to normal work hours pursuant to local municipal noise bylaws.
- Excavated materials should be used on-site wherever possible in order to minimize truck haulage to off-site disposal areas.
- Dust control agents should be applied as necessary
- Dry exposed soil should be kept wet to make it less susceptible to wind erosion and should be covered if left for extended periods of time.
- Pre-construction and post-construction surveys of neighboring building/properties should be completed to ensure that any impacts associated with construction can be clearly identified.
- Construction in residential areas should be scheduled during cool or cold weather periods, when recreational usage of outdoor areas on residential properties is generally lower, if possible.

12.2.3 Public Notification

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

13 Permits and Approvals

13.1 MECP

The Township would need to complete an amendment to its existing Environmental Compliance Approval (ECA) to update the process descriptions and capacities. This would involve a technical review by the MECP.

Permits would be required from the MECP in case any threatened or endangered species are found during detailed field surveys.

13.2 Township

A site plan approval and building permit would need to be obtained from the Township of Havelock Belmont Methuen.

14 Public and Agency Consultation

14.1 Points of Contact

Consultation with the public and government review agencies is a necessary and important component of the Municipal Class Environmental Assessment process. To meet the consultation requirements for this Schedule C project, the Township ensured that the public and review agencies were informed of the Study and given the opportunity to provide input on the assessment and alternative evaluation process. The following sub sections provide a summary of the key points of contact that were established throughout the course of the Study, as well as a summary of comments and feedback received. Furthermore, the project status and notices were published on the Township's website at https://www.hbmtwp.ca/en/living-here/wastewater-treatment-plant-wwtp.aspx.

A summary of comments received during the Class EA and responses is included in **Appendix I**.

14.1.1 Notice of Study Commencement

The Notice of Study Commencement was developed to briefly outline the purpose and justification for the Study to the ministries, organizations, agencies and other stakeholders that may be affected and/or interested in the Havelock WWTP Upgrades. The Notice was sent via mail to the stakeholders listed in **Appendix G.** The Notice can also be found in **Appendix G**.

The Notice of Study Commencement was also published on the Township's website on August 10, 2021.

14.1.2 Public Information Centres

Two public information centers (PICs) were held to obtain input at key milestones of the Class EA process. These milestones included introducing the study problem and opportunities, describing alternatives and design concepts for expanding the Havelock WWTP.

14.1.2.1 Public Information Centre 1

The Notice of PIC 1 was issued via email to the stakeholders identified at the onset of the project, as well as additional stakeholders who requested future notification through the various project communication platforms. The notice was issued on March 1, 2022.

During the global pandemic caused by COVID-19, a virtual PIC presentation was pre-recorded and made available for viewing on the Township's website on March 3, 2022.

The purpose of the first PIC was to provide background information on the studies to stakeholder's and the public and introduce the project team. The PIC also provided an engagement opportunity through a survey/questionnaire for interested parties to provide comments, submit questions and identify areas of importance regarding the Class EA.

The PIC 1 pre-recorded video received approximately 60 views. Comments were received through the PIC questionnaire/survey. The pre-recorded video remains available on the Township's website.

14.1.2.2 Public Information Centre 2

The Notice of PIC 2 was issued via email to the stakeholders identified at the onset of the project, as well as additional stakeholders who requested future notification through the various project communication platforms. The notice was issued on October 11, 2022.

An in-person PIC was held on November 8th, 2022 at the Lions Hall in the Havelock Community Center. A presentation was given, outlining the project background, evaluation process and the preferred solution.

A PIC 2 pre-recorded video was also published on the Township's website for anyone who was unable to attend the PIC in person. The PIC 2 pre-recorded video has received approximately 20 views. Comments were received through the PIC questionnaire/survey. The pre-recorded video remains available on the Township's website.

14.2 Public, First Nations and Agency Comments and Responses

A summary of the comments and questions received from the public, agencies, and First Nations representatives during the Class EA process is included in **Appendix H.**

14.3 Consultation with the Ministry of the Environment, Conservation and Parks

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. In response, the MECP identified key indigenous communities in the study area as well as important cultural and archaeological land use considerations.

A pre-consultation was held with the MECP on June 4th, 2021, to introduce the project and receive input from the MECP on the requirements of the Class EA. Meeting minutes can be found in **Appendix A**.

14.4 Indigenous Community Consultation and Engagement

All project notices were sent to the following Indigenous Communities, as identified by the MECP on September 24, 2021:

- Alderville First Nation;
- Curve Lake First Nation;
- Hiawatha First Nation;
- Mississaugas Scugog Island First Nation; and,
- Kawartha Nishnawbe.

Follow up calls were made to all Indigenous Communities to request input/feedback.

15 Public Review Period

This Environmental Study Report (ESR) documents the findings of the Schedule C Municipal Class EA Study. Filing of this ESR initiates the 30-day public review period starting April 27, 2023, and ending May 26, 2023.

16 Conclusions and Recommendations

The following is a summary of the key findings presented in the Environmental Study Report.

The capacity of the Havelock WWTP has been exceeded during wet weather flow conditions. The plant has limited capacity to treat septage. Projected growth in the community will result in additional flows which will exceed the plant's rated capacity. A solution is required to address existing capacity constraints and to provide capacity to service growth.

Six alternative solutions were considered:

- Do Nothing;
- Limit growth;
- Reduce I&I in the collection system;
- Expand Havelock WWTP;
- Build a new WWTP on existing site; and,
- Build a new WWTP on a new site.

The alternatives were evaluated based on pass/fail criteria. Only Alternative 4 – Expand Havelock WWTP meet all the mandatory criteria. Pursuing further I&I reductions in the collection system is recommended as part of the preferred strategy.

Four design concepts were evaluated. The design concepts revolved around the use of the abandoned lagoons for equalization or storage.

The design concepts were evaluated based on social, natural, technical and financial considerations. The preferred plant expansion approach was Design Concept 2 – Use Existing Lagoon for Raw Sewage Equalization.

All public, agency and First Nations consultation was conducted in accordance with the requirements for Schedule C Municipal Class EA projects as outlined in the 2015 version of the MEA Class EA document. All comments received have been documented and addressed in the Project File Report.

The following is recommended as part of the implementation of the preferred solution:

- Additional field investigations should be conducted in support of the design of the upgrades. This includes a Stage 2 Archeological Assessment (findings from Stage 2 may trigger additional study which would also need to be completed prior to implementation), natural environment surveys, and geotechnical and hydrogeological investigations.

- Additional sampling of wastewater upstream of the plant should be conducted to properly characterize the influent wastewater.
- A detailed analysis of flow data should be conducted to confirm design criteria and the sizing requirements for the plant expansion.
- The Township should continue pursuing I&I reduction measures.
- The Township should complete annual reviews of flows to the plant to assess the effect of I&I reduction measures and assess the reserve capacity of the plant taking into account allocated development. This review should be completed using the approach outlined in MECP Procedure D-5-1.
- Implementation of the preferred design concept should be carried out in two phases: Phase 1 – retrofitting lagoon for raw sewage equalization and Phase 2 – expansion of treatment processes to a rated capacity of 1,580 m3/d.
- It is understood that the proposed Long Term Care Facility would be constructed by 2025. No additional development should be approved until Phase 1 has been completed. Upon completion of these upgrades, the plant could accommodate approximately 80 new detached/semi-detached unit equivalents.
- Phase 2 should be initiated when the remaining reserve capacity of the Havelock WWTP (accounting for actual flows and allocated development units) reaches approximately 80% of the current rated capacity. Once this threshold is reached, no further development should be approved until the plant expansion is completed.
- It is recommended that the Township update their asset management plan, sewer and hauled waste rates and development charges by-laws to ensure full cost recovery.
- It is recommended that the Township establish/adopt design standards for sewer design and construction for new developments that ensure compliance with best practices.
- It is recommended that the Township pursue provincial and federal funding opportunities.
- It is recommended that an air and noise assessment is completed for Phase 2.

17 Bibliography

Aqua-Aerobic. (2022). *Cloth Media Filtration* . Retrieved from https://aqua-aerobic.com/downloads/ClothMedia_BROCHURE_web.pdf

Canada. (2012). *Wastewater Systems Effluent Regulations, SOR/2012-139, Fisheries Act.*

City of Peterborough. (2022). *Engineering Design Standards.*

County of Peterborough. (2022). *County of Peterborough - Official Plan.*

Engage Engineering Ltd. (2018). *Functional Servicing Study.*

Fleischer, E. J. (2006). Evaluation of Membrane Bioreactor Process Capabilities to Meet Stringent Effluent Nutrient Discharge Requirements. *Water Environment Research*, 162-178.

Golder. (2021). *Stage 1 Archaeological Assessment.*

Grand River Conservation Authority . (2006). *Plain Language Guide to the Clean Water Act.*

HBM. (2015). *The Official Plan of the Township of Havelock-Belmont-Methuen.*

MEA. (2015). *Municipal Class Environmental Assessment Manual.*

MECP. (2008). *Design Guidelines for Sewage Works.*

MECP. (2016). *Water management: policies, guidelines, provincial water quality objectives.*

MECP. (2021). *The Planning Act*.

Metcalf & Eddy. (2014). *Wastewater Engineering - Treatment and Resource Recovery.*

NBMCA. (2022). *Summary of Ontario's Water Related Legislation*. Retrieved from North Bay-Mattawa Conservation Authority: https://www.actforcleanwater.ca/general-information/summary-of-ontario-s-water-related-legislation/

Ontario. (1990). *Planning Act, R.S.O. 1990, c. P.13.*

Ontario. (2020). *A Place to Grow - Growth Plan for the Greater Golden Horseshoe.*

Ontario. (2020). *Provincial Policy Statement, 2020.*

Ontario. (2021). *Clean Water Act, 2006, S.O. 2006, c. 22.*

Ontario. (2021). *Environmental Assessment Act, R.S.O. 1990, c. E.18.*

Ontario. (2021). *Environmental Protection Act, R.S.O. 1990, c. E.19.*

Parkson. (2022). *DynaSand Continuous Upflow, Granular Media Filter*. Retrieved from https://648175-2113281-raikfcquaxqncofqfm.stackpathdns.com/sites/default/files/documents/2022-03/parkson_dynasand_filter_brochure.pdf

Parkson. (2022). *DynaSandD2 - Advanced Continous Backwash Filtration System*. Retrieved from https://648175-2113281-raikfcquaxqncofqfm.stackpathdns.com/sites/default/files/documents/document-dynasand-d2-brochure-web-version-1030.pdf

Statistics Canada. (2021). *Census Profile, 2021 Census of Population*. Retrieved from https://www12.statcan.gc.ca/census-recensement/2021/dp-pd/prof/details/page.cfm?Lang=E&SearchText=Ontario&DGUIDlist=2021A000235&GENDERlist=1,2,3&STATISTIClist=1&HEADERlist=0

A

Appendix A: MECP Meeting Minutes

B

Appendix B: Assimilative Capacity Study

C

Appendix C: Natural Environment Assessment Report

D

Appendix D: Stage 1 Archaeological Assessment Report

E

Appendix E: Cultural Heritage Screening Report

F

Appendix F: Cost Estimates

G

Appendix G: Notice of Study Commencement

H

Appendix H: Comment Log