GREENSVILLE DRINKING WATER SYSTEM

Schedule C, Municipal Class Environmental Assessment

November 14, 2024

Prepared for:
City of Hamilton

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Executive Summary

The City of Hamilton has completed a Municipal Class Environmental Assessment (MCEA) study for the Greensville Rural Settlement Area (RSA) to provide improvements to the Harvest Road Water Supply System (WSS) which supplies water to thirty-six (36) homes. The drinking water system is currently supplied by one groundwater-sourced municipal well and pump station (FDG01) which is not equipped with a backup water supply, and several components of the existing FDG01 system are reaching end of life. FDG01 is operating safely and effectively, however, it does not meet the City's current outstation design manual criteria. The existing water supply (FDG01) is classified as groundwater under the direct influence (GUDI) of surface water and received adequate treatment to provide a safe supply of water to the community. However, historical water quality sampling data suggests rising sodium and nitrate levels over time (Stantec, 2022). More recent data indicates nitrate levels approaching half of the provincial maximum acceptable concentration (MAC) which suggests actions can be taken by the City to explore nitrate mitigation; although nitrate is a challenging contaminant to treat which may require costly treatment systems.

The purpose of this study is to determine the preferred servicing scenario for the Harvest Road Water Supply System that will be equipped with a backup water supply, select alternative supplies, and identify the location of a new pumping station within Johnson Tew Park if required.

In accordance with the Municipal Class Environmental Assessment (MCEA) (2023), this study is being planned as a Schedule C undertaking, which includes the completion of Phases 1 through 4 of the MCEA study process.

Background

In 2016, the Mid-Spencer Creek/Greensville Rural Settlement Area Subwatershed Study was completed and recommended a Schedule C EA for a "municipal backup well" for Greensville DWS. In 2017, the City initiated a Schedule C Class EA for a municipal backup well supply for Greensville which was ultimately reported as the Greensville Backup Well Feasibility Study as a condition assessment of the system (2019) identified additional considerations and issues, and the City was interested in evaluating the feasibility of refurbishing the existing facility as well as additional alternatives and their relative life-cycle costs.

Following the 2016 Mid-Spencer Creek / Greensville Rural Settlement Area Subwatershed Study, the City completed several studies and investigations and ultimately determined that the intent of the 2016 study recommendation was to provide a more resilient water supply for the Greensville drinking water system and the 36

residential connections along the Harvest Road Water Supply System. Therefore, while the 2016 study specifically recommends a “backup well”, the City determined through engineering consultations that resiliency for the existing system could be provided through other means that could balance short- and long-term impacts on the environment and neighbouring residents, life-cycle costs, and operations burden - such as a trucked water connection and/or water storage such as a buried reservoir. Therefore, the approach to this MCEA was to identify the preferred alternative servicing scenario that could provide “backup supply” but not specifically to identify an alternative with a “backup well”.

Consultation

A project contact list was created which includes multi-level government agencies and officials, City of Hamilton staff, committees, emergency service contacts, potentially interested Indigenous communities, members of the public, utility services, special interest groups, as well as local property owners within the study area. Project notices issued to date include the Notice of Study Commencement & Public Information Centre (PIC) #1 (September 22, 2023), Notice of PIC #2 (February 20, 2024), Reschedule Notice of PIC #2 (March 22, 2024). The notices were published in the Hamilton Spectator newspaper, mailed to residential area of Greensville, provided to First Nations / Indigenous Communities, emailed to the project contact list and internal City of Hamilton staff. The Notice of Completion is anticipated to be issued in January 2025.

Two (2) Public Information Centres (PICs) were hosted as a component of the consultation process for this study to provide the public with an opportunity to express concerns throughout the study process, while assisting with the development of a recommended strategy. The PICs were held as live virtual meetings using the Microsoft Teams platform, and participants accessed the meetings online or by phone. Pre-registration was required and could be completed by following a QR code or visiting the project website. The PICs were recorded and made available on the project website following the live event. Comments were accepted through a survey made available on the project team, or by contacting a member of the project team by e-mail or phone.

All input from the public, review agencies, committees, and other stakeholders has been documented. All consultation with Indigenous communities has also been documented in a Consultation Log.

Phase 1 – Problem and Opportunities

The Greensville DWS is serviced by one (1) groundwater-sourced municipal communal well system, which is not equipped with backup water supply, and several components of the existing system (FDG01) are reaching end of life. FDG01 is operating safely and effectively, however, it does not meet the City’s current outstation design manual.

In 2022, the City completed a Constructability and Risk Assessment which identified alternatives for backup water supply and identified the implementation of a new municipal communal well and pump station with water storage in a buried reservoir could provide reliable water supply and quality to the Greensville DWS and meet the City's water outstation design manual criteria, and would allow for the decommissioning of the existing FDG01 treatment building.

The City is committed to providing safe and reliable drinking water to the Greensville DWS residents and will evaluate alternative servicing scenarios with backup water supply for the Greensville DWS.

Phase 2 – Alternative Solutions

As part of Phase 2 of the MCEA study process, reasonable and technically feasible solutions to the problems and opportunities were identified and evaluated based on their ability to resolve the problem statement, and their impacts to the socio-economic, natural, cultural, and technical environments.

Long List of Alternative Solutions

A long list of alternative solutions was developed for the study based on previous reports and considered various opportunities for alternative water supply, the condition assessment of FDG01, and the Constructability and Risk Assessment Study. The long list of alternative solutions included:

- Do Nothing
- Alternative 1 – Expand the Lake Based Distribution System
- Alternative 2 – Construct a Reservoir
- Alternative 3: Refurbish and Upgrade FDG01 with Backup Connection
  - Alternative 3A – Trucked Water Connection and Refurbishment of FDG01
  - Alternative 3B – Trucked Water Connection and Upgrades to FDG01 Towards City Water Outstation Design Manual
- Alternative 4: Maintain Two Stations
  - Alternative 4A – Maintain and Retrofit FDG01 Well and Pump Station, and Source Additional Well Supply in the Park with New Pump Station
  - Alternative 4B – Maintain FDG01 and Source Additional Well Supply in Park with New Pump Station and Watermain
- Alternative 5: Build New Station with New Well in Park, and Decommission FDG01
  - Alternative 5A – One Station with One Well and Reservoir at Cedar Avenue
  - Alternative 5B – One Station with One Well and Trucked Water Connection at Cedar Avenue
- Alternative 6 – One Station with Two Wells at Cedar Avenue

Preliminary screening was completed to evaluate the long list alternatives, and to create a short-list of feasible alternative servicing solutions based on construction feasibility and ability to address the problem statement.

Short List of Alternative Solutions

The shortlisted alternative solutions included:

Alternative 4A – Two Stations. Maintain and Retrofit FDG01 Well and Pump Station, and Source Additional Well Supply in the Park with New Pump Station

Involves maintaining and retrofitting FDG01 well and pump station, sourcing an additional well supply in the park and constructing a new pump station at the end of Cedar Avenue ("FDG02"). This alternative would allow for a continued water supply to rely on during construction.

Alternative 5A: One Station with One Well and Reservoir in the Park; Decommission FDG01

Involves decommissioning FDG01 well and pump station; sourcing one (1) primary well supply in the park and constructing a new pump station ("FDG02") at the end of Cedar Avenue with a reservoir for water storage and backup supply. This option would provide redundant water storage and help manage projected seasonal peak demands.

Alternative 6: One Station with Two Wells om the Park; Decommission FDG01

Involves decommissioning FDG01 well and pump station; sourcing two (2) well supplies in the park and constructing a new pump station at the end of Cedar Avenue ("FDG02"). This alternative could also include a trucked water connection for additional redundancy for emergency supply.

The short-listed alternatives were evaluated for their impacts on natural environment, socio-economic environment, cultural environment, technical engineering, and financial (i.e., life cycle) costs.

Preferred Alternative Solution

The evaluation criteria determined that Alternative 5A – One Station with One New Well, Pump Station and Reservoir in the Park is the preferred alternative solution and is carried forward into the Evaluation of Alternative Design Concepts.

Phase 3 – Design Alternatives

The alternative design concepts involved identification of potential locations for a new pump station, as part of preferred design Alternative 5A. Three alternatives were considered for the location of the pump station:

Alternative Location 1

Alternative Location 1 is to the south of the park path entrance at the end of Cedar Avenue. The Lot is identified and secured by the City and is proximal to the alternative well supply (TW2-13). This location may impact proximal property values and impact views from the park and other community locations. With the exception of these impacts (Socio-Economic Environment), Location 1 is rated highly against all other evaluation criteria, resulting in the overall rating of most preferred.

Alternative Location 2

Alternative Location 2 is to the north of the park path entrance at Cedar Avenue. This lot would require identification and ownership by the City and was not preferred by Parks as City Parks has other plans for tree planting in this area. Additionally, this lot is further away from the alternative well supply (TW2-13). This alternative rates highly in all areas of evaluation criteria. Location 2 is rated higher than Location 1 for Socio-Economic Environment because this location will allow for an existing treeline to conceal the view of the proposed pump stations from existing properties. The overall rating for Alternative Location 2 is moderately to most preferred.

Alternative Location 3

Alternative Location 3 is located at the end of Medwin Avenue. This lot would require identification and ownership by the City. This lot is the furthest away from the alternative well supply (TW2-13), when compared to Alternative Location 1 and 2. This lot is the only lot that would require an easement and result in additional construction costs to connect to the distribution system on Harvest Road as it would result in locating the pump station furthest from the existing distribution system. Location 3 is likely to impact proximal property values and impact views from the park and other community locations for properties that are not connected to the Harvest Road distribution system. This lot is rated highly against cultural environment, moderately high against financial and natural environment, and moderately against socio-economic environment and technical engineering, resulting in a score of moderately preferred.

Recommended Design

Based on the evaluation, it was determined that Alternative Location 1: South of the park path entrance at Cedar Avenue is the preferred location for the new pump station.

In summary, the recommendation to improve the resiliency of the Greensville DWS supply is to implement Alternative 5A, which includes the following:

- Construct a fenced wellhead for TW2-13 in the Park.
- Connect a watermain from TW2-13 to a new pump station in the Park.

- Construct the new pump station with a buried two-cells (i.e., dual cell) reservoir with water storage based on 1 day at maximum day demand (MDD). Consider trucked water connection to system for additional redundancy during detailed design.
- Locate the new pump station building at the South end of the Park entrance at the end of Cedar Ave., specific location to be determined in consultation with Parks.
- Decommission FDG01.

Preliminary Cost Estimate

A 2024 Class D (-30% / +50%) cost estimate for the construction of the new station, including the procurement of all equipment and land, and demolition of the existing facility, is summarized below.

Class D Opinion of Probable Cost

Description	Cost
Structural and Architectural – Shell	$1,126,000
Structural and Architectural – Interiors	$221,000
Process / Mechanical	$875,000
Electrical	$434,000
Site & Ancillary Work	$248,000
Demolition of FDG01	$162,000
Sub-Total	*$3,066,000*
Construction Contingencies (25%)	$766,500
Consultant Costs	*$784,242*
Land Costs and Fees	$31,680
Total Estimate	**$4,648,422**
Low Estimate (-30%)	$3,253,000
High Estimate (+50%)	$6,973,000

Implementation and Timing

The final construction timing will be determined based upon completion of property acquisition, utility relocations (as necessary) and the detailed engineering as well as securing required approvals. It is estimated that the construction of the project could be

completed in approximately 10 months. Coordination with adjacent City projects, conservation efforts, property owners, and regulatory agencies is planned early in the design process, providing opportunities for further consultation and to assist in finalizing the construction timing. At this time, considering the timelines required for property acquisition and completion of design and other advance activities, construction is planned to occur no sooner than 2026.

Network traffic management and a communications plan will be developed during detailed design to inform road users, outline detours during potential closures, and instruct local traffic movement. Access to properties will be maintained during construction.

Potential Impacts and Proposed Mitigation

Many of the environmental concerns related to this project have been mitigated through the process by which the preferred design was selected.

Natural Heritage

The following mitigation measures and best practices are recommended to reduce potential impacts to natural heritage features during construction:

- Delineate the work areas with tree protection fencing prior to construction.
- Develop and implement an erosion and sediment control plan. Maintain the erosion control measures until disturbed soils are secure and stable. Revegetate disturbed/exposed soil as soon as feasible.
- Wash, refuel and service equipment in designated areas, and have a spill management plan to address accidental spills. Check machinery regularly for fluid leaks.
- Implement a clean equipment protocol to prevent the introduction of invasive species.
- Avoid wildlife during construction by implementing timing restriction and visual searches.

Timing restrictions are recommended to avoid disturbance to wildlife that may be using natural areas, including breeding birds and Monarch:

- To avoid nesting birds and contravention of the MBCA, removal of vegetation and structures with nests will avoid the period between April 1 and August 15.
- Monarch larvae may be present between April 1 and September 30, and vegetation removal should avoid this period if possible. If vegetation clearing will

proceed when Monarch larvae may be present, milkweed plants will be inspected for Monarch larvae prior to their removal. If larvae are present, they will be moved to a location that is suitable and safe under the direction of a qualified professional. Monarch caterpillars will be moved to other milkweed plants; for other larval stages (i.e., eggs and chrysalis), entire milkweed plants will be transplanted.

Visual searches of work areas will be conducted before work commences each day to identify and avoid other wildlife. Visual searches will target vegetated areas and inspect machinery and equipment left in the work are overnight prior to starting equipment. If wildlife is encountered, work at that location will stop, and the animal(s) will be permitted reasonable time to leave the are on their own. Observations of species at risk will be reported to the MECP and MNR within 48 hours of the observation. Species at risk will not be harassed or moved, unless they are in immediate danger.

Archaeology

A Stage 3 archaeological assessment has been completed in the identified area for construction and there are no anticipated impacts on archaeological or heritage resources during the implementation of the projectIn the event of discovering potential archaeological or heritage artifacts during construction, all operations will be halted until comprehensive investigations are carried out.

Park Land

The pump station will compromise a section of the existing parkland and will introduce a small secure, fenced parking area and pump station building that will change the vertical appearance of the park. To minimize the visual impact, the preferred pump station location has been identified adjacent to the existing park boundary at the end of Cedar Avenue in an area that is considered fragmented from natural park features and does not impede with the existing trail system. To the extent possible, encroachment into natural areas, regardless of ecological function or designation, will be avoided.

A detailed landscape planting plan will be developed during detailed design, including native species that are suitable for the site conditions and sourced from a local nursery where possible. The planting plan for near-road areas should focus on a planting regime that would support edge management objectives such as, providing long term visual and noise barriers, creating a living barrier to discourage anthropogenic entry at unwanted locations, and providing shade.

Preliminary investigations determined that the site is suitable for natural drainage features, such as a bioswale and vegetative filter strip, since it is situated at a higher elevation compared to the rest of the park. The following low impact development (LID) features are proposed:

- Maintaining sidewalks only where critical and only on one side of the path shared with the roadway where possible.
- Natural drainage systems such as infiltration trenches or soakaway pits.
- Vegetation that can prevent erosion and runoff.
- Bioswale with vegetative filter strip.

Traffic, Noise, and Air Quality

A traffic management plan and a communications plan will be developed during detailed design to ensure road users are informed of construction impacts including potential road closures and detours. Access to properties will be maintained during construction. Low speed limits for trucks on site will be enforced.

The contractor will be required to abide by municipal noise control by-laws and ensure that all construction equipment is kept in good working order to limit additional noise. Noise may be produced from the facility during the following activities: daily visits from operational staff typically by motorized vehicle (e.g., pickup truck); intermittent pump operation and pressure tank operation; occasional generator operation; routine maintenance visits by operation staff such as monthly chlorine deliveries; infrequent construction upgrades such as to replace a pump; future construction should the system require major upgrades. The design concept has been developed with considerations for reducing noise, and further opportunities to reduce noise from the new facility will be considered during detailed design. The project is expected to have a minimal impact on air quality and considerations for minimizing impacts on air quality will be reviewed during detailed design. During operation, the pump station is not expected to contribute to air emissions other than during a loss of power when the generator would be used for temporary energy supply.

Emissions and Climate Change Resiliency

The conceptual design was developed by considering opportunities to minimize greenhouse gas emissions and reduce energy use. For example, the new well (FDG02) is expected to require less treatment than the existing well (FDG01) and therefore a reduction in energy consumption at the new facility is expected due to the decommissioning of UV light disinfection.

The design concept was developed by considering opportunities to improve resilience and reliability of the system to continuously produce potable water without interruption. Therefore, the system will be equipped with backup generator. Backup water supply is achieved through both a dual cell buried reservoir which has been sized based on providing one day at maximum day demand based on historical water demand records,

and via a trucked water connection which could be used to fill the reservoir in the event of an interruption in well production.

The anticipated impacts and proposed mitigation measures have been described in Section 8 of the Environmental Study Report. The City of Hamilton will refine mitigation measures during detail design and prior to the start of construction to ensure the proposed works are acceptable and to obtain required permits as discussed in Section 9 of the Environmental Study Report.

Permitting

A summary of permitting requirements is included in Section 9 including the requirements for a permit to take water (PTTW) application.

Closing

The filing of this Environmental Study Report (ESR) represents the conclusion of Phase 1 through Phase 4 of the Municipal Class EA planning process as outlined in the MCEA document. Provided that no Section 16 Order requests are received and provided all appropriate environmental and engineering permitting and approvals are obtained, the City may proceed with detail design and implementation (Phase 5) 30 days following the completion of the public review period.

Acronyms / Abbreviations

AWQI	Adverse Drinking Water Quality Incident
AO	Aesthetic Objective
C	Celsius
CSA	Canadian Standards Association
CT	Concentration x Time
d	Day(s)
DWS	Drinking Water System
DWWP	Drinking Water Works Permit
EA	Environmental Assessment
ESR	Environmental Study Report
GUDI	Groundwater Under the Direct Influence of Surface Water
HVA	Highly Vulnerable Aquifer
HVAC	Heating, Ventilation, and Air Conditioning
L	Litre(s)
LED	Light Emitting Diode
LID	Low Impact Development
m	Meter(s)
m^2	Meters squared
m^3	Meters cubed
MAC	Maximum acceptable concentration
MCEA	Municipal Class Environmental Assessment
MCM	Ministry of Citizenship and Multiculturalism
MECP	Ministry of Conservation and Parks
MNR	Ministry of Natural Resources
mg	Milligram(s)
MODA	Multi-objective decision analysis
N	Nitrogen
NDMA	Nitrosodimethylamine

NEP	Niagara Escarpment Plan
NTU	Nephelometric Turbidity Units
OHT	Ontario Heritage Trust
PIC	Public Information Centre
PPS	Provincial Policy Statement
PTTW	Permit to Take Water
RSA	Rural Settlement Area
s	Second(s)
SAR	Species at Risk
SGRA	Significant Groundwater Recharge Area
TM	Technical Memorandum
UV	Ultraviolet
WHPA	Wellhead Protection Area
WODM	Water Outstation Design Manal
WSS	Water Supply System

1 Introduction

The City of Hamilton has completed a Municipal Class Environmental Assessment (EA) study for the Greensville Rural Settlement Area (RSA) to provide improvements to the Harvest Road Water Supply System (WSS). The Drinking Water System is currently supplied by one groundwater-sourced municipal well and pump station (FDG01) which is not equipped with a backup water supply, and several components of the existing FDG01 system are reaching end of life. FDG01 is operating safely and effectively, however, it does not meet the City's current outstation design manual criteria.

In 2022, the City completed a Constructability and Risk Assessment which identified alternatives for a backup water supply. The assessment identified the implementation of a new municipal communal well and pumping station with water storage could provide reliable water supply and quality to the Harvest Road WSS and meet the City's outstation design manual criteria, while decommissioning FDG01.

The purpose of this study is to determine the preferred servicing scenario with a backup water supply, and the location of the new well and new pumping station within Johnson Tew Park if required.

1.1 Study Area

The Greensville RSA includes the Harvest Road WSS and is located within part of Lots 10-11, Concession 2 in the former Township of West Flamborough, present-day City of Hamilton (**Figure 1**). The southern limit of the study area is located adjacent to the Niagara Escarpment. The mid-Spencer Creek flows through the RSA. The land use east and west of the Study Area is residential, while south of the site is institutional (school, community centre). North of the site is an aggregate extraction site.

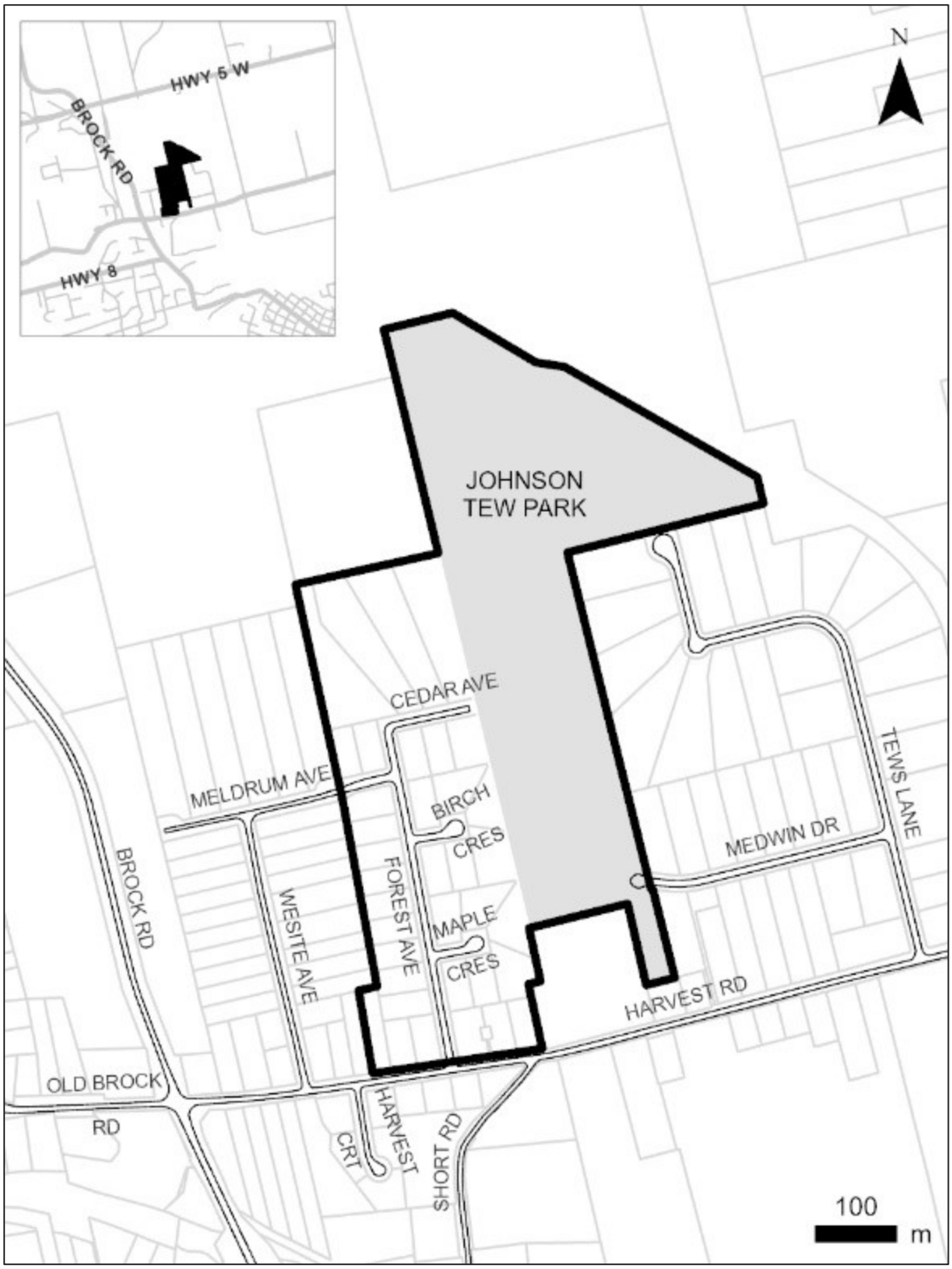

Figure 1: Study Area Map

1.2 Study Team Organization

General direction was provided by the City with progress meetings held at key points throughout the planning process. Key members of the study team included the following individuals:

City of Hamilton

- Marco Silverio, Project Manager

Stantec Consulting Ltd.

- Nicole McLellan, Project Manager
- Sarah Micks, Environmental Planner

1.3 Municipal Class Environmental Assessment Process

The Environmental Assessment Act of Ontario provides for the protection, conservation, and management of the environment in Ontario. Activities with common characteristics and common potential effects may be assessed as part of a “class” and are therefore approved subject to compliance with the pre-approved Class EA process. The Ontario Ministry of the Environment, Conservation and Parks (MECP) is responsible for administration of the EA Act.

The Municipal Class Environmental Assessment (MCEA) is an approved Class EA process that applies to municipal infrastructure projects including roads, water, and wastewater. This process provides a comprehensive planning approach to consider alternative solutions and evaluate their impacts on a set of criteria (e.g., environmental, social, technical and economic considerations) and determine mitigating measures to arrive at a preferred alternative for addressing the problem (or opportunity). The Class EA process involves a rigorous public consultation component that includes various provincial and municipal agencies, Indigenous communities, and the public, at each of the project stages.

The MCEA process is undertaken prior to modifications or additions to municipal infrastructure, to ensure that potential impacts associated with all project aspects are considered. **Figure 2** illustrates the Class EA planning process and identifies the steps considered mandatory for compliance with the requirements of the EA Act. The following provides an overview of the five-phase planning process:

- Phase 1 – Identify the Problem and Opportunity statement.
- Phase 2 – Identify and evaluate alternative solutions.

- Phase 3 – Identify and evaluate alternative design concepts for the preferred solution.
- Phase 4 – Prepare design plans and an Environmental Study Report (ESR) for a minimum 30-day public review period.
- Phase 5 –This phase involves detailed design and the preparation of contract/tender documents followed by construction, operation, and monitoring.

The EA process adhered to for this study and shown in **Figure 2** follows the MCEA document amended in 2023.

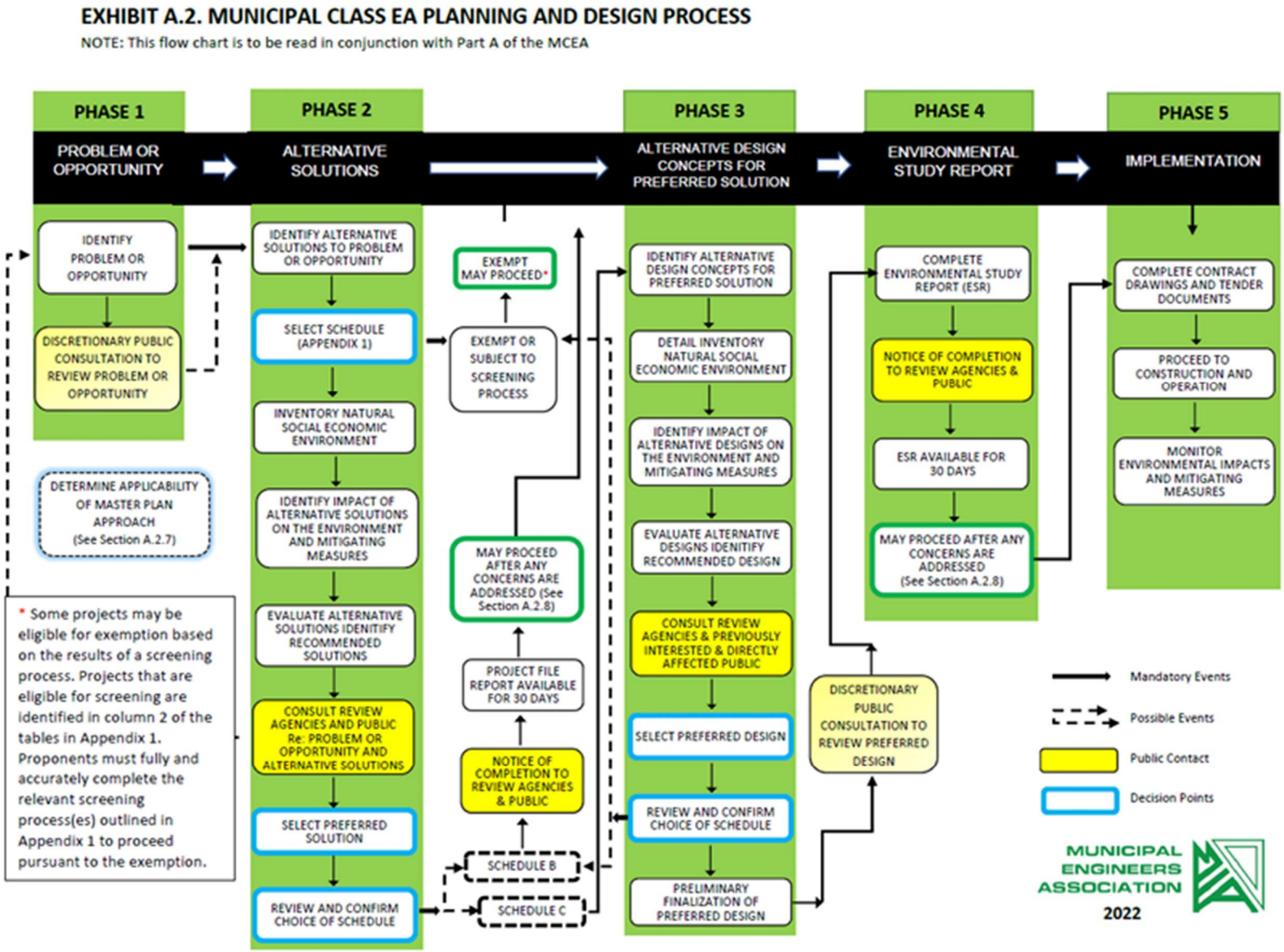

Figure 2: MCEA Process Flowchart

Based on the nature and extent of the project, as well as its anticipated impacts to the surrounding environment, the MCEA document specifies three different schedules under which projects may be planned, and the assessment process required for each:

Exempt projects are pre-approved under the MCEA and can proceed directly to Phase 5 (implementation). Exempt projects, formerly Schedule A and A+ projects, include various municipal maintenance, operational activities, rehabilitation works, minor reconstruction or replacement of existing facilities, and new facilities that are limited in scale and have minimal adverse effects on the environment. These projects are exempt from the requirements of the *Environmental Assessment Act*.

Schedule B projects have potential for some adverse environmental impacts. These projects are required to proceed through the first two phases of the MCEA process, involving mandatory contact with directly affected public and relevant review agencies, to ensure that they are aware of the project and that their concerns are identified and considered. A Project File Report must be prepared and made available for review (30-day public review period) by interested persons or parties. If there are no outstanding concerns or Section 16 Orders, then the proponent may proceed to implementation/detail design (i.e., Phase 5) once the regulatory process has been completed. Schedule B projects generally include improvements and minor expansions to existing facilities or smaller new projects.

Schedule C projects have the potential for more significant environmental impacts. These projects are required to proceed through all five stages of the MCEA process. Schedule C projects require an Environmental Study Report be completed and filed for a 30-day public review period. If there are no outstanding concerns, the proponent may proceed to implementation once the regulatory process has been completed. These projects generally include the construction of new facilities, or major expansions to existing facilities.

The selection of the appropriate project schedule to be followed is dependent on the anticipated level of environmental impact, and at times the estimated construction costs.

1.3.1 Class EA Project Classification

The Greensville Drinking Water System MCEA was undertaken in accordance with the guidelines of the Municipal Engineers Association (MEA) MCEA Document (amended in 2023). Due to the type of project, anticipation for potential effects, and estimated capital costs, the MCEA is defined as a Schedule ‘C’ project. A Schedule ‘C’ project involves either the construction of new facilities or major modification to existing facilities.

Schedule ‘C’ projects have the potential for significant environmental impacts and must follow the full planning process specified in the Class EA document, including Phases 1 through 4. The project is documented in an Environmental Study Report (ESR), which is then filed for review by the public, review agencies, and Indigenous communities.

1.3.2 Section 16 Order Process

Interested persons may provide written comments to the City of Hamilton for a response using the following contact information:

Marco Silverio
Project Manager – Source Protection Planning
City of Hamilton
Marco.Silverio@hamilton.ca
905-546-2424 ext.6099

In addition, a request may be made to the Minister of the Environment, Conservation and Parks under Section 16 of the *Environmental Assessment Act* requiring a higher level of study (i.e., requiring an individual/comprehensive EA approval before being able to proceed), or that conditions be imposed (e.g., require further studies), only on the grounds that the requested order may prevent, mitigate, or remedy adverse impacts on constitutionally protected Aboriginal and treaty rights. Requests on other grounds will not be considered. Requests should include the full name and contact information of the person(s) making the request for the ministry.

Requests should specify what kind of order is being requested (request for additional conditions or a request for an individual/comprehensive environmental assessment), how an order may prevent, mitigate, or remedy those potential adverse impacts, and any information in support of the statements in the request. This will ensure that the ministry is able to efficiently begin reviewing the request.

The request should be sent in writing by mail or by email to:

Minister of the Environment, Conservation and Parks
Ministry of Environment, Conservation and Parks
777 Bay Street, 5th Floor
Toronto ON M7A 2J3
minister.mecp@ontario.ca

and

Director, Environmental Assessment Branch
Ministry of Environment, Conservation and Parks
135 St. Clair Ave. W, 1st Floor
Toronto ON, M4V 1P5
EABDirector@ontario.ca

Requests should also be sent to the City.

1.4 Canadian Environmental Assessment Act

The *Canadian Environmental Assessment Act* (2012) focuses federal environmental review on projects which have the potential to cause significant adverse environmental effects in areas of federal jurisdiction. For the *Act* to apply, the proposed project must be designated under the “Regulations Designating Physical Activities” and specifically be listed in the “Schedule for Physical Activities”. Review of the Schedule for Physical Activities shows there is no physical activity that matches the work proposed. Therefore, meeting the requirements of the *Canadian Environmental Assessment Act* will not be necessary for this project.

2 Consultation

Consultation is a vital part of the Class EA process. Active engagement with all potentially affected parties including government agencies, community members, special interest groups, and Indigenous communities ensures a transparent and responsible planning process.

2.1 Project Contact List

A project contact list was created which includes multi-level government agencies and officials, City of Hamilton staff, committees, emergency service contacts, potentially interested Indigenous communities, members of the public, utility services, special interest groups, as well as local property owners within the study area. The list was regularly updated to include those who expressed interest in the study. Addresses for all properties within the study area were compiled and used for the mail-out of the project Notices. A copy of the contact list is provided in **Appendix A**.

2.2 Project Notices

Notices were sent via mail or email (where requested) to property owners within the study area, the project contact list, and Indigenous communities. Each notice was published in the Hamilton Spectator newspaper and posted to the City's website (https://www.hamilton.ca/greensville-drinking-water-system) and Engage Hamilton website (https://engage.hamilton.ca/greensvilledws). The study notifications are provided in **Appendix A**, including:

- Notice of Study Commencement & Public Information Centre 1 – posted to City of Hamilton project website on September 22, 2023. Published in the Hamilton Spectator newspaper on September 25 and October 2, 2023. Mailed to residential area of Greensville September 27, 2023. Emailed to First Nations / Indigenous Communities on September 25, 2023. Emailed to the project contact list and internal City of Hamilton staff September 20, 2023.

- Notice of Public Information Centre 2 – posted to the City of Hamilton project website on February 20, 2024. Published in the Hamilton Spectator newspaper on February 22, and February 29, 2024. Mailed to residential area of Greensville on February 21, 2024. Emailed to First Nations / Indigenous Communities on February 20, 2024. Emailed to the project contact list and internal City of Hamilton staff on February 20, 2024.

- Rescheduled Notice of Public Information Centre 2- posted to the City of Hamilton project website on March 22, 2024. Published in the Hamilton Spectator newspaper on March 22 and March 28, 2024. Mailed to residential area of

Greensville March 19, 2024. Emailed to First Nations / Indigenous Communities on March 19, 2024. Emailed to the project contact list and internal City of Hamilton staff on March 19, 2024.

Notice of Study Completion – will be posted to the City of Hamilton project website, published in the Hamilton Spectator newspaper, mailed to the residential area of Greensville, and emailed to First Nations / Indigenous Communities, internal City of Hamilton staff and the project contact list.

2.3 Public Consultation

Two Public Information Centres (PICs) were hosted as a component of the consultation process for this study to provide the public with an opportunity to express concerns throughout the study process, while assisting the development of a recommended strategy.

2.3.1 Public Information Centre 1

The first PIC was held as a live virtual meeting on Wednesday, October 11, 2023, from 6:00pm to 8:00pm. Snapshots are shown in **Figure 3** and materials are provided in **Appendix A**. The project team provided an overview presentation of the project and was available to answer all questions. The event was held using the Microsoft Teams platform, and individuals were able to participate online or by phone. Pre-registration was required and could be completed by following a QR code or visiting the project website. The PIC was recorded and made available on the project website following the live event. Comments were accepted from October 11 to November 10, 2023, and could be provided through a survey made available on the project team, or by contacting a member of the project team by email or phone. A total of 18 participants attended the meeting. Following the meeting, a Frequently Asked Questions document was uploaded to the project website to summarize the questions and answers provided throughout the online meeting.

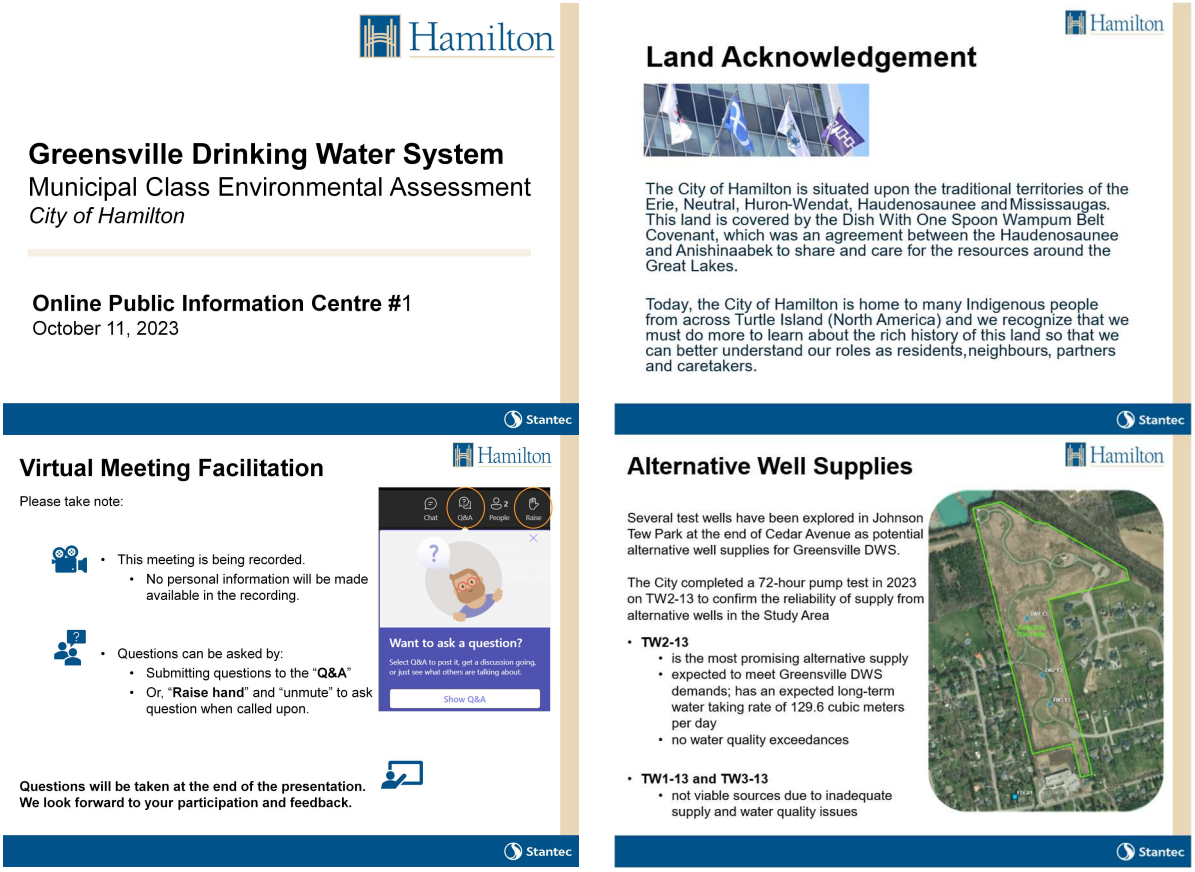

Figure 3: Snapshots from virtual presentation slides (all materials provided in Appendix A).

A total of 12 comments were received by email or phone call from the public and agencies, and 11 comments were received through the online survey. PIC 1 materials are provided in **Appendix A**.

2.3.2 Public Information Centre 2

The second PIC was held as a live virtual meeting. The PIC was initially scheduled for Wednesday, March 6, 2024, from 6:00 p.m. to 8:00 p.m. The March 6, 2024, meeting was postponed. Notification advising participants that the PIC was postponed, and notice would be provided when a new date was determined was posted on the City's website, and emailed to the project contact list, First Nations / Indigenous communities, internal City of Hamilton staff, and those who had registered for the event.

The PIC was rescheduled and held on Thursday, April 4, 2024, from 6:00 p.m. to 8:00 p.m. Select snapshots are shown in **Figure 4** and materials are provided in **Appendix A**. The project team presented the alternative design solutions, evaluation criteria, and the recommended strategy. The event was held using the Microsoft Teams platform,

and individuals were able to participate online or by phone. Pre-registration was required and could be completed by following a “QR” code or visiting the project website. The PIC was recorded and made available on the project website following the live event. Comments were accepted from April 4 to May 3, 2024, and could be provided through a survey made available on the project team, or by contacting a member of the project team by email or phone. A total of 31 participants attended the meeting. Following the meeting, a Frequently Asked Questions document was uploaded to the project website to summarize the questions and answers provided throughout the online meeting.

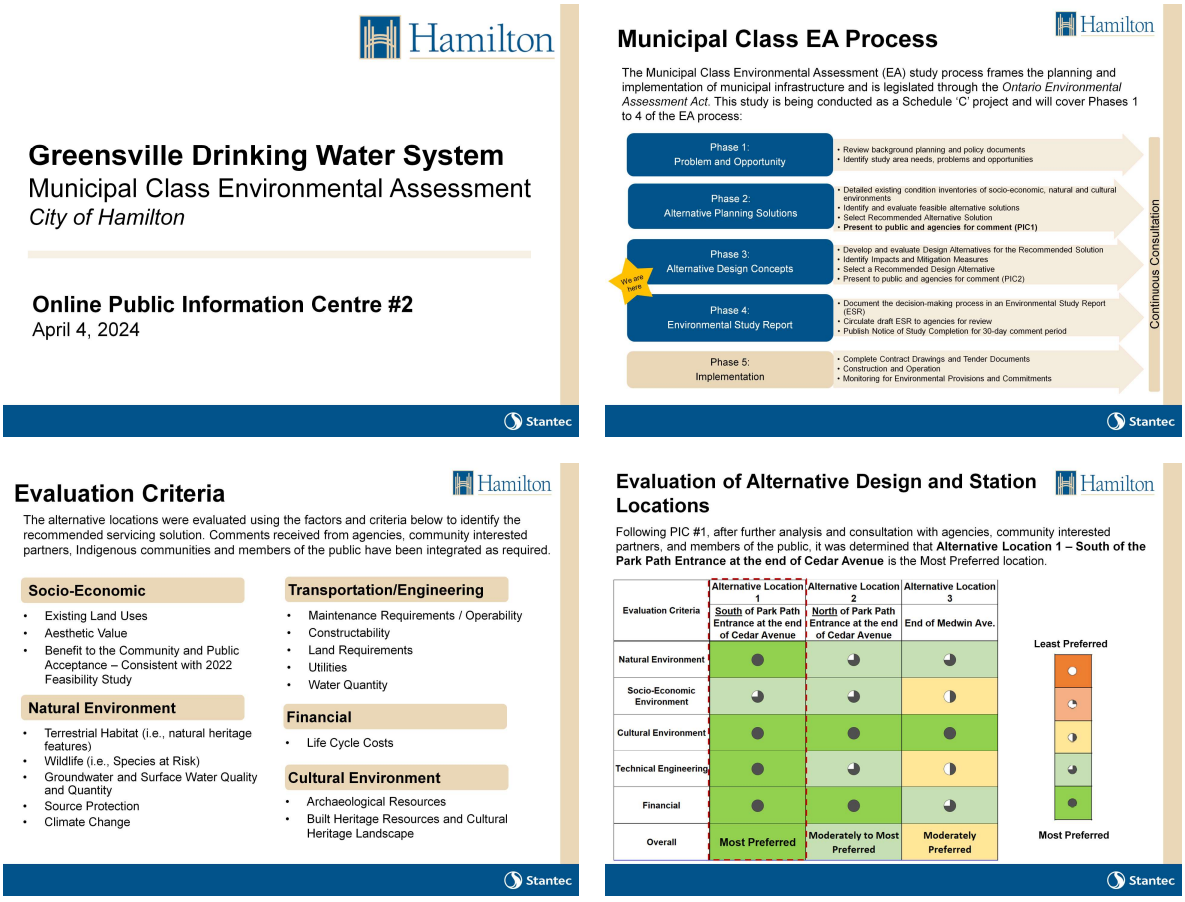

Figure 4: Snapshots from PIC #2 presentation materials (all materials provided in Appendix A).

A total of 22 comments were received by email or phone call from the public and agencies, and 1 comment was received through the online survey. PIC 2 materials are provided in **Appendix A**.

2.3.3 Notice of Completion

At the completion of the project, the project mailing list will be notified by a Notice of Completion, including Indigenous communities on the MECP project list provided. The Notice of Completion will be issued in January 6, 2025 for the start of the 30 day comment period. The Notice will be included on the City website from January 6, 2025 to February 5, 2025.

Should any comments be received during the 30 day public review period, the project team and Municipality of Kincardine will communicate directly with the individuals to discuss and seek to resolve the comments.

2.4 Agency Consultation

Several agencies, ministries and authorities were contacted during project initiation and throughout the study to notify them of the project and to request information related to the study area and feedback pertaining to the study. Agency comments received are included in **Appendix A**.

Provincial Agencies

- Ministry of Natural Resources and Forestry
- Ministry of Environment, Conservation and Parks
- Ministry of Citizenship and Multiculturalism
- Ministry of Transportation
- Ministry of Agriculture, Food, and Rural Affairs
- Infrastructure Ontario
- Niagara Escarpment Commission
- Hamilton Conservation Authority

Utilities

- Hydro One
- Enbridge Pipelines Inc.
- HCE Energy Inc.
- Bell Canada
- Alectra Utilities Corporation
- Sun Canadian Pipeline

Stakeholders / Schoolboards

- Bruce Trail Conservancy
- Environment Hamilton
- Citizens at City Hall (CATCH)
- Community Action Program for Children
- Hamilton Wentworth Council of Home & School Associations
- Hamilton Waterfront Trust
- Hamilton Community Foundation
- Cycle Hamilton
- Hamilton Cycling Committee
- Hamilton-Wentworth District School Board

A draft of the ESR was provided to the MECP on August 19, 2024 for 30 day review, and the MECP confirmed all MECP comments on the draft ESR had been provided on October 3, 2024. Comments were received from the Project Review Unit (PRU), as well as the Conservation and Source Protection Branch and are included in **Appendix A**.

2.5 Indigenous Communities Engagement

The following Indigenous communities were engaged as part of this study:

- Mississaugas of the Credit First Nation
- Huron Wendat First Nation
- Metis Nation of Ontario
- Six Nations of the Grand River
- Haudenosaunee Develop Institute

All study notifications have been provided to the above communities by mail and email, and follow-up phone calls/emails were completed to ensure communities had sufficient information to determine consultation interests. As the study progressed, all interested parties were notified and invited to all PICs and given the opportunity to express concerns and provide feedback through an invitation to meet with the project team.

Mississaugas of the Credit First Nation requested to be involved in archaeological studies or fieldwork associated with the project. The project team provided the Stage 3 Archaeological Assessment that was completed in 2014 to support this study, and noted no further Archaeological Assessment would be required.

Huron Wendat First Nation requested to review archaeological studies or fieldwork associated with the project. The project team provided the Stage 3 Archaeological Assessment that was completed in 2014 to support this study, and noted no further Archaeological Assessment would be required.

Six Nations of the Grand River requested to continue to receive notifications and updates related to the study. Six Nations of the Grand River was included on the project contact list and continued to be notified throughout the duration of the study.

A copy of Indigenous community engagement is provided in **Appendix A**.

3 Planning and Policy Context

This section summarizes the provincial and municipal plans, policies and initiatives that have relevance to this study. All aspects of the study including identifying problems and opportunities, the evaluation of alternatives, and development of the design were caried out in consideration of these policies to ensure the study recommendations are consistent with the City's strategic planning.

3.1 Provincial Policy Statement (2020)

The *Provincial Policy Statement* (PPS 2020) is issued under the *Planning Act, R.S.O. 1990, c.P.13* and supports the planning of land uses across the Province of Ontario. The PPS 2020 provides policy direction for the use and management of land, as well as infrastructure while protecting the environment and resources and to ensure opportunities for employment and residential development. The Provincial Planning Statement was issued under Section 3 of the Planning Act and came into effect on October 20, 2024.

Section 1.6.6.1 of the PPS states that planning for water services shall ensure that systems are provided in a manner that can be sustained by the water resources upon which such services rely, prepares for the impacts of a changing climate, is feasible and financially viable over their lifecycle, and protects human health and safety, and the natural environment.

Through the PPS 2020, the province seeks to ensure that its resources are managed in a sustainable manner to protect essential ecological processes and public health and safety, minimizing environmental and social impacts to meet long terms needs. This ESR meets the objectives of the PPS by adhering to the MCEA process.

3.2 Rural Hamilton Official Plan (2012)

The Rural Hamilton Official Plan (2012) applies to the lands in the rural area of the City. The Official Plan provides a long-term vision for the physical development of the City to achieve a sustainable, healthy future.

The Official Plan identifies the communal water supply system in Greensville, as a result of private water service failures, operator default and/or previous public health emergencies, and notes that partially serviced rural development is subject to higher risk of failure and the potential for future public health emergencies. The Plan notes there are restrictions on both the creation and expansion of communally serviced or partially serviced rural development, resulting in the Greensville RSA being prohibited from further development and expansion. Prior to acceptance of a private communal water supply, an application for an amendment to the Official Plan will be required

following the completion of a Municipal Class Environmental Assessment. The Study Area (Figure 1) is located within the Greensville RSA.

3.3 Greensville Secondary Plan (1992)

The Greensville Secondary Plan was developed in 1992 to establish land use policies and guidelines for the Greensville RSA. The Secondary Plan provides a comprehensive approach to the land and community facilities in the RSA, specifically related to the planned approach to growth and development within the RSA. The Greensville Secondary Plan includes guidelines for the stormwater and hydrogeological studies required prior to development approvals within the RSA. These guidelines within the Secondary Plan are in place to protect the quality and quantity of the water supply system within the community.

3.4 Mid-Spencer Creek / Greensville Rural Settlement Area Subwatershed Study (2016)

In 2016, the Mid-Spencer Creek/Greensville Rural Settlement Area Subwatershed Study (Aquafor Beech Ltd.) was completed and recommended a Schedule C EA for a "municipal backup well" for Greensville DWS. In 2017, the City initiated a Schedule C Class EA for a municipal backup well supply for Greensville which was ultimately reported as the Greensville Backup Well Feasibility Study (Wood Environment & Infrastructure Solutions [Wood], 2022).

The City completed a Subwatershed and Class EA in 2016 for the Mid-Spencer Creek and Greensville Rural Settlement Area. The study set a management strategy for surface water such as streams and stormwater, groundwater, community servicing such as water and septic, and natural areas such as wetlands and woodlots. The preferred solution identified for domestic water supply within the study area was to maintain individual services (wells and septic systems) on future lots and to add a backup well to the existing city well. This alternative was selected based on the impact to the environment, capacity of groundwater resources, consistency with existing policy and the objective to provide a better level of service to the homes currently serviced by the municipal well. The study noted that the location, sizing and preliminary design of the necessary infrastructure (treatment plant, storage tank) would be subject to further assessment under a Schedule C Municipal Class Environmental Assessment (MCEA).

3.5 Greensville Backup Well Feasibility Study (2022)

In 2022, the City of Hamilton completed an investigation of other solutions and conducted further studies under a Feasibility Study to determine cost implications associated with implementing the Subwatershed Study Class EA recommendations. As a result of the high costs identified for refurbishing FDG01, potential construction

limitations (with no existing backup water supply or trucked water connection), and the range of potential alternative scenarios, the City paused the Schedule C EA and the study was completed as the Greensville Backup Well Feasibility Study (Wood, Draft 2020; Final 2022).

The Feasibility Study evaluated three (3) design concepts to provide water service the community:

1. Design Concept One (1) proposed a combined supply from test well one (TW1-13) and test well two (TW2-13) (Stantec, 2014). This solution requires the installation of a well pump and transmission line servicing wells TW1-13 and TW2-13. A pumping control and disinfection building is required to meet drinking water quality requirements and to pump into the Harvest Road Water Supply System distribution system.

2. Design Concept Two (2) involves a single well supply. This solution requires the installation of a well pump and transmission line servicing re-rated well TW2-13. The technical evaluation confirms a long-term water taking rate of 129,600 L/day from well TW2-13. A pumping control and disinfection building is required to connect to meet drinking water quality requirements and to pump into the Harvest Road Water Supply System distribution system.

3. The last design concept, called Design Concept Two Alternative (2A) suggested a single supply from well TW2-13 with a modification to Cedar Avenue. The solution is nearly identical to Design Concept Two (2), however the Cedar Avenue cul-de-sac would be modified to accommodate maintenance vehicles.

The recommendation of the Feasibility Study was to implement a single well supply with one fenced wellhead, installation of a well pump, transmission line, pumping control and treatment building to provide a cost-effective solution with ease of access for maintenance purposes. A preferred location for an additional well house and pumping station (FDG02) was selected at the end of Cedar Avenue. Further, it would also involve modifying the Cedar Avenue cul-de-sac to accommodate maintenance vehicles for improved access. The potential alternative locations for the new pump station are located within the Johnson Tew Park and will be further assessed under this Schedule C MCEA.

3.6 Greenbelt Plan (2017)

The Greensville RSA is located within the Greenbelt Plan Area and is therefore subject to the policies of the Greenbelt Plan (2017). The Plan includes land within and builds upon the ecological protection plan of the Niagara Escarpment Plan. The Greenbelt protects ecologically and hydrologically significant natural environments and scenic landscapes, which clean the air, provide drinking water, diverse flora and fauna habitats, and provide recreational activities.

The Greenbelt Plan supports rural settlement areas and the achievement of complete communities that enhance human health and well being, while minimizing adverse environmental impacts, and improving resilience against climate change.

3.7 Niagara Escarpment Plan (2017)

The Greensville RSA is partially located within the Niagara Escarpment Plan (NEP), specifically within the Escarpment Rural Area, and is therefore subject to the policies of the NEP. The lands are designated as Minor Urban Centre, with underlying Escarpment Rural Area. The lands are located outside of the Niagara Escarpment Development Control Area; therefore, a Development Permit is not required for the proposed works. The policies of the NEP will still apply to the lands. The NEP seeks to protect the geologic feature of the Niagara Escarpment and lands in its vicinity.

The NEP notes that municipal water and private communal water systems shall not be located in the Escarpment Natural Area, Protection Area, Rural Area, or Mineral Resources Extraction Area, unless such servicing is required to address failed individual water services or ensure the protection of public health where it has been determined by a medical officer of health that there is a public health concern associated with the existing service. Where municipal water systems already exist in one of the aforementioned Escarpment areas, existing development within an approved service area boundary may be connected to these systems. The Greensville RSA is an approved service area boundary.

3.8 Clean Water Act (2006)

The purpose of the Clean Water Act, 2006, is to protect existing and future sources of drinking water and ensure that all Ontarians have access to safe drinking water. The Clean Water Act ensures communities protect their drinking water supplies through prevention; by developing collaborative, watershed-based source protection plans that are locally driven and based on science. The Clean Water Act established source protection areas and source protection regions based on vulnerable areas adjacent to municipal wells and intake locations in lakes and rivers. The Clean Water Act outlines requirements for local multistakeholder source protection committee for each area. These committees identify significant existing and future risks to their municipal drinking water sources and develop plans to address these risks.

3.9 City of Hamilton Climate Lens

The City of Hamilton developed a Climate Lens tool to ensure a consistent and efficient delivery of improved climate action, including emission reduction and adaptation benefits. The Climate Lens is intended to incent behavioral change and consideration of climate impacts into the planning of infrastructure projects with a view to implementing Canada’s mid-century goals of a clean growth low carbon economy. The Climate Lens

requires staff to consider how Greenhouse Gas emissions will be reduced in a project, opportunities for mitigation, and opportunities to improve climate adaption. Additionally, council has approved a Biodiversity Action Plan for the City.

3.10 Halton-Hamilton Source Protection Plan

The Halton-Hamilton Source Protection Plan contains essential policies to ensure that activities that post significant threats to municipal drinking water sources in the Halton Region Source Protection Area and the Hamilton Region Source Protection Areas cease to exist or never become significant. The Greensville RSA falls within a Significant Groundwater Recharge Area (SGRA), Highly Vulnerable Aquifer (HVA), and a Wellhead Protection Area (WHPA). An SGRA is considered significant in maintaining the water level in an aquifer that supplies drinking water, or groundwater. The soils in this area are permeable and allow rain and snowmelt to enter the ground easily. An HVA is an area of soil or rock under the ground where cracks and spaces allow water to reach the aquifer. A WHPA is an area around a wellhead that contributes source water to a drinking water system. Policies and recommendations to mitigate potential impacts on the SGRA, HVA and WHPA will be followed for this study.

4 Existing Conditions

4.1 Socio-Economic Environment

The study area is located within the Greensville Rural Settlement Area. Land use designations within the study area include Settlement Residential, and a Community Park (Johnson Tew Park).

The study area is also located within the NEP. Lands are designated as Minor Urban Centre, with underlying Escarpment Rural Area. The lands are located outside of the Niagara Escarpment Development Control Area.

4.2 Cultural Environment

4.2.1 Archaeological Resources

A Stage 3 Archaeological Assessment was carried out for the Johnson Tew Community Park and Arboretum in 2014 (Stage 3 Archeological Assessment of Pre-contact Sites AhGx-693, 694, 696, and The Coulson Site (AhGx-691) Johnson Tew Community Park and Arboretum Part of Lot 11, Concession 2 Geographic Township of Flamboro West, Wentworth County, now the City of Hamilton, 2014. The assessment was completed under Project Information Form (PIF) P375-0014-2013, P375-0015-2013, P375-0016-2013, and P375-0017-2013.

The historic Coulson site (AhGx-691), and pre-contact sites AhGx-693, 694, and 695 were registered in the Ontario Archaeological Sites database subsequent to a Stage 2 assessment of Part of Lot 11. A Stage 3 assessment was recommended for four sites to determine the nature and extent of cultural deposits at each. This assessment was initiated on October 24, 2013, and continued until November 27, 2013. The Stage 3 archaeological assessment (2014) concluded that only the northern one-third of the park contained cultural heritage value, while the southern site portion (AhGx-694) was found to have a low density of material and was not deemed to be a cultural heritage resource.

Based on the archaeological assessment, the proposed area for the improvements of this study at the end of Cedar Avenue do not fall within an area of archaeological potential, and no further assessment is required.

During construction, if potential archaeological or heritage artifacts are found, all work will be ceased until further investigations are completed.

A copy of the Stage 3 Archaeological Assessment is provided in **Appendix B**.

4.2.2 Built Heritage Resources and Cultural Heritage Landscapes

To determine the presence of potential and previously identified built heritage resources and cultural heritage landscapes, the Ministry of Citizenship and Multiculturalism (MCM) Criteria for Evaluating Potential for Built Heritage Resources and Cultural Heritage Landscapes checklist was completed and cultural heritage consultations with the MCM, City of Hamilton and the Ontario Heritage Trust (OHT) were completed to identify potential provincial heritage properties, OHT easements, or trust owned properties within or adjacent to the study area. The Built Heritage and Cultural Heritage Checklist is provided in **Appendix C**. The results of the checklist indicate that the Study Area contains structures over 40 years of age and municipal plaques. The structures over 40 years of age are the residences in the western part of the Study Area which were built in the mid-1970's. The City of Hamilton's Heritage Planner confirmed these residences are part of ongoing screening for heritage assets and are not considered to be built heritage resources. These types of residences are common mid-20th to late 20th century residences that are widespread throughout southern Ontario. Based on this review, further study for this potential indicator of cultural heritage value or interest are not recommended.

The two plaques are in the northern part of Johnson Tew Park overlooking the quarry. These plaques are not located near the proposed well or pump house locations. Therefore, the plaques are not expected to be impacted by the alternatives to address water supply for Greensville. Should removal of the plaques be required during construction, they should be reinstalled following completion of the work. Based on this review, further study for this potential indicator of cultural heritage value or interest is not recommended.

4.3 Natural Environment

The Study Area is in the Rural Settlement Area of the Rural Hamilton Official Plan (RHOP, City of Hamilton 2021). The Rural Hamilton Official Plan (RHOP, City of Hamilton 2021) "provides direction and guidance on the management of…[its] communities, land use change and physical development." It implements the PPS (discussed above), including identification of a Natural Heritage System and protection requirements for key natural heritage features and in Core Areas. The RHOP maps the Natural Heritage System including Cores Areas and Linkages on Schedule B. There are no Core Areas (such as significant woodlands or wetlands), or Linkages designated on Schedule B of the RHOP. The Study Area is in the Greenbelt Protected Countryside and the Greenbelt Natural Heritage System is designated to the immediate south.

Natural areas, terrestrial and aquatic resources were described in the Greensville Backup Well Feasibility Study (Wood, 2022). The significant woodlands identified within the Greensville RSA are adjacent to Johnson Tew Park and were not found within the Study Area. There were no other significant natural areas to note within the Study Area.

The ecological land classification for the Study Area is identified as Dry Fresh Mixed Meadow. No nationally or provincially endangered species were identified within the Study Area. There may be locally uncommon or rare plants and birds that may be impacted by the proposed project.

No wetlands or watercourses are within the Study Area.

4.3.1 Natural Environment Review

The City completed a Natural Heritage Assessment to support this Schedule C MCEA and the report is provided in **Appendix D** (Stantec, November 4, 2024). The assessment addresses the Project Location plus 120-m Adjacent Lands (collectively referred to as the Study Area), which includes the Johnson Tew Park and surrounding community of Greensville.

Sources reviewed included:

- Natural Heritage Information Centre (NHIC)
- Ontario GeoHub Land Information Ontario (LIO) database
- Rural Settlement Area of the Rural Hamilton Official Plan (City of Hamilton 2021)
- Greensville Backup Well Feasibility Study (Wood 2020)

The background review did not identity records of natural heritage feature or areas (such as wetlands, woodlands, watercourses, valleylands, Significant Wildlife Habitat, or Areas of Natural and Scientific Interest) in the Study Area.

Natural heritage data was assessed to identify key natural heritage features and significant natural features and functions outlined in the RHOP (Section 1.6) and PPS (Section 1.5). The following key/significant features were identified:

- Suitable Habitat for SOCC ((Eastern Milksnake, Barn Swallow, Monarch, Oldwife Underwing Moth and Penitent Underwing Moth)
- Candidate Significant Wildlife Habitat (Raptor Wintering Areas)

There were occurrences of SOCC plants (honey locust, northern pin oak and grey-headed prairie coneflower); however, these are planted occurrences and are not considered to indicate the presence of SWH.

The Study Area also provides breeding and foraging habitat for a variety of migratory birds that are protected by the MBCA and is expected to support a variety of other common, urban tolerant wildlife such as white-tailed deer, red fox and eastern cottontail.

4.4 Existing Infrastructure

4.4.1 Greensville Drinking Water System

The Greensville DWS currently provides water to 36 municipal water connections in the Greensville RSA. The system is currently supplied by one (1) well (FDG01), which was constructed in 1975 and brought online in 1976 with 15 initial residential connections. FDG01 has a drilled depth of approximately 12.15 m and is located near the intersection of Harvest Road and Forest Avenue in Greensville between two existing residential properties with minimal buffer around the wellhouse. Access to the wellhouse is somewhat restricted due to a narrow driveway. The FDG01 property is zoned as S1: Rural Zone Settlement Residential and does not currently meet the minimum setback requirements. The existing building is granted a grandfather clause given that it was constructed before the latest update to By-law No. 05-200. However, an increases of the building footprint would require compliance with the by-law or an exemption. All residents in the area are on individual septic systems.

The existing well system (FDG01) is not equipped with backup water supply, and several of the components of the existing system are reaching end of life. FDG01 is operating safely and effectively, however, it does not comply with the City's current Water Outstation Design Manual (WODM).

The municipal drinking water license for FDG01 stipulates a daily rated capacity of 199 m^3/d, and a Permit to Take Water (PTTW) daily rated capacity of 197 m^3/d. Water demands from 2021-2022 are summarized in **Table 1**.

Table 1: Greensville DWS Demands (2021-2022)

	Average Day Demand (m^3/d)	Maximum Day Demand (m^3/d)	Maximum Hourly Demand (m^3/h)	Peak Hourly Demand (m^3/h) [3]
Demand (2021-2022)	33.2[1]	93.4[2]	5.8	5.1

Table notes:

[1] 52.7 m^3/d in summer

[2] 99th percentile: 74.4 m^3/d

[3] 99th percentile peak hour demand

4.4.2 Site Access

The existing site is located between two residential properties on a narrow lot with a narrow access driveway with overhead wires. Site photos are shown in **Figure 5**.

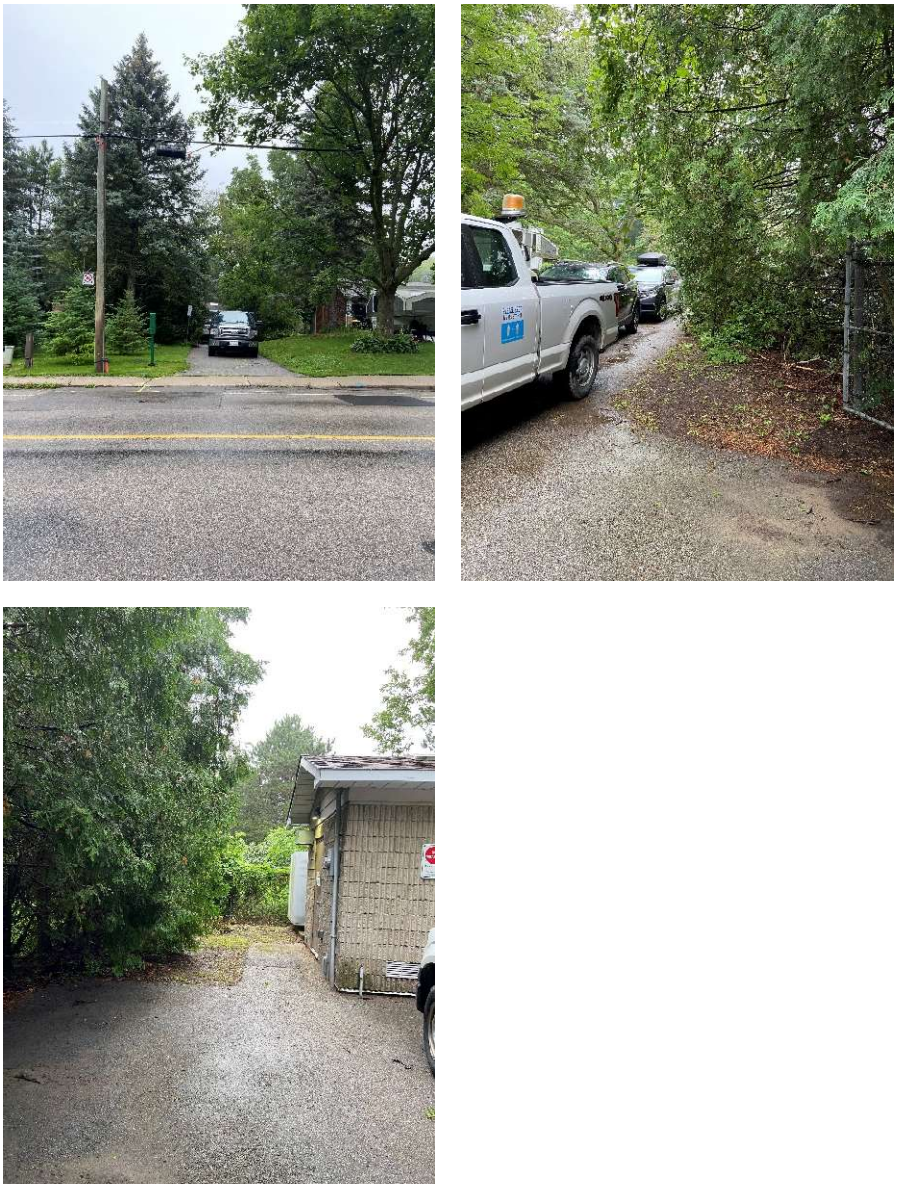

Figure 5: Photos of the existing FDG01 Site.

4.4.3 FDG01 Water Treatment

FDG01 is classified as a GUDI (groundwater under the direct influence of surface water) supply. Effective in-situ filtration is provided, and treatment is designed for 4-log virus

inactivation (i.e., 99.99% inactivation or removal).[1] Treatment consists of 2-stage cartridge filtration, primary disinfection by ultraviolet light (UV) followed by chlorination by sodium hypochlorite for 2-log virus (i.e., 99% inactivation or removal) inactivation in an underground chlorine contact chamber. Chlorination also provides secondary disinfection within the distribution system. Fluoridation is not practiced at the Greensville DWS. The existing well has a submersible pump rated for 2.3 L/s @ 79 m TDH, based on the current DWWP (dated 2019). As a result, the high lift pumping system has been sized based on a design flow rate of 2.3 L/s which is the equivalent of 198 m^3/d or approximately 8.28 m^3/h.

4.4.4 FDG01 Water Quality

From 2017 to 2021, the average raw water pH was 7.77 (range: 7.53 to 7.97), and the average turbidity was 0.375 NTU (range: 0.09 to 2.74 NTU). Raw water nitrate as nitrogen concentrations have ranged from 5.23 to 7.08 mg/L over the last five years, with an average of 5.78 mg/L. It should be noted that the maximum detected nitrate concentration of 7.08 mg/L was detected in 2017 and the secondary maximum value in this data set is 6.24 mg/L nitrate-as-nitrogen which was reported in 2020.

Greensville DWS distribution sampling has detected elevated levels of nitrate historically ranging from 5.1 to 5.8 mg/L and treated water nitrate levels reported to range from 5.20 to 6.27 mg/L nitrate as nitrogen in 2020. The concentration of nitrate was observed to gradually trend upwards throughout 2020 (from January to December) where the average value for the winter months (January, February, and March) was 5.53 mg/L, and the average for the fall months (October, November, December) was 6.20 mg/L, which represents an increase of more than 10% in the concentration over time, and values consistently greater than half-standard. The maximum acceptable concentration (MAC) for nitrate-as-nitrogen is 10 mg/L (which is an equivalent to 45 mg/L nitrate where the factor is [nitrate]*0.2258=nitrate as N).

FDG01 raw well water supply has historically had sodium concentrations ranging from 101-151 mg/L with an average value of 131 mg/L over the last five years. A potential source of sodium to FDG01 may be road salting on the well-traveled road neighbouring FDG01. The Greensville DWS treated supply had reported sodium concentrations in 2020 ranging between 123 to 131 mg/L with one adverse drinking water quality incident

[1] Where the drinking-water system obtains water from a raw water supply which is ground water, the treatment process must, as a minimum, consist of disinfection and must be credited with achieving an overall performance that provides, at a minimum 2-log (99%) removal or inactivation of viruses before the water is delivered to the first consumer.
For example, with ground water of pH 7-8 and temperature 7-10 degrees Celsius (°C), this requirement can be met by a minimum chlorine residual of 0.2 mg／L, measured as free chlorine, after 15 minutes of contact time determined as T_{10} at maximum flow rate. For ground water whose conditions are outside this range of pH or temperature, higher CT values may be needed to achieve the required minimum virus inactivation. (Ontario Procedure for Disinfection of Drinking Water)

(AWQI). The aesthetic objective (AO) for sodium in drinking water is 200 mg/L, and the local Medical Officer of Health is to be notified when sodium concentrations exceed 20 mg/L so that this information can be communicated to local physicians for their use with patients on sodium restricted diets. Notification of sodium concentrations are only required once every 57 months.

The Greensville DWS distribution lead testing in 2020 included two (2) samples with <0.0001 mg/L lead and a pH range of 7.38 to 7.39. Ten (10) residential lead samples taken in 2020 showed concentrations from 0.0005 to 0.0025 mg/L which were also below Ontario MAC of 0.01 mg/L, as well as below Health Canada guideline value of 0.005 mg/L. Concentrations of other metals of concern, including arsenic (<0.0001 to 0.0001 mg/L), were not found to be elevated. The City conducted additional sampling for N-nitrosodimethylamine (NDMA) in the distribution system in 2021; NDMA was not detected during this sampling event and is not expected to fluctuate significantly over time.

4.5 Previous Studies

4.5.1 Greensville Station Condition Assessment (2019)

GHD completed a Condition Assessment for FDG01 (2019), which identified deficiencies and areas of concern for the existing Greensville DWS assets. Components of the Greensville DWS were ranked on three scales for risk: probability of failure which is a scale from 1 – 5 with 1 being a rate probability of failure and 5 being almost certain; severity of failure which is a scale from 1 – 5 with 1 being an insignificant severity of failure and 5 being an extreme severity of failure; and overall risk score which is calculated as the product of the probability score and severity score and ranges from 1 – 25 with 1 – 4 being low risk and 16 – 25 being critical risk. Items that were identified as having high or critical risk include:

- Intake piping
- Well components (motor, well pump, well pump starter)
- Pressure Reducing Valve
- UV Reactors (1 & 2)
- Pressure Tanks (1, 2, 3 & 4)
- Power Panel
- Indoor and outdoor receptacles
- Station Walls

The overall condition of the FDG01 system was ranked on a condition scale of 1 being best condition and 5 being the poorest condition. FDG01 received a score of 2 for the average value of all asset conditions, indicating the system is currently operating at a 'good' condition. It was, however, identified that the following assets are operating at a condition of 5 (poor):

- Pressure Gauge (Well Discharge)
- Floor Drains

The assessment concluded that the assets that were identified as areas of concern included the majority of the prime power and FDG01 building electrical assets which are in need of replacement, some site civil and structural assets including the need for new fencing and grading on the property, and crack repair of the floor and walls. Additionally, heavy corrosion has occurred on some of the process piping, valves, and instrumentation (due to sodium hypochlorite being stored in the one room pump house).

Immediate capital improvements were identified so that, once completed the system will adhere to the WODM standards. Upgrades were identified for Site Civil (asphalt drive and parking area, trees/landscaping, fencing, and pressure gauge), Process Instrumentation and Control (well level panel meter), Building Mechanical (eyewash station, floor drains, roof drains, and dehumidifier), Building Electrical (conduit, station flood switch), and Structural/Architectural (station floor flab, station roof, and station walls). These upgrades were noted to likely result in a building expansion to be completed.

The Condition Assessment report also presented an alternative solution and cost comparison to provide Greensville with a backup water supply. The alternative solution included demolishing the existing FDG01 Pump Station, retrofitting the existing FDG01 to act as a well only, and installation of a watermain along Forest Avenue to the proposed FDG02 station which would house the treatment equipment. This solution was found to have high capital costs and would cause significant disruption along Forest Avenue during construction of the new raw watermain.

4.5.2 Greensville DWS Constructability and Risk Assessment (2022)

Stantec completed a Constructability and Risk Assessment in 2022 to assess potential alternatives for backup supply for Greensville DWS. This assessment used the short-listed alternatives previously considered by the City of Hamilton, as part of a City-completed Scenario Matrix. A summary of the short-listed alternative servicing scenarios is included in **Table 2.**

Table 2: Summary of Shortlisted Alternatives and Descriptions by the Constructability and Risk Assessment Study (Stantec, 2022)

Alternative	Description	Special Considerations	Capital Cost (Level D, 2022)
1A. Equip DWS with backup water haulers at Cedar Ave	• Refurbish FDG01 and maintain existing well and pump house (no site building expansion) • Connection for water haulers would be added at the end of Cedar Ave	• Requires evaluation of impacts of reversed flow to distribution system with different water supply/quality for emergency supply • Requires EA amendment • Will not meet City's capital design standards	• $2.8M (refurbishment)
1B. Equip DWS with backup water haulers at Cedar Ave	• Refurbish FDG01 and expand building to improve compliance with City minimum design standards • Connection for water haulers would be added at the end of Cedar Ave	• Requires evaluation of impacts of reversed flow to distribution system with different water supply/quality for emergency supply • Requires EA amendment	• $4.9M (Incl. $1.6M associated with backup water supply requirements during construction)
2. New Station and Well (FDG02) at Cedar Ave with reservoir and backup water hauler connection	• Decommission FDG01 • Construct pump house connected to FDG02 at end of Cedar Avenue with reservoir • Include connection for water hauler to new reservoir in design and cost estimate	• Commissioning would require additional consideration for initial reversal of flow to distribution system; Potential need for cleaning/swabbing of distribution system prior to commissioning • Backup supply may be of different water quality • Requires EA amendment	• $4.0M (construction / capital)

Alternative	Description	Special Considerations	Capital Cost (Level D, 2022)
3. New Station with two new well supplies at Cedar Ave (no reservoir)	• Decommission FDG01 • Construct pump house connected to FDG02 and additional well supply at end of Cedar Avenue	• Includes backup water supply from site well, no water haulers • Backup supply less likely to have impacts on distribution water quality • Requires EA amendment	• $3.8M (construction/capital)

The Constructability and Risk Assessment Multi-Objective Decision Analysis (MODA) determined that the preferred solution is Alternative 2 (New Station and Well at Cedar Ave with reservoir and backup water hauler connection). Since the cost of the new station is only marginally higher than the refurbishment and/or expansion of FDG01 cost, it is thought that the additional investment into the new FDG02 site would result in a more reliable facility for long term operations. A summary of the MODA scoring is shown in **Table 3**.

Table 3: MODA Scoring Summary

Evaluation Criteria	Alternative 1A	Alternative 1B	Alternative 2	Alternative 3
Budget	25	20	35	20
Technical and Construction	84	60	100	76
Operations and Maintenance	24	32	48	48
Other	20	16	14	14
Total	153	128	**197**	158

Site conditions and constraints were also identified as part of the Constructability and Risk Assessment. The current FDG01 property is zoned as S1: Rural Zone Settlement Residential and the location does not currently meet the minimum setback requirements. Since the existing building was constructed prior to the latest update to by-law No. 05-200, a grandfather clause has been granted. However, an increases to the building footprint will require the building to conform to by-law No. 05-200, unless an exemption is granted.

Since the existing facility is not in conformance with the WODM standards, a new expanded facility would be required to meet these standards. The following upgrade requirements include, but are not limited to:

- Separate rooms for chemical, electrical and process equipment
- Areas for workbenches, desks or storage areas
- Separate washrooms
- Janitorial facilities
- Steel pitched roof

It was noted that expanding the building would require demolishing the existing FDG01 building and constructing a new pump station with a larger footprint on the property.

Extending the existing footprint will allow for vehicular access to the wellhouse as well as access to the standby generator behind the building. There is currently no sanitary connection at FDG01, therefore it is assumed that a separate washroom and janitorial facilities will not be required which will leave some elements of the WODM unaccomplished.

4.5.3 Alternative Well Supplies

Several test wells have been explored in Johnson Tew Park (a passive park) at the end of Cedar Avenue as potential alternative or backup well supplies for Greensville DWS (**Figure 6**). TW2-13 is the most promising alternative supply which was constructed in 2013 in accordance with O. Reg. 903 and has an expected long-term water taking rate of 129,600 L/day (SNC-Lavalin, 2017; with no exceedances identified for ODWS maximum acceptable concentrations and low risk for being influenced by surface water identified previously. TW2-13 has a depth of 12.50m to 21.37m into an open hole in the bedrock of dark brown to black dolostone and shale. The groundwater level noted in 2013 was 10.4m. The well record documents the overburden material as brown topsoil (0 to 0.91m), brown/red clay and stones (0.9-9.45m), grey clay and stones (9.45-11.89m), and dark grey limestone (11.89-21.34m).

Previous reports have summarized water quality information on the available alternative well supplies (SNC-Lavalin 2017; Stantec 2022; Wood 2022). TW1-13 would not meet demand of the Greensville DWS and has elevated contaminants that may require additional treatment including iron (16.4 mg/L), manganese (0.228 mg/L), and lead (0.044 mg/L), although nitrates were not detected. TW3-13 was not found to be a viable source due to inadequate supply and water quality issues.

Figure 6: Location of Three Test Wells in Study Area and FDG01

4.5.3.1 PUMPING TEST REPORT (2023)

In late 2022, the City conducted a pumping test focused on assessing the supply potential and water quality of TW2-13 (Terraprobe 2023; **Appendix E**). Pump testing of the preferred alternative well supply for FDG02 (TW2-13) was conducted in 2014; however, the test was interrupted at about 56 h due to generator malfunction. Given that this is the only test well to have been identified in the area to meet the supply demands for the Greensville DWS and would be the singular supply for Greensville under the preferred alternative identified by the Constructability and Risk Assessment (Stantec 2022), it was recommended to complete a full 72-h pump test of TW2-13 to confirm the long-term water taking rate and obtain a category 3 permit to take water (PTTW).

The ability of the test well to sustainably produce 90 L/min was reviewed. A 90 L/min step rate was evaluated for 120 minutes and produced a total volume of 10,800 L (90 L/min * 120 min = 10,800 L). During the test, the static pumping well level was 12.5m and the measured well drawdown was 1.0m.

As the step pump testing was completed at three flow intervals (50, 70 and 90 L/min), a sustainable capacity of the well was calculated by the linear relationship of the observed drawdown at the end of each completed step. The maximum allowable drawdown from the on-site well is estimated from the static water level of 11.5m below grade and the pump setting of approximately 3.0 m from the base of the well (21.8 m). The resulting maximum flow rate accounting for a safety factor of 0.5 would be 184L/min or 3.1 L/s. Following a 72-h pump test, the water level in TW2-13 was observed to have recovered to 95% of the previous measured static water level within 1.5 h following the completion of the pump test.

Stantec reviewed both the SNC Lavalin (2017) and Terraprobe (2023, Draft) hydrogeological reports conducted at test well TW2-13. Based on the testing completed and results presented within these reports, Stantec supports the conclusion that the available drawdown observed during 72 h pumping tests indicate that the well is capable of a long-term yield of 90 L/min (129,000 L/d).

4.5.3.2 WATER QUALITY AND TREATMENT FOR ALTERNATIVE WELL SUPPLIES

As part of the Pump Test, water quality samples were collected throughout December 2022 and January 2023 at TW1-13, TW2-13, TW3-13, MW101 (overburden well), five (5) monitoring wells including FDG01, and one surface water location. TW1-13 and TW3-13 were again found to exceed the MAC for numerous water quality parameters; however, it is noted that nitrate levels within TW1-13 and TW3-13 were not detected. TW1-13 also showed exceedances in iron. These results suggest a potential opportunity for well blending to minimize nitrate levels in the future should the trend in nitrate levels in TW2-13 increase over time and should TW2-13 be relied upon as the primary supply for Greensville. Given this potential future opportunity, careful consideration for the location of a potential new pump station should be made for a potential piped connection to TW1-13.

The key results of water quality testing for TW2-13 are summarized below. Overall, the water quality was found to be of good quality and did not exceed the MAC for any O. Reg. 169/03 health-related parameters. Given that the well is not identified as GUDI, the treatment system for this well is expected to be less complex than that for the existing FDG01; UV disinfection is not expected to be required to meet the current disinfection criteria of 2-log virus. Should regulations increase in the future, the chlorination system could be operated to provide a minimum 4-log virus, or the treatment system could be retrofitted with a low-profile UV disinfection process within the same building footprint. Therefore, treatment for TW2-13 is expected to have lower life-cycle costs and lower maintenance requirements.

4.5.3.3 NITRATE

In TW2-13, nitrate as N was observed to increase from 1.4 mg/L to 3.2 mg/L for the duration of the pump test. The Ontario Regulation 169/03 health-related limit for nitrate (as N) is 10 mg/L, and for nitrite (as N) is 1.0 mg/L. Nitrite as N samples were all below detection (0.05 mg/L) for TW2-13. Given that there are no known existing contributing sources of nitrate in the study area and the neighbouring test wells had lower nitrate levels, the nitrate levels in TW2-13 are not expected to rise over time.

4.5.3.4 ARSENIC

The Ontario MAC for arsenic is 0.01 mg/L and was not exceeded in any samples at TW2-13.

4.5.3.5 MANGANESE & LEAD

The proposed Health Canada guideline for manganese in drinking water (2019) provides a MAC for total manganese in drinking water of 0.12 mg/L (120 µg/L), and an aesthetic objective (AO) for total manganese in drinking water is 0.02 mg/L (20 µg/L). It is anticipated that the Ontario Ministry of the Environment, Conservation and Parks (MECP) will adopt these guidance values in a similar form at some point in the near future. The current MECP AO for manganese is 0.05 mg/L. The results at TW2-13 for manganese ranged from 0.0339 mg/L to 0.0056 mg/L and therefore this parameter is not expected to be an issue with respect to MAC exceedances.

Similarly, the MAC for lead in Ontario is 0.010 mg/L and all measurements from TW2-13 were substantially below this value. The Health Canada guideline for lead in drinking water is 0.005 mg/L, and all measurements were again below this value.

4.5.3.6 HARDNESS

It is noted that hardness in TW2-13 samples ranged from 334-436 mg/L and increased over time. It is recommended that the City review the potential for the water quality from TW2-13 to be either corrosive or scale forming and compare these results with that of FDG01 to identify if distribution system corrosion control management considerations should be taken during the design of the preferred servicing scenario.

4.5.4 Alternative Solutions and Direction

Following the 2016 Mid-Spencer Creek / Greensville Rural Settlement Area Subwatershed Study, the City completed several studies and investigations and ultimately determined that the intent of the 2016 study recommendation was to provide a more resilient water supply for the Greensville drinking water system and the 36 residential connections along the Harvest Road Water Supply System. Therefore, while the 2016 study specifically recommends a “backup well”, the City determined through

engineering consultations that resiliency for the existing system could be provided through other means that could balance short- and long-term impacts on the environment and neighbouring residents, life-cycle costs, and operations burden - such as a trucked water connection and/or water storage such as a buried reservoir. Therefore, the approach to this MCEA was to identify the preferred alternative servicing scenario that could provide “backup supply” but not specifically to identify an alternative with a “backup well”.

5 Problem and Opportunity Statement

Based on the review of existing conditions, background studies and planning documents, improvements are required in the study area.

The Greensville DWS is serviced by one groundwater-sourced municipal communal well system, which is not equipped with backup water supply, and several components of the existing system (FDG01) are reaching end of life. FDG01 is operating safely and effectively, however, it does not meet the City's current outstation design manual.

In 2022, the City completed a Constructability and Risk Assessment which identified alternatives for backup water supply and identified the implementation of a new municipal communal well and pump station with a buried reservoir could provide reliable water supply and quality to the Greensville DWS and meet the City's water outstation design manual criteria.

The City is committed to providing safe and reliable drinking water to the Greensville DWS residents and will evaluate alternative servicing scenarios with backup water supply for the Greensville DWS.

6 Alternative Solutions

As part of Phase 2 of the MCEA study process, reasonable and technically feasible solutions to the problems and opportunities are identified and evaluated based on their ability to resolve the issues, and their impacts to the socio-economic, natural, cultural, and technical environments.

6.1 Long List of Alternative Solutions

A long list of alternative solutions was developed for the study. These alternatives vary in complexity, complexity, construction cost, and their potential ability to address the study area issues. This long list was developed by the previous studies completed by the City and considers various opportunities for alternative water supply, the condition assessment for FDG01, and the Constructability and Risk assessment study. The long list of alternatives developed are summarized below.

Do Nothing

This alternative assumes no pre-emptive upgrades to the existing FDG01 well supply and treatment system. This alternative does not meet the problem and opportunity statement and was not carried forward for further evaluation.

Alternative 1 – Expand the Lake Based Distribution System

This alternative would involve constructing a pump station, potentially at Woodley Lane as the closest point in the existing City Lake Based Distribution System and a 2.2 km connection to FDG01. FDG01 could be decommissioned but the FDG01 treatment building would be maintained. This alternative is highly disruptive and would be a costly watermain to install, also requiring a booster pumping station. There are also potential water age and water quality issues with switching the primary water supply. This alternative was not carried forward for further evaluation.

Alternative 2 – Construct a Reservoir

This alternative requires building a new reservoir facility in the Study Area to include a reservoir to supply the Greensville DWS to be supplied by trucked water. The FDG01 well and treatment components could be decommissioned. This alternative presents concerns with water age and associated water quality and does not align with the problem and opportunity statement. Therefore, this alternative was not carried forward for further evaluation.

Alternative 3A – Trucked Water Connection and Refurbishment of FDG01

This alternative involves constructing a trucked water connection for the Greensville DWS and refurbishment of the existing FDG01. The trucked water connection would be located at the end of the distribution system on Cedar Avenue. This alternative does not fully address the problem and opportunity statement, as it is not feasible to refurbish the existing FDG01. This alternative was not carried forward for further evaluation.

Alternative 3B – Trucked Water Connection and Upgrades to FDG01 Towards City Water Outstation Design Manual

This alternative involves constructing a trucked water connection for the Greensville DWS and refurbishment of the existing FDG01 and associated upgrades to work towards the City WODM. The trucked water connection would be located at the end of the distribution system on Cedar Avenue. This alternative does not fully address the problem and opportunity statement, as it is not feasible to upgrade the existing FDG01 towards the City Outstation Design Manual. This alternative was not carried forward for further evaluation.

Alternative 4A – Maintain and Retrofit FDG01 Well and Pump Station, and Source Additional Well Supply in the Park with New Pump Station

This alternative involves maintaining and retrofitting FDG01 well and pump station, sourcing an additional well supply in the park and constructing a new pump station at the end of Cedar Avenue (“FDG02”). This alternative would allow for a continued water supply to rely on during construction. This alternative was carried forward for further evaluation.

Alternative 4B – Maintain FDG01 and Source Additional Well Supply in Park with New Pump Station and Watermain

This alternative requires maintaining the FDG01 well, identifying an additional well supply in the park, building a new pump station with reservoir in the park (“FDG02”), and constructing a new watermain from FDG01 well to the new pump station in the park. This would involve decommissioning the existing pumping and treatment components at the FDG01 treatment building. This alternative has poor construction feasibility, and would be disruptive to the local community, and is therefore not carried forward for further evaluation.

Alternative 5A – One Station with One Well and Reservoir at Cedar Avenue

This alternative involves decommissioning FDG01 well and pump station; sourcing one (1) primary well supply in the park and constructing a new pump station (“FDG02”) at the end of Cedar Avenue with a reservoir for water storage and backup supply. This option would provide redundant water storage and help manage projected seasonal peak demands. This alternative was carried forward for further evaluation.

Alternative 5B – One Station with One Well and Trucked Water Connection at Cedar Avenue

This alternative involves decommissioning FDG01 well and pump station and a new well and pump station would be constructed at the end of Cedar Avenue (“FDG02”); however backup supply would be provided only by a trucked water connection. This alternative does not include the additional infrastructure for an on-site reservoir for backup water storage. This option may not be able to meet the peak seasonal demands and was not carried forward for further evaluation.

Alternative 6 – One Station with Two Wells at Cedar Avenue

This alternative involves decommissioning FDG01 well and pump station; sourcing two (2) well supplies in the park and constructing a new pump station at the end of Cedar Avenue (“FDG02”). This alternative could also include a trucked water connection for additional redundancy for emergency supply. This option was carried forward for further evaluation.

6.1.1 Alternatives Carried Forward

Preliminary screening was completed to evaluate the long list alternatives to create a short-list of feasible alternative servicing solutions. The shortlisted alternatives include:

- **Alternative 4A**: Maintain and Retrofit FDG01 Well and Pump Station, and Source Additional Well Supply in the Park with New Pump Station
- **Alternative 5A**: One Station with One Well and Reservoir at Cedar Avenue
- **Alternative 6**: One Station with Two Wells at Cedar Avenue

6.2 Short List of Alternative Solutions

6.2.1 Evaluation Criteria

The shortlisted alternatives were evaluated against the evaluation criteria in **Table 4** to select the preferred servicing solution.

Table 4: Evaluation Criteria

Component	Evaluation Criteria	Description
Natural Environment	Terrestrial Habitat (i.e., natural heritage features)	• Potential adverse effects on terrestrial species and habitats
	Wildlife (i.e., Species at Risk)	• Potential to impact SAR and SAR habitat
	Groundwater and Surface Water Quality and Quantity	• Potential adverse effects on groundwater, wells, surface water quality and quantity
	Source Protection	• Consistent with Source Protection objectives
	Climate Change	• Potential to reduce Greenhouse Gas emissions and align with City of Hamilton Climate Lens
		• Improve resiliency or vulnerability to climate change conditions (i.e., extreme weather events)
Socio-Economic Environment	Existing Land Uses	• Potential adverse effects on existing land use (i.e., construction impacts, park space, trails, noise during operation, safety)
	Aesthetic Value	• Impacts on aesthetics of surrounding area
	Benefit to the Community and Public Acceptance. Consistent with 2022 Feasibility Study	• Provides reliable water supply (i.e., with backup) to the HRWSS residents
		• Provides safe / high quality drinking water supply to Greensville HRWSS residents

Component	Evaluation Criteria	Description
Cultural Environment	Archaeological Resources	• Conserves archaeological resources • Minimize potential impact to archaeological sites and areas of archaeological potential
	Built Heritage Resources and Cultural Heritage Landscapes	• Conserves built heritage resources and cultural heritage landscapes • Minimize potential impact on known (e.g., previously recognized) and potential built heritage resources and cultural heritage landscapes
Technical / Engineering	Maintenance Requirements / Operability	• Access for Hamilton Water • Potential to require additional snow removal • System operational complexity
	Constructability	• Ability to minimize construction constraints and complexity • Duration of construction has potential to minimize impacts to existing residences
	Land Requirements	• Amount of land required for new pump well system • Potential to require acquisition or easements (temporary/permanent)
	Utilities	• Proximity to existing utilities (i.e., electrical supply)
	Water Quantity	• Adequate water quantity measures and projections
Financial	Life Cycle Costs	• Capital costs of the proposed alternatives • Cost for operations and maintenance of the proposed alternatives

6.2.2 Evaluation of Short List of Alternative Solutions

The short-listed alternatives were reviewed using the evaluation criteria in **Table 4** to identify the preferred servicing solution for Greensville RWS. Each alternative was analyzed and given a score from Least Preferred to Most Preferred. The scale used for the scoring is displayed in **Figure 7**.

Figure 7: Evaluation Scoring

The results of the evaluation of short list of alternative solutions are summarized in **Table 5**.

Table 5: Evaluation of Short List of Alternative Solutions

Evaluation Criteria	Water Supply Alternatives for Greensville DWS		
	4A – Maintain and Retrofit FDG01 Well and Pump Station, and Source Additional Well Supply in the Park with New Pump Station	**5A – One Station with One Well and Reservoir at Cedar Avenue**	**6 - One Station with Two Wells at Cedar Avenue**
Natural Environment	• Requires new fenced wellhead and pump station in the park, and maintenance of FDG01 site • FDG01 well is GUDI, has elevated sodium, rising nitrates • Proposed supply would meet system demands • Proposed supply would achieve Source Protection Plan objectives for backup well supply • Potentially higher greenhouse gas emissions for maintaining two (2) wellheads and two (2) pump stations • Potentially higher greenhouse gas emissions for operating ultraviolet (UV) light disinfection required for FDG01 GUDI well supply • Potentially higher resiliency to climate change conditions / extreme weather events with two stations • Potential for future treatment requirements for nitrates at FDG01 and management of the process waste stream	• Requires one fenced wellhead in addition to the proposed new pump station • No adverse impacts to groundwater and surface water quality and quantity. New supply quality expected to be improved • New supply expected to meet future peak demands • Achieves Mid-Spencer/Greensville Rural Settlement Area Subwatershed Study (2016) recommendation to provide backup supply through a reliable on-site buried reservoir with 1-day storage • Lower greenhouse gas emissions expected for operating one wellhouse without UV disinfection and lower outstation maintenance for one wellhead and one pump station • Good / moderate resiliency to climate change conditions / extreme weather events with 1-day on-site storage and possibility for addition of trucked water connection during detailed design	• Requires two fenced wellheads in addition to the proposed new pump station • No adverse impacts to groundwater and surface water quality and quantity • Achieves Source Protection Plan objectives for backup well supply • Potentially moderately higher greenhouse gas emissions for maintaining two (2) wellheads • Potentially moderately higher resiliency to climate change conditions / extreme weather events with two well supplies and on-site reservoir

Evaluation Criteria	Water Supply Alternatives for Greensville DWS		
	4A – Maintain and Retrofit FDG01 Well and Pump Station, and Source Additional Well Supply in the Park with New Pump Station	**5A – One Station with One Well and Reservoir at Cedar Avenue**	**6 - One Station with Two Wells at Cedar Avenue**
Socio-Economic Environment	• Occupies two sites long-term in the community with vertical pump station buildings • Requires routine maintenance and access to two locations within the community • Assures a reliable and redundant water supply system for the community • Provides a good quality drinking water supply to the Greensville DWS residents • Water quality is different between the two well supplies resulting in different areas of the distribution system potentially receiving different water quality	• Requires one fence wellhead in the Park • Water storage reservoir is buried • Assures a reliable and redundant water supply system for the community • Provides a high-quality drinking water supply to the Greensville DWS residents	• Requires two fenced wellheads in the Park and additional watermain in the park. • Water storage reservoir is buried • Assure a reliable and redundant water supply system for the community with an additional well supply and buried reservoir • Provides a good to high-quality drinking water supply to the Greensville DWS
Cultural Environment	• Conserves archaeological resources • Conserves built heritage resources and cultural heritage landscapes	• Conserves archaeological resources • Conserves built heritage resources and cultural heritage landscapes	• Conserves archaeological resources • Conserves built heritage resources and cultural heritage landscapes
Technical Engineering	• Alternative is consistent with policy and regulatory objectives • More complex system than others in Ontario based on size of population • Reliability is improved with introduction of additional well supply and pump house	• Alternative is consistent with policy and regulatory objectives, Common water system concept to others in Ontario • Reliability is improved with construction of new building meeting water outstation design manual and addition of 1-day reservoir storage	• Alternative is consistent with policy and regulatory objectives, Common water system concept to others in Ontario • Reliability is improved with second supply and construction meeting water outstation design manual

Evaluation Criteria	Water Supply Alternatives for Greensville DWS		
	4A – Maintain and Retrofit FDG01 Well and Pump Station, and Source Additional Well Supply in the Park with New Pump Station	**5A – One Station with One Well and Reservoir at Cedar Avenue**	**6 - One Station with Two Wells at Cedar Avenue**
	• Construction complexity for refurbishing FDG01 is high and unable to meet some requirements of the City water outstation design manual • Duration of construction expected to be the least favorable for the construction of the new wellhead, pump station and refurbishing of FDG01. • High maintenance requirements and complexity for two stations • Higher operational complexity for two stations • Higher maintenance requirements and complexity for operating two wells with different treatment requirements (where FDG01 is GUDI requiring UV light) • Will require additional backup generator at FDG02 building • Potential for future treatment requirements for nitrates at FDG01 and the need for additional treatment maintenance and labour burden	• Duration of construction expected to be the most favorable for the new well, pump house, and decommissioning FDG01 station • Lowest maintenance and operational complexity for operating one well and storage reservoir • Backup generator from FDG01 can be repurposed	• Duration of construction expected to be moderate for the new pump station and two wellheads, and decommissioning of FDG01 station • Additional construction complexity with commissioning two new well supplies and additional watermain • Additional maintenance complexity expected with maintaining and sampling two well supplies • Water quality is different between the well supplies; TW1-13 would require dilution to meet some health-based regulatory criteria • Water quantity is different between the well supplies; TW1-13 unable to meet peak demands and system would be relying more on storage reservoir if TW2-13 is offline • Will require backup generator; possibly can be repurposed from FDG01
Financial	• Highest capital costs • Highest long-term operating and maintenance costs	• Lowest capital costs • Lowest long-term operating and maintenance costs	• Moderate capital costs • Low to moderate long-term operating and maintenance costs

Evaluation Criteria	Water Supply Alternatives for Greensville DWS		
	4A – Maintain and Retrofit FDG01 Well and Pump Station, and Source Additional Well Supply in the Park with New Pump Station	**5A – One Station with One Well and Reservoir at Cedar Avenue**	**6 - One Station with Two Wells at Cedar Avenue**
	• Moderate to high net present value expected at 25-year horizon depending on FDG01 condition and needs for structural repairs • Potential for future treatment requirements for nitrates at FDG01	• Moderate to high net present value expected at 25-year horizon	• Highest net present value expected at 25-year horizon
Overall	**Least Preferred**	**Most Preferred**	**Moderately Preferred**

6.3 Preferred Solution

The evaluation criteria determined that **Alternative 5A – One Station with One Well and Reservoir at Cedar Avenue** is the preferred alternative solution and is carried forward into the Evaluation of Alternative Design Concepts.

6.4 Alternative Design Concepts

6.4.1 Evaluation of Alternative Design Concepts

The alternative design concepts for Alternative 5A includes the evaluation of three potential locations for a new pump station shown in **Figure 8**:

- Alternative Location 1: to the south of the park path entrance at the end of Cedar Avenue.
- Alternative Location 2: to the north of the park path entrance at the end of Cedar Avenue.
- Alternative Location 3: at the end of Medwin Avenue.

Figure 8: Well and Pump Station Alternative Locations

The alternative locations were evaluated using the same criteria outlined in **Table 4** to determine the preferred location for the new pump station and buried reservoir.

Table 6: Evaluation of Alternative Locations for the Pump Station

Evaluation Criteria	Alternative Location 1 **South of Park Path Entrance at the end of Cedar Avenue**	Alternative Location 2 **North of Park Path Entrance at the end of Cedar Avenue**	Alternative Location 3 **End of Medwin Avenue**
Natural Environment	• Approximately 1,400 m^2 of disturbance at edge of Park with no fragmentation in the park • No adverse effects to groundwater, wells and surface water quality and quantity expected • Consistent with source protection plan objectives	• Approximately 1,400 m^2 of disturbance at edge of Park with no fragmentation in the park • No adverse effects to groundwater, wells and surface water quality and quantity expected • Consistent with source protection plan objectives	• Approximately 1,400 m^2 of disturbance with no fragmentation in the park • No adverse effects to groundwater, wells and surface water quality and quantity expected • Consistent with source protection plan objectives
Socio-Economic Environment	• Proximal to end of Cedar Ave at north end of Harvest Road water supply system • No fragmentation to the park expected • Minor impact on the park aesthetics • Proposed location may impact proximal property values and impact views of the park from some community locations • Expected to provide consistent water supply to the existing distribution system	• Proximal to end of Cedar Ave at north end of Harvest Road water supply system • No fragmentation to the park expected • Minor impact on the park aesthetics • Existing treeline expected to provide some concealing of proposed pump station from existing properties • Expected to provide consistent water supply to the existing distribution system	• Would impact aesthetics on the park more than the other alternative locations • Proposed location may impact proximal property values and impact views of the park from some community locations • Expected to provide consistent water supply to the existing distribution system

Evaluation Criteria	Alternative Location 1 **South** of Park Path Entrance at the end of Cedar Avenue	Alternative Location 2 **North** of Park Path Entrance at the end of Cedar Avenue	Alternative Location 3 End of Medwin Avenue
Cultural Environment	• Conserves archaeological resources • Conserves built heritage resources and cultural heritage landscapes	• Conserves archaeological resources • Conserves built heritage resources and cultural heritage landscapes	• Conserves archaeological resources • Conserves built heritage resources and cultural heritage landscapes
Technical Engineering	• Simplest access from existing City road • Requires 110 m watermain to connect to FDG02 well and existing distribution system • Located on City-owned land; lot is secured, and space is available • Access to site is maintained by Hamilton Roads and Maintenance Department	• Simplest access from existing City road • Requires 145 m watermain to connect to FDG02 well and existing distribution system • Located on City-owned land and space is available; recommend consultation with Parks • Access to site is maintained by Hamilton Roads and Maintenance Department	• Access is available from Medwin Avenue • Requires 55 m watermain to connect to FDG02 well and existing distribution system • Not City-owned land • Would require easement and additional construction costs to connect to the distribution system on Harvest Road • Proximity to existing utilities is further compared to other alternatives
Financial	• Similar total approximate cost • City has budgeted for Parks compensation for pump station location (2017 estimate) • May impact property value	• Slightly higher approximate cost for additional watermain • City has budgeted for Parks compensation for pump station location (2017 estimate) • May impact property values	• Highest cost for additional watermain • City has budgeted for Parks compensation for pump station location (2017 estimate) • May impact property values
Overall	**Most Preferred**	**Moderately to Most Preferred**	**Moderately Preferred**

The results of the evaluation are summarized below.

Alternative Location 1 - is to the south of the park path entrance at the end of Cedar Avenue. The lot is identified and secured by the City and is proximal to the alternative well supply (TW2-13). This location may impact proximal property values and impact views from the park and other community locations. With the exception of these impacts (Socio-Economic Environment), Location 1 is rated highly against all other evaluation criteria, resulting in the overall rating of most preferred.

Alternative Location 2 - is to the north of the park path entrance at Cedar Avenue. This lot would require identification and ownership by the City. Additionally, this lot is further away from the alternative well supply (TW2-13). This alternative rates highly in all areas of evaluation criteria. Location 2 is rated higher than Location 1 for Socio-Economic Environment because this location will allow for the existing treeline to conceal the view of the proposed pump stations from existing properties. The overall rating for Alternative Location 2 is moderately to most preferred.

Alternative Location 3 - is located at the end of Medwin Avenue. This lot would require identification and ownership by the City. This lot is the furthest away from the alternative well supply (TW2-13), when compared to Alternative Location 1 and 2. This lot is the only lot that would require an easement and result in additional construction costs to connect to the distribution system on Harvest Road as it would result in locating the pump station furthest from the existing distribution system. Location 3 is likely to impact proximal property values and impact views from the park and other community locations for properties that are not connected to the Harvest Road distribution system. This lot is rated highly against cultural environment, moderately high against financial and natural environment, and moderately against socio-economic environment and technical engineering, resulting in a score of moderately preferred.

6.4.2 Recommended Design

Based on the evaluation, it was determined that **Alternative Location 1: South of the Park Path Entrance at Cedar Avenue** is the preferred location for the new well, pump station and buried reservoir. A plan-view schematic of the preferred location within the study area is shown in **Figure 9** and photos of the preferred site location are provided in **Figure 10**.

In summary, the recommendation to improve the resiliency of the Greensville DWS supply is to implement Alternative 5A (one station with one well and reservoir in the park at Cedar Avenue), which includes the following:

- Construct a wellhead for TW2-13 in the park.
- Connect a watermain from TW2-13 to a new pump station building in the park.

- Construct the new pump station with a buried reservoir with 1-day water storage and treatment by chlorination. Consider trucked water connection to system for additional redundancy during detailed design.
- Locate the new pump station building at the south end of the park entrance at the end of Cedar Avenue, with the specific location to be determined in consultation with Parks.
- Decommission FDG01 groundwater-sourced municipal well and pumping/treatment station and chlorine contact pipe.

Figure 9: Preferred supply well and location for pump station.

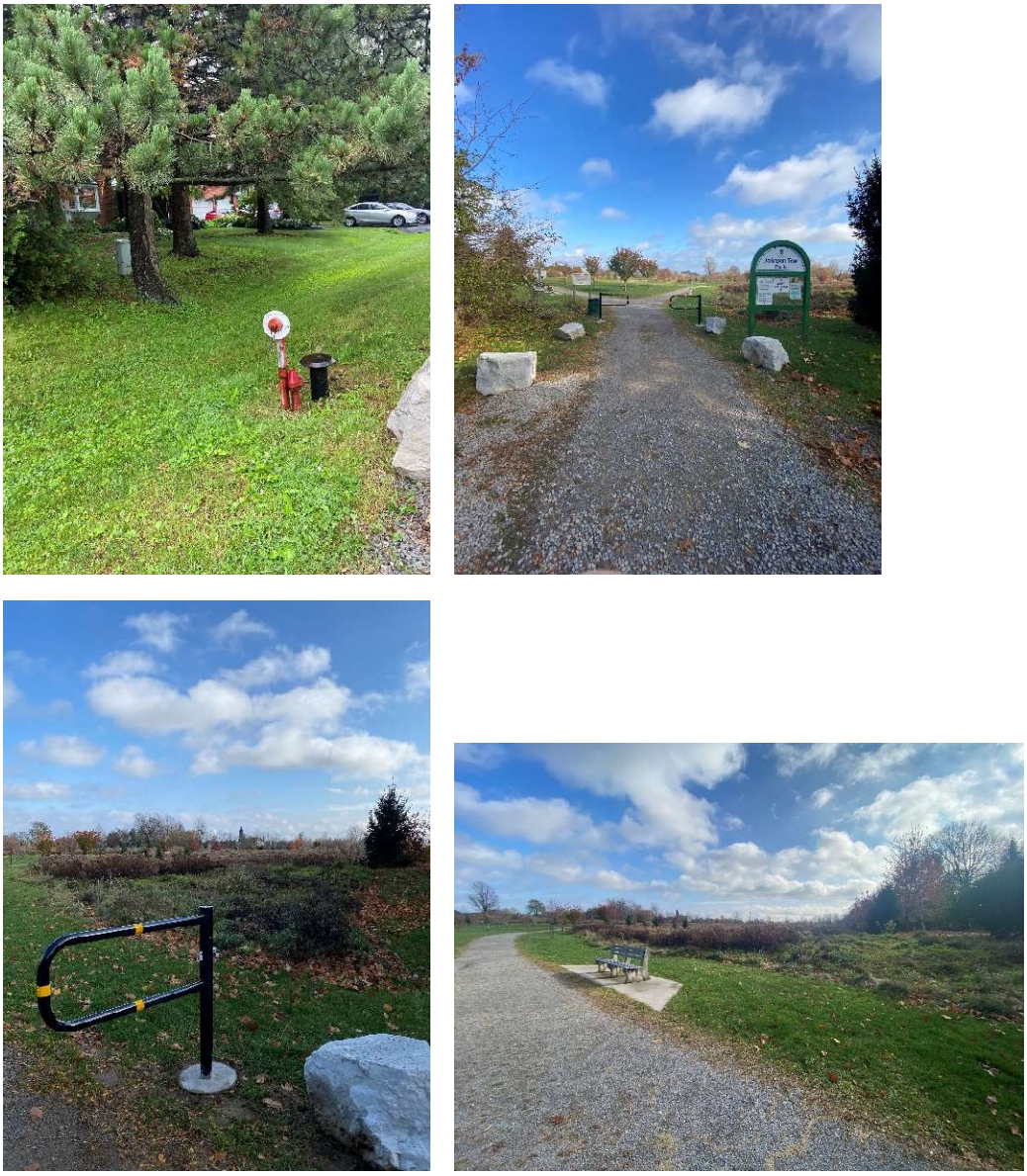

Figure 10: Photos of the recommended locations for a new pump station and buried reservoir.

In Figure 10, the top left shows an available connection to the existing distribution system at the end of Cedar Ave. Top right shows the entrance to Johnson Tew Park. Bottom left shows the view of the proposed site location from the entrance to Johnson Tew Park. Bottom right shows the view of the proposed site from the North.

7 Project Description

The Preferred Alternative Solution, described in **Section 6.3**, and Preferred Alternative Design (location), described in **Section 6.4** is recommended to be implemented as the final design concept. The selected design includes one well supply and wellhead, one pump station (FDG02) with backup generator, backup water supply from a buried reservoir, chlorine disinfection system, and a trucked water connection at the end of Cedar Avenue. This solution involves transitioning to a new primary supply from one new wellhead from the existing Test Well 2-13 (TW2-13). The existing FDG01 treatment station will be decommissioned. The new pump station and buried reservoir will be located to the south of the park path entrance at the end of Cedar Avenue. The conceptual design layout is shown in **Figure 11**, for reference. The design concept is detailed in the Report titled “Water Supply System – Design Concept” prepared by Stantec (2024) and will be summarized in the following section of this report.

Figure 11: FDG02 Conceptual Site Layout

7.1 Design Elements

7.1.1 General

The new facility design is based on the City of Hamilton's WODM and MECP Design Guidelines for Drinking Water Systems. The new facility will include a three-room pump station consisting of a process room, electrical room and chemical room contained within an ornamental security fence providing enclosed parking for approximately two service vehicles and a standby generator. A site plan and conceptual section drawings for the pump station and buried reservoir are provided in **Appendix F**. A conceptual Landscape Plan is provided in **Appendix G**

7.1.2 Disinfection Requirements

Test well TW2-13 was determined to be a groundwater well with low risk for surface water contamination and therefore it is assumed that it will not be classified as groundwater under the direct influence of surface water (GUDI). The disinfection requirements per the current Ontario Procedure for Disinfection of Drinking Water is therefore 2-log inactivation of viruses (i.e., 99% inactivation or removal). However, the system will be designed for 4-log inactivation (i.e., 99% inactivation or removal) in anticipation of future regulatory changes to the Ontario Procedure for Disinfection[2].

The following are estimations of the design flows for the Greensville DWS:

- TW2-13 sustainable yield = 90 L/min (1.5 L/s) (greater than historical system maximum day demand of 1.2 L/s)
- Treatment design flow rate = 1.6 L/s
- High lift pump flow rate = 2.0 L/s (greater than historical system peak hour demand of 1.9 L/s)

It should be noted that these design flow rates are estimations and will be reviewed based on available pump specifications, during detailed design.

7.1.3 Storage

The on-site storage reservoir was developed to satisfy the following reservoir volume requirement:

[2] With reference to anticipated adoption of 4-log virus inactivation recommendations per Health Canada's *Guidelines for Canadian Drinking Water Quality: Guideline Technical Document – Enteric Viruses,* 2019.

A. Volume for chlorine disinfection contact time (free chlorine residual concentration multiplied by the reservoir contact time; “CT”) disinfection, assuming future 4-log virus inactivation requirements.

B. One (1) day of build-out maximum day demand (94 m^3) for equalization.

C. Operating range for pump operational flexibility.

- Total reservoir volume = (A)+(B)+(C).

The volume calculations were completed as part of the in the Water Supply System – Design concept report (Stantec, 2024) which determined that the required CT for the system is 8 mg*min/L, resulting in a minimum detention time of 40 min. The equalization volume was calculated to be 93.4 m^3.

The underground reservoir will be located beneath the well house. The reservoir will consist of two reservoir cells each providing 56 m^3 of available storage (112 m^3 total) plus two wet well cells each providing 13 m^3 of available storage (26 m^3 total) for a combined total available storage volume of 138 m^3.

System sizing was based on recent system water demands which are summarized in **Table 1**. The system is not required to provide fireflow production or storage.

7.1.4 Disinfection

Primary and secondary disinfection will be provided through chlorination by injection of sodium hypochlorite injection (12.5% w/w). The treatment process will consist of two chlorine injection points: one on the raw water header to provide chlorine residual through the dual-celled 129 m^3 (total volume) reservoir for primary disinfection, and a secondary dosing point on the reservoir discharge for trim chlorination to target a finished water free chlorine residual set-point to maintain secondary disinfection. Sodium hypochlorite will be dosed to the two injection locations using three peristaltic chemical metering pumps, operating as duty/duty/standby, and each sized to provide 100% capacity.

The total active sodium hypochlorite storage volume is approximately 50 L (excludes freeboard) based on 30 days of storage at maximum monthly average day flows (55 m^3/d, or 0.63 L/s) and conservative chlorine dose (3 mg/L). One double-walled sodium hypochlorite storage tank will be provided. The tank should be constructed of double-walled XLPE. An additional containment volume is not required for double-walled chemical tanks.

Two chlorine residual analysers will be used to provide regulatory and finished free chlorine residual monitoring, and a finished water turbidity analyzer will provide finished water quality monitoring.

7.1.5 Civil Design Elements

Civil design elements for the Greensville DWS site include:

- Security fencing around the perimeter of the facility.
- Asphalt driveway from Cedar Avenue to the new wellhouse gate.
- Asphalt parking area within the fence enclosure with two parking spaces and sufficient space for truck turnaround and maintenance activities.
- Sufficient area for snow storage and accessibility for snow removal equipment.
- Concrete pad for emergency back up generator.
- Installation of approximately 55m of raw watermain from the new well FDG02 to the new well house, and approximately 30m of potable watermain extending from the new well house to the distribution system connection at the end of Cedar Avenue. It is estimated that the new watermain on the well house influent will be 50mm in diameter, and effluent will be 100mm in diameter.[3]
- Use of Low Impact Development (LID) features where possible to minimize and treat stormwater, and to minimize use of asphalt.

Figure 12 and **Figure 13** provide conceptual design renderings to illustrate the exterior layout of the building and site**.**

[3] Watermain Design Criteria for Future Alterations Authorized Under a Drinking Water Works Permit – Section 4.0. Government of Ontario. June 2021.

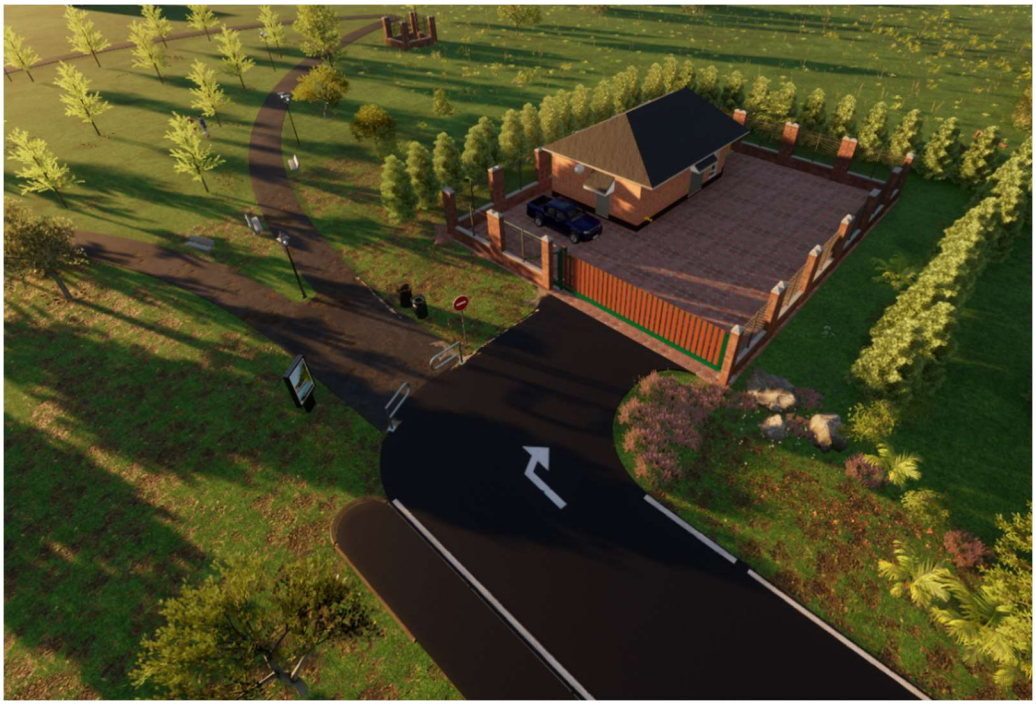

Figure 12: FDG02 Conceptual Building Site - from North-East and Cedar Avenue

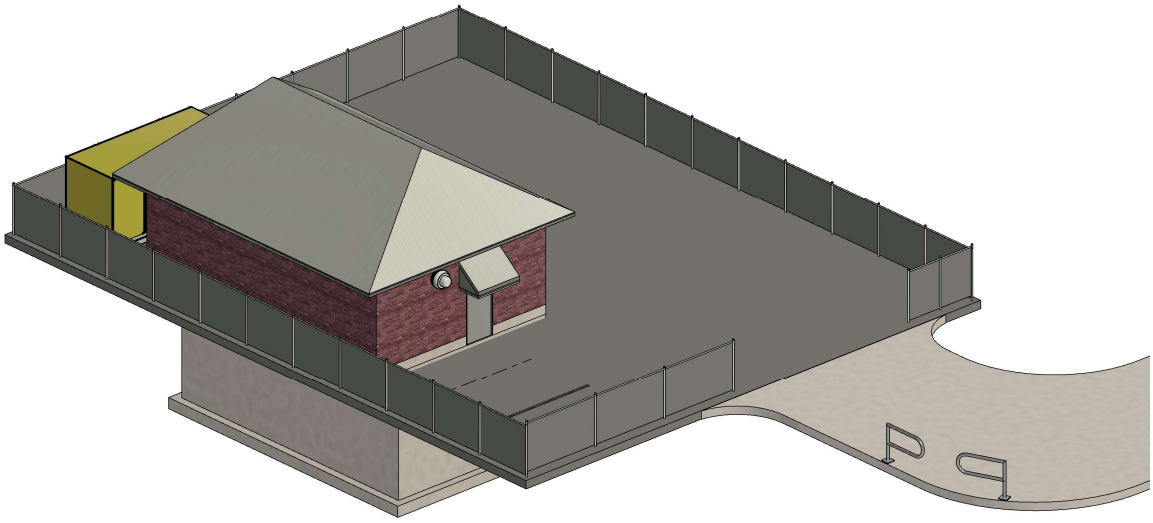

Figure 13: FDG02 Conceptual Building Site - from North-West and Below-Grade Reservoir

7.1.6 Low Impact Development

It was of interest to investigate ways the amount of asphalt could be reduced for the site. For this reason, the use of LIDs has been considered. It was found that 12.5 m^3 of storage to treat the first 25 mm of runoff can be provided by a bioswale and vegetative filter strip. In order to determine the accurate drawdown time of the bioswale, the site soil characteristics are required, including the native soil infiltration rate. Therefore, a geotechnical study of the project area is recommended for future work. A high-level sketch of the potential LID bioswale design (plan view) is shown in **Figure** 14**14.**

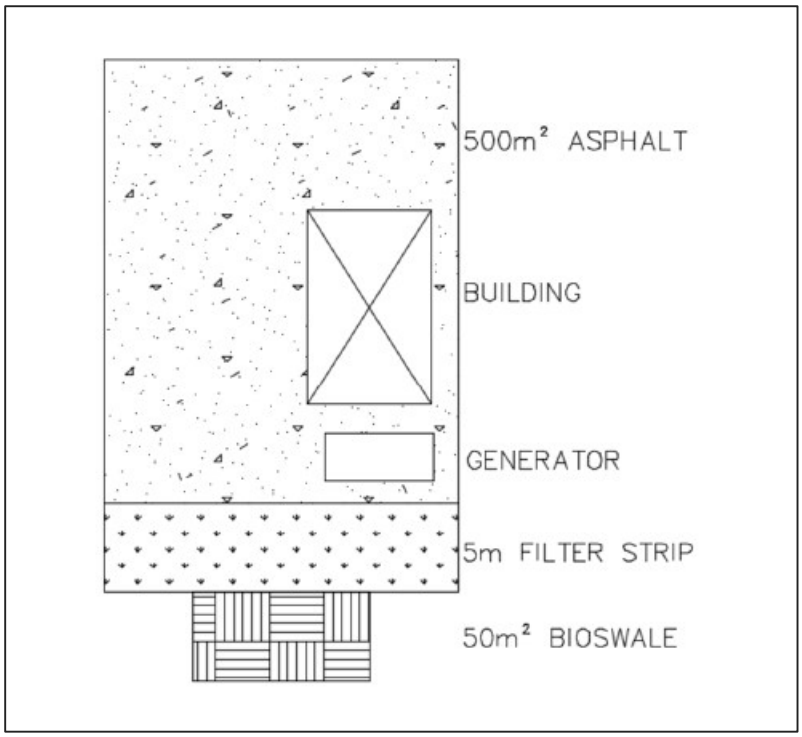

Figure 14: LID Bioswale Plan Sketch

7.1.7 Electrical

The electrical room will be separate from the chemical and process room and will house electrical controls, per the City WODM.

The electrical service is sized to provide maximum power demand for two (2) booster pumps (3 HP) operating in duty-standby configuration, one (1) 0.75 HP well pump and auxiliary single-phase loads of approximately 80% of 25 KVA (HVAC, lighting, process control, miscellaneous load will be confirmed during detailed design).

A standby generator will be located within the fenced enclosure to power the well house in the event of a power outage. Considerations for sound attenuation for the generator

in the form of either soundwall or an acoustic enclosure will be reviewed during detailed design. It is possible that the existing natural gas generator at FDG01 could be reused for the new facility if the size is sufficient and the power supply is compatible. The existing natural gas generator is 1-phase, 30 kW 120/240V, 40 kVA. An investigation regarding standby generator size, emissions and proximity to the residential neighbourhood will be required during detailed design. The FDG01 Condition Assessment (GHD, 2019) recommended replacement of the standby generator over the next 11 – 25 years.

Lighting may be manually switched to LED (light-emitting diode) lighting throughout the new facility. Emergency lighting and signage can be provided throughout the well house using emergency battery packs.

No exterior lighting has been included in this conceptual design based on consultation with the City and operations.

7.1.8 Mechanical

The building is expected to be heated either by natural gas or electric unit heaters and the temperature controlled by a thermostat. The building temperature should be maintained at 15 °C during winter months. Air conditioning is not to be installed per the City's WODM, to be confirmed by the City during detailed design specifically for the electrical room.

A dehumidifier will be installed in the process room to remove extra moisture in the air which can cause condensation and corrosion on metal surfaces.

The building will be equipped with smoke and carbon monoxide detectors, and a security system.

Plumbing work shall include but is not limited to the following:

- Tempered water line and backflow preventor.
- Electric on-demand domestic hot water tank and system.
- Emergency eyewash/shower in the chemical room, fed by tempered water.
- Floor drains for the emergency eyewash/shower in the chemical room, as well as process areas and sampling locations. The finished concrete floor must be sloped towards the floor drains to promote positive drainage. The floor drain system will be dechlorinated and discharged by gravity to a soak-away pit to be evaluated during detailed design.

7.1.9 Structural/Architectural

The architectural finish for the new building will be architectural brick to match the surrounding neighbourhood aesthetic and blend in with the houses in the surrounding area. Insulated metal exterior doors will be provided at the chemical room and process room. A peaked metal roof is recommended to match the surrounding neighbourhood aesthetic. Security fencing will be ornamental. The architectural design will meet the requirements of the Ontario Building Code, including energy efficiency and floor safety. The interior walls will be concrete block with a painted finish. The floors will be concrete finish and sealed for durability.

The new well house will be a three-room design with a footprint of approximately 75 m^2. The building is a single-story above grade building with a below grade reservoir underneath the superstructure. The structural design will meet the Ontario Building Code requirements and CSA codes for concrete, masonry and steel design.

7.2 Utilities

Utilities present along Cedar Ave include HydroOne, Union Gas and Bell Canada. The locations of the existing utilities have been identified, and consultation with the utility companies will occur during detailed design. A preliminary review was completed, and it is anticipated that the proposed work is not expected to impact existing utilities as the new facility is proposed in an undeveloped portion of the park.

7.3 Property

Permanent property acquisition and dedication is anticipated only for the new fenced areas of the pump station and wellhead at the end of Cedar Avenue to the south end of the park path entrance. The actual new right-of-way and the limits of property acquisition required will be confirmed during detailed design. The City has been in consultation with Parks regarding the acquisition of the required land and the City has obtained an evaluation of the lot.

7.4 Construction Staging

FDG01 would remain in service throughout the construction of the new wellhouse, limiting the requirement for backup water supply to the Greensville community. The potential to re-use the existing natural gas generator at FDG01 would be determined during detailed design. This does not include the relocation of existing utilities that may be required to accommodate the work and it is assumed that major utility relocations would be completed in advance of major construction.

7.5 Implementation Timeframe and Schedule

It is estimated that construction works will take approximately 10 months with potential phasing outlined in **Table 7**.

Table 7. Staging for Conceptual Design

Construction Phase	Key Objectives	Approximate Duration
Phase 1	• Site Preparation • Tree/Shrub removal • Wellhead Installation and Yard Piping	2 months
Phase 2	• Construction of new Well House, including reservoir and all internal mechanical, electrical, and instrumentation components • Asphalt Paving	4 months
Phase 3	• Complete I/O Checks, Manufacturer Startups, and System Testing • Complete initial 7-day run test • Completion of 14-day Performance Test • Achieve Substantial Performance • Final Site Restoration including Site Grading, Asphalt Paving, Fence Installation, and Seeding	2 months
Phase 4	• Decommission FDG01 Wellhouse • Demolish FDG01 Wellhouse	2 months

Construction timing is contingent on property acquisition, utility relocations (as necessary), detailed engineering and securing required approvals. Coordination with adjacent City projects, conservation efforts, property owners, and regulatory agencies is planned early in the detailed design phase, providing opportunities for further consultation and to assist in finalizing the construction timing. At this time, considering the timelines required for property acquisition and completion of design and other advance activities, construction is planned to occur no sooner than 2026.

7.6 Preliminary Cost Estimate

A 2024 Class D (-30% / +50%) cost estimate for the construction of the new station, including the procurement of all equipment and land, and demolition of the existing facility, is summarized in **Table 8**.

Table 8: Class D Opinion of Probable Cost

Description	Cost
Structural and Architectural – Shell	$1,126,000
Structural and Architectural – Interiors	$221,000
Process / Mechanical	$875,000
Electrical	$434,000
Site & Ancillary Work	$248,000
Demolition of FDG01	$162,000
Sub-Total	*$3,066,000*
Construction Contingencies (25%)	$766,500
Consultant Costs	*$784,242*
Land Costs and Fees	$31,680
Total Estimate	**$4,648,422**
Low Estimate (-30%)	$3,253,000
High Estimate (+50%)	$6,973,000

This opinion of cost was developed based on current market rates for labor, material, and equipment. Costs were developed to represent 2024 Canadian dollars. General requirements and fees are expected to cover the General Contractor's indirect costs such as bonding, insurance, supervision, temporary facilities, utilities, and cleanup. Rates are inclusive of sub-trade overhead and markup and are based on unionized labour performing work during regular hours.

The structural estimates assumed the building structure will be constructed of steel frame with brick veneer on masonry perimeter wall and prefinished metal roof. This estimate assumes no contaminated land, and that the hydro connection from the local residential neighbourhood will be sufficient. Costs may vary should premiums be encountered during winter construction, costs for unusual delays, unforeseen site conditions, escalation, taxes, and schedule impacts.

Contingencies and fees were developed using the City's cost estimation workbook, then a low-estimate (minus 30%) and high estimate (plus 50%) were calculated to provide a Class D estimate based on the information in-hand. A summary of the City's capital cost estimation workbook is provided in **Appendix H**.

8 Potential Environmental Impacts and Proposed Mitigation

Several mitigation measures are proposed as part of the assessment process to address various potential environmental impacts from implementing the preferred design concept.

- Measures will be taken to mitigate impacts on terrestrial and wildlife by minimizing vegetation removal and avoiding wildlife habitats. Areas of the park disturbed during the process will be rehabilitated to their original state prior to construction.
- In the event of discovering potential archaeological or heritage artifacts during construction, all operations will be halted until comprehensive investigations are carried out.
- Considerations will be made for potential noise and dust disturbances during the construction phase.
- The occasional use of the backup generator will contribute to a minor temporary increase in the City of Hamilton's greenhouse gas emissions.
- In terms of climate change, the minor loss of local carbon sinks (grassed areas) will be offset by the proposed tree plantings intended for concealing the facility. This will also serve as a visual buffer around the pump station and parking area.

A letter was received from the City Planning and Economic Development Department with comments on the draft ESR (August 14, 2024, Stantec) and the Natural Environment Technical Memo (Appendix D), and this letter is provided in **Appendix A**.

8.1 Archaeological Resources

A Stage 3 archaeological assessment has been completed in the identified area for construction and there are no anticipated impacts on archaeological or heritage resources during the implementation of the project. In the event of discovering potential archaeological or heritage artifacts during construction, all operations will be halted until comprehensive investigations are carried out.

8.2 Hydrogeology

There are two main aquifers in the study area, which are not expected to be impacted by the implementation of the preferred solution.

8.3 Park Land

The pump station will compromise a section of the existing parkland and will introduce a small secure, fenced parking area and pump station building that will change the vertical appearance of the park. To minimize the visual impact, the preferred pump station location has been identified adjacent to the existing park boundary at the end of Cedar Avenue in an area that is considered fragmented from natural park features and does not impede with the existing trail system.

A letter was received from City Forestry & Horticulture Section with respect to the Application for the proposed project site, and this letter is provided in **Appendix A**.

8.4 Natural Environment

No significant natural areas or aquatic resources were identified within the area that will be impacted by construction or the implementation of the study recommendation.

8.4.1 Opportunities to Mitigate Construction Impacts

Inadvertent encroachment of heavy equipment, siltation and/or spills of deleterious substances, noise, and dust migration into natural features were identified as potential indirect impacts from construction. These impacts may alter species composition by compacting and smothering vegetation and introducing substances that could be harmful to vegetation and wildlife, such as fuel used by construction vehicles and introduction and spread of invasive species. Additional disturbance may be required to facilitate spill clean-up activities. Where they occur, these impacts are expected to be localized to the construction area and adjacent areas.

The following mitigation measures and best practices are recommended to reduce potential impacts to natural heritage features during construction:

- Delineate the work areas with tree protection fencing prior to construction.
- Develop and implement an erosion and sediment control plan. Maintain the erosion control measures until disturbed soils are secure and stable. Revegetate disturbed/exposed soil as soon as feasible.
- Wash, refuel and service equipment in designated areas, and have a spill management plan to address accidental spills. Check machinery regularly for fluid leaks.
- Implement a clean equipment protocol to prevent the introduction of invasive species.

- Avoid wildlife during construction by implementing timing restriction and visual searches.

8.4.2 Wildlife Avoidance

Timing restrictions are recommended to avoid disturbance to wildlife that may be using natural areas, including breeding birds and Monarch:

- To avoid nesting birds and contravention of the MBCA, removal of vegetation and structures with nests will avoid the period between **March 31** and **August 31**.
- Monarch larvae may be present between **April 1** and **September 30**, and vegetation removal should avoid this period if possible. If vegetation clearing will proceed when Monarch larvae may be present, milkweed plants will be inspected for Monarch larvae prior to their removal. If larvae are present, they will be moved to a location that is suitable and safe under the direction of a qualified professional. Monarch caterpillars will be moved to other milkweed plants; for other larval stages (i.e., eggs and chrysalis), entire milkweed plants will be transplanted.
- Oldwife Underwing Moth and Penitent Underwing Moth larvae may be present on host plants such as Black Walnut between approximately mid-spring and mid-summer; therefore, avoidance of the MBCA restricted period (March 31 and August 31) will also protect caterpillars.

Visual searches of work areas will be conducted before work commences each day to identify and avoid other wildlife. Visual searches will target vegetated areas and inspect machinery and equipment left in the work are overnight prior to starting equipment. If wildlife is encountered, work at that location will stop, and the animal(s) will be permitted reasonable time to leave the are on their own. Observations of SAR or SOCC will be reported to the MECP and MNR within 48 hours of the observation. Species at risk will not be harassed or moved in any way, unless they are in immediate danger.

8.4.3 Revegetation

To the extent possible, encroachment into natural areas, regardless of ecological function or designation, will be avoided.

Disturbed/exposed soil will revegetate to incorporate a variety of native species and that are suited to the site conditions, and plant material will be sourced locally if possible. Planting plans will include a variety of species that are beneficial to Monarch and other insects and wildlife, such as nectar-producing grassland species. Non-native invasive species will be excluded from planting plans

Vegetation inspection will be completed to document compliance with the planting plans (e.g., correct species and quantities were planted) and vegetation establishment. Adaptive management will be implemented if required due to poor survival of planted material, insufficient vegetation cover, and presence of invasive species in planted areas. Adaptive strategies may include supplemental plantings and/or control of unacceptable species.

A conceptual Landscape Plan is provided in **Appendix G**. A detailed landscape planting plan will be developed during detailed design, including native species that are suitable for the site conditions and sourced from a local nursery where possible. The planting plan for near-road areas should focus on a planting regime that would support edge management objectives such as, providing long term visual and noise barriers, creating a living barrier to discourage anthropogenic entry at unwanted locations, and providing shade.

8.5 Low Impact Development

The incorporation of LIDs will be further assessed and confirmed though detailed design. However, as part of conceptual design, the following LID features are proposed:

- Maintaining sidewalks only where critical and only on one side of the path shared with the roadway where possible.
- Natural drainage systems such as infiltration trenches or soakaway pits.
- Vegetation that can prevent erosion and runoff.
- Bioswale with vegetative filter strip.

Preliminary investigations determined that the site is suitable for natural drainage features, such as a bioswale and vegetative filter strip, since it is situated at a higher elevation compared to the rest of the park. These opportunities can be further developed during detailed design.

8.6 Noise and Air Quality

The design concept has been developed with considerations for reducing noise, and further opportunities to reduce noise from the new facility will be considered during detailed design. Noise may be produced from the facility during the following activities:

daily visits from operational staff typically by motorized vehicle (e.g., pickup truck); intermittent pump operation and pressure tank operation; occasional generator operation; routine maintenance visits by operation staff such as monthly chlorine deliveries; infrequent construction upgrades such as to replace a pump; future construction should the system require major upgrades.

The contractor will be required to abide by the municipal noise control by-laws and ensure that all construction equipment is kept in good working order to limit additional noise. The contractor will also ensure that the idling of construction equipment is kept to a minimum. Additional noise and vibration control measures will be addressed during detailed design and included in the construction contract, as required.

The project is expected to have a minimal impact on air quality and considerations for minimizing impacts on air quality will be reviewed during detailed design. For example, should the gas supply at the end of Cedar Avenue be insufficient for a natural gas backup generator, then a diesel generator could be considered as an alternative; however, the impacts of a diesel generator on air quality and other design impacts relating to air quality, will be considered and kept to a minimum during detailed design. Other mitigation measures can include dust screens on construction fencing, protect stockpiles of material with a barrier or windscreen, revegetation planting exposed soil as soon as possible.

During operation, the pump station is not expected to contribute to air emissions other than during a loss of power when the generator would be used for temporary energy supply.

8.7 Construction Impacts and Mitigation

8.7.1 Traffic Management During Construction

Constructability concerns are considered minor although access to the park at the end of Cedar Avenue may be restricted during construction. Ther will be a periodic increase in local traffic due to delivery of materials and equipment to the site during construction, as well as construction staff and vehicles during the construction phase of the project. Construction signage will be posted to inform residents and motorists of the potential for construction related traffic. A traffic management plan and a communications plan will be developed during detailed design to ensure road users are informed of construction impacts including potential road closures and detours. Access to properties will be maintained during construction. Low speed limits for trucks on site will be enforced.

8.7.2 Excess Materials and Waste

All waste generated during construction must be disposed of in accordance with ministry requirements.

8.8 Climate Change

The MECP's guide, *Consideration of Climate Change in the Environmental Assessment Process*, outlines two approaches for consideration and addressing climate change in project planning including:

- Reducing a projects impact on climate change (climate change mitigation).
- Increasing the projects and local ecosystems resilience to climate change (climate change adaptation).

The objectives of the climate change document have been considered in the generation and evaluation of alternatives, recommended design, and mitigation approaches.

With respect to mitigation, the conceptual design was developed by considering opportunities to minimize greenhouse gas emissions and reduce energy use. For example, the new well (FDG02) is expected to require less treatment than the existing well (FDG01) and therefore a reduction in energy consumption at the new facility is expected due to the decommissioning of UV light disinfection. Additionally, the size of the site and the treatment building was reduced as compared to other alternatives and previous design concepts, and therefore will have a lower impact during construction, and is expected to reduce energy requirements and greenhouse gas emissions associated with heating systems and general operation.

With respect to adaptation, the conceptual design was developed by considering opportunities to improve resilience and reliability of the system to continuously produce potable water without interruption. Therefore, the system will be equipped with backup generator. Backup water supply is achieved through both a dual cell buried reservoir which has been sized based on providing one day at maximum day demand based on historical water demand records, and via a trucked water connection which could be used to fill the reservoir in the event of an interruption in well production.

9 Approvals and Permits

The proposed works will require approvals and permits from various agencies and City departments as summarized in **Table 9**. Pre-consultation meetings and design submissions should be coordination as needed during detailed design with the following agencies and City departments where appropriate.

Table 9: Approvals and Permitting Summary

Agency	Permit/Approval
Ministry of the Environment, Conservation and Parks (MECP)	ESR
	Form 1 – Record of Watermains
	Amendment to Drinking Water Works Permit
	Amendment to Municipal Drinking Water License
	Permit to Take Water (Category 3)
	Environmental Compliance Approval (ECA) for emissions and discharges related to air, noise, waste, and sewage.
Hamilton Conservation Authority	Pre-Consultation
City of Hamilton Parks Department	Ongoing consultation
City of Hamilton Forestry Department	Ongoing consultation Permitting with respect to Tree Management Plan and Tree Inventory Analysis Table
City of Hamilton Buildings Department	Site Plan Approval
	Building Permit
	Occupancy Permit
	Demolition Permit (for FDG01)
Electrical Safety Authority	Ongoing consultation
Alectra Utilities	Ongoing consultation

10 Closing

The filing of this Environmental Study Report represents the conclusion of Phase 1 through Phase 4 of the Municipal Class EA planning process as outlined in the MCEA document. Provided that no Section 16 Order requests are received, the City may proceed with detailed design and implementation (Phase 5) 30 days following the completion of the public review period.

11 References

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