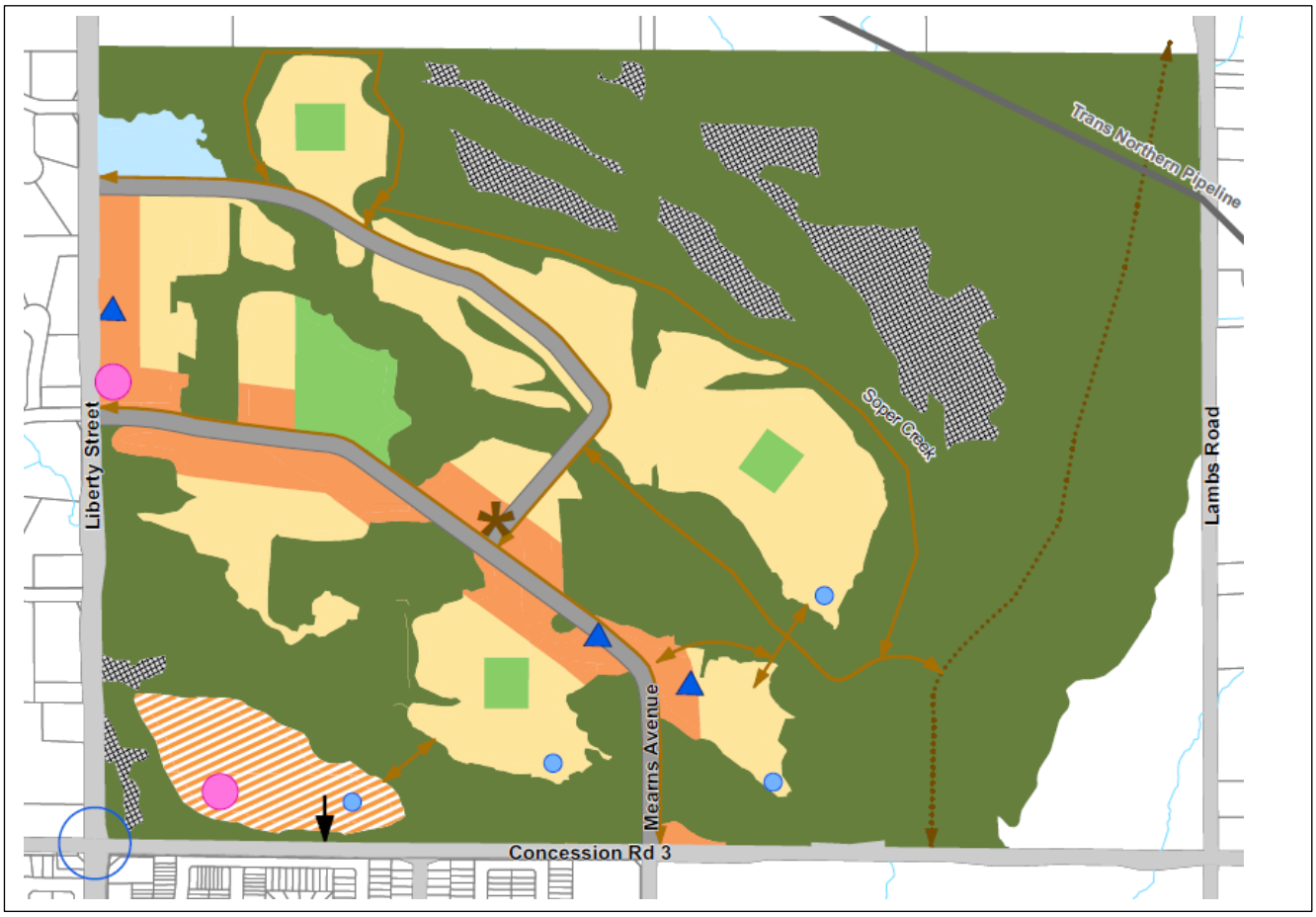


Soper Springs Secondary Plan

Functional Servicing Study Report

April 2025 | Project # 19133

Municipality of Clarington

Clarington | TYLin

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1 INTRODUCTION

The Soper Springs Secondary Plan (SSSP) area is identified as a new development area in the Municipality of Clarington's Official Plan. The SSSP area general extends from Concession Road 3 north to the Bowmanville Urban Boundary, and from Liberty Street northeast to Lambs Road. The study area is illustrated in **Figure 1-1**.

Figure 1-1 Study Area



While the SSSP area is designated as 'Urban Residential' in the Clarington Official Plan, the type and distribution of land uses through the area have yet to be finalized, and the means by which the planned development will be serviced have not been established.

T.Y. Lin International Canada Inc. (TYLin) was retained by the Municipality of Clarington to prepare a Transportation Study and Functional Servicing Report for the SSSP area. The Functional Servicing Study Report (FSSR) has been prepared to demonstrate how the planned SSSP area can be efficiently and sustainably serviced, including transportation, water supply and distribution, wastewater, and stormwater. This study has been fully integrated with and completed as part of the overall SSSP planning study.

The investigations and analyses completed for this FSSR have also been closely coordinated with the separate but parallel Soper Creek Subwatershed Study (SCSWS). The SCSWS examines the entire Soper Creek watershed but focusses on the planned Soper Hills and Soper Springs

development areas in Bowmanville. The SCSWS study includes assessments of hydrology, hydrogeology, fluvial geomorphology, and aquatic and terrestrial habitat. The overall planning study, SCSWS and other relevant completed and ongoing studies relevant to the SSSP area are described in **Section 2**.

2 BACKGROUND

2.1 Relevant Studies

The SSSP is identified as a new development area in Clarington's Official Plan, and a number of studies have been completed or are underway to support the planning and development of the SSSP. These studies are briefly described in the following sections.

2.1.1 Soper Creek Subwatershed Study (SCSWS)

The overall goal of the SCSWS is development of a management plan that allows sustainable urban growth, while ensuring maximum benefits to the natural and human environments of the corresponding watershed.

The subwatershed study is undertaken in three phases as follows:

- Phase 1: Subwatershed Characterization
- Phase 2: Subwatershed Management Strategies
- Phase 3: Implementation and Monitoring Plans

The subwatershed study will satisfy Phases 1 and 2 of the Municipal Class Environmental Assessment process.

Phase 1 of the subwatershed study has been completed, which investigated and inventoried the natural resources which could potentially be impacted by future urban development. Along with characterization of natural resources this study identified preliminary constraints and opportunities which have been considered in the development of the alternative and proposed land use concept. Findings from the Phase 1 study relevant to the SSSP area are summarized in **Section 3**.

Phase 2/3 of the subwatershed study is on-going and has been completed in draft. The Phase 2/3 report provides the framework and broad-scale guidance to the next level of planning and design study as urban development proceeds The Phase 2/3 report provides the recommended subwatershed strategy based on environmental, social, and cost considerations, and provides an update to the hydrologic and hydraulic models, the environmental constraints mapping, and identifies measures to protect, enhance or restore environmental features and functions.

2.1.2 Planning Study

A Secondary Plan is a framework for managing new growth and determines where land use designations, such as residential and commercial uses, will be located within the bounds of the

Secondary Plan area. It also establishes the general alignments of the major road networks needed to move people and goods within, to and from the area, considering both vehicular and active forms of transportation. Usually, these primary road networks also provide the spine of the water, wastewater and storm drainage systems needed to service the Secondary Plan area.

This FSSR has been prepared in support of the SSSP and has been fully integrated with the planning study underway to establish the land use plan and policies for the SSSP area. The planning study is a four phased process that began in mid-2019 and will ultimately lead to a Secondary Plan, and zoning by-law, for the area. These phases are:

- Phase 1: Public Input and Technical Analyses
- Phase 2: Urban Design and Sustainability Principles, Criteria and Alternative Land Use Plans
- Phase 3: Preferred Land Use Plan
- Phase 4: Final Secondary Plan and Zoning By-Law

This FSSR commenced in the Phase 1 of the planning study and has been updated throughout the study. The transportation and servicing needs and constraints have been considered in the development and evaluation of alternative land use plans, and the final FSSR establishes the water, wastewater and storm drainage infrastructure needed to adequately and efficiently service the preferred land use plan.

3 EXISTING CONDITIONS

3.1 Land Use

Land use in the study area is primarily agricultural, with several wooded areas associated with Soper Creek and its tributaries. There are existing residential properties in the study area, with access from Liberty Street, Mearns Avenue and Lamb's Road. A telecommunications tower in the south, is located within the study area with access from the north limit of Mearns Avenue. A gas pipeline traverses the north-east corner of the study area.

The lands surrounding the study area are primarily residential and agricultural. Estate residential homes are located off Rebecca Court, Pamela Court and Sydel Court west of Liberty Street, and a newer residential development is located on the south side of Concession Road 3 between Liberty Street and Mearns Avenue. East of Mearns Avenue, the lands south of Concession Road 3 and east of Lamb's Road are predominantly agricultural.

The Clarington Official Plan designates the lands in the SSSP area as 'Urban Residential', with significant portions of the study area associated with Soper Creek and its tributaries designated as Environmental Protection Area. A Community Park is also indicated on the Official Plan, located at the north-east corner of Liberty Street and Concession Road 3. The Clarington Official Plan designates Liberty Street, Concession Road 3 and Lamb's Road as Type 'B' arterials. It also shows Mearns Avenue extended north and then west to intersect with Liberty Street as a new Type C arterial, and a new east-west Type C arterial road at the north limit of the study area, connecting Bowmanville Avenue to Lambs Road.

The Durham Region Official Plan designates Liberty Street, Concession Road 3 and Lamb's Road as Type 'B Arterials. Like the Clarington Official Plan, the Durham Official Plan shows the extension of Mearns Avenue northward into the study and then westward to connect to Liberty Street as a future Type C arterial, , and a future Type C arterial road across the north limit of the study area from Bowmanville Avenue to Lambs Road. Archaeology and Cultural Heritage

3.2 Archaeology

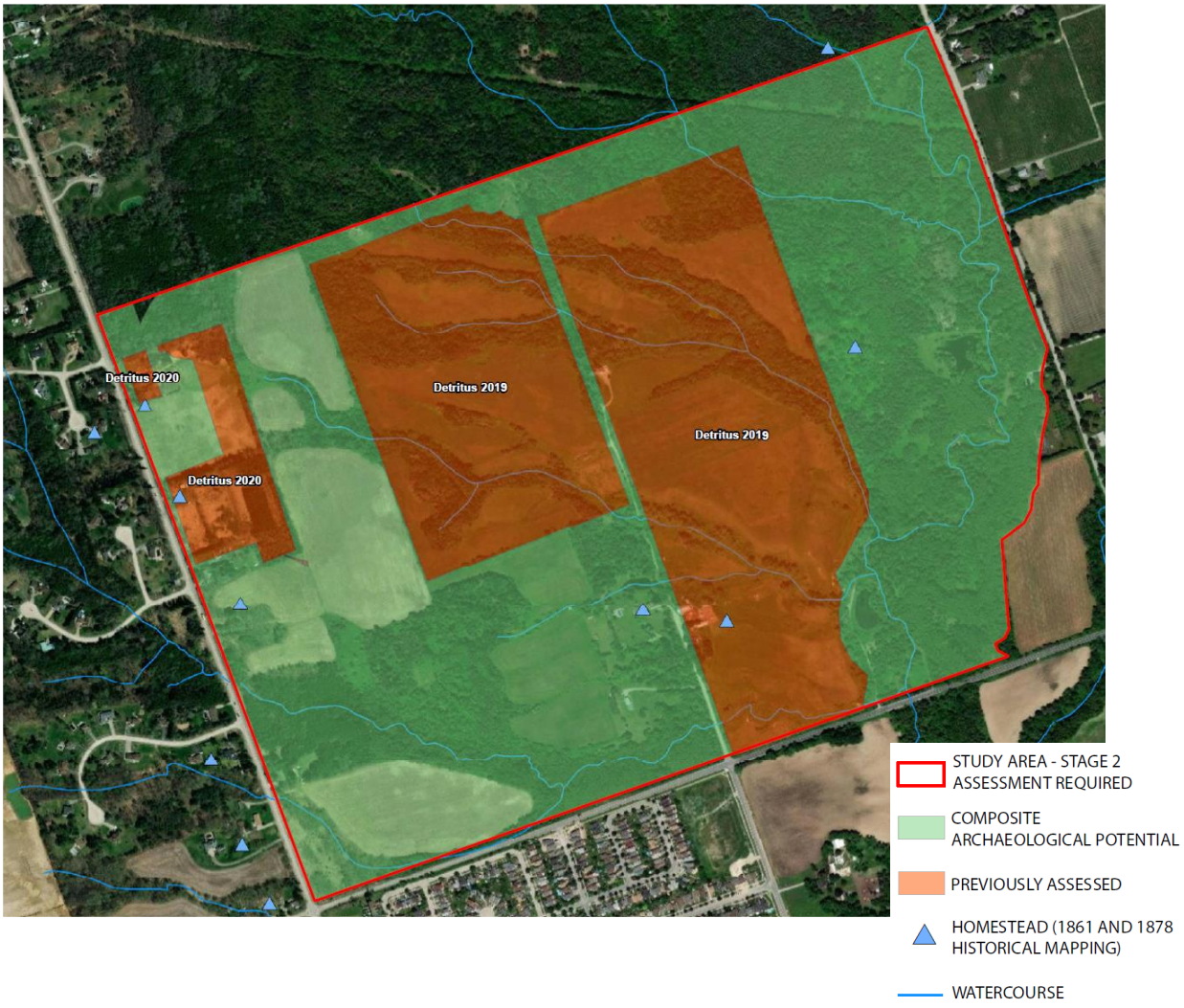
3.2.1 Archaeological Assessment

A Stage 1 Archaeological Assessment (AA) was completed for the SSSP study area (ASI, 2020). The background review determined that approximately 38% of the study area is covered by previous Stage 1 and Stage 2 AAs, and the study concluded that almost all of the remaining areas have potential for Indigenous and/or Euro-Canadian archaeological resources.

Previous archaeological assessments have identified an Early Woodland registered site and 3 Euro-Canadian registered sites within the study area, and 5 additional registered sites within 1 km of the study area. Of the four registered sites within the study area, 2 have been deemed free of further archaeological concern, while Stage 3 investigations have been initiated for the remaining 2 sites.

The Stage 1 AA recommends that Stage 2 AAs be completed prior to development of any of the remaining lands not covered by the previous assessments. **Figure 3-1** illustrates the previously assess areas and areas requiring further Stage 2 assessments within the SSSP area.

Figure 3-1 Composite Archaeological Potential



From ASI, 2020

3.3 Topography and Drainage

The study area is located within Soper Main subwatershed of Soper Creek Watershed. Land surface topography of the study area varies from 125 m to 150 m above sea level (masl) and generally slopes from north to southeast.

The main branch of Soper Creek is located within and near the east edge of the SSSP area, generally flowing in a north to south direction. Within the study area, several tributaries flow in a south-easterly direction and join the main branch of Soper Creek. These tributaries convey drainage from the study area as well as external areas to the north and west of the study area.

3.4 Soils and Groundwater

Soil and groundwater conditions through the study area are documented in the Soper Creek Subwatershed Study – Phase 1 Report (Aquafor Beech Limited, 2023). The relevant information is summarized in the following sections.

3.4.1 Surficial Geology

The study area is located within Iroquois Shore physiographic region and is covered by sandy beach deposits which are remnants of Glacial Lake Iroquois. The surficial geology of the study area mainly consists of Glaciolacustrine Sand and Gravel. There is a band of organic deposit wetlands along the banks of a reach of Soper Creek, on the east of the study area. There is also a patch of older fluvial alluvium on the southeast of the study area.

3.4.2 Hydrogeology

There are four main aquifers in the study area as follows:

- **Blue Mountain Formation Shale aquifer:** The Blue Mountain shales may act as a weak aquifer where the upper surface is weathered and fractured, however there is limited water supply potential in this unit.
- **Thorncliffe and Scarborough sands and silts:** This aquifer is the lower aquifer in the study area, is laterally extensive and generally thick under the study area and appears to be fully confined in the study area. Groundwater flow in the aquifer reflects regional flow patterns emanating from the Oak Ridges Moraine.
- **Oak Ridges Aquifer Complex:** This is the upper aquifer in the study area. While this aquifer is thick to the west, it is not entirely present on the east and is only present in some areas. Water levels reflect this variability and suggest that ORAC discharge can significantly support streamflow. ORAC streamflow reflects longer intermediate scale flow paths from

the ORM and would likely appear as cold-water upwelling.

- **Surficial Aquifer System: Iroquois Beach Sands:** This is the surficial aquifer system in the study area. The surficial sands and gravels of the Iroquois Beach deposits provide a significant but seasonally intermittent groundwater resource. The sands likely saturate with spring snowmelt, and locally discharge this water through the remainder of the year.

Within the study area, groundwater flow generally follows the surface topography in a north-west to south-easterly direction. A considerable amount of groundwater from the study area is expected to emerge as groundwater discharge in the main branch of Soper Creek at the east edge of the study area.

3.4.3 Water Budget

A fully distributed hydrologic model was developed for the study area. This model provides estimates of the components of the water budget. The major components of the water budget are shown in **Figure 3-2** through **Figure 3-4**. The maps show the distribution of the key components.

Figure 3-2 Average Annual Actual Evapotranspiration

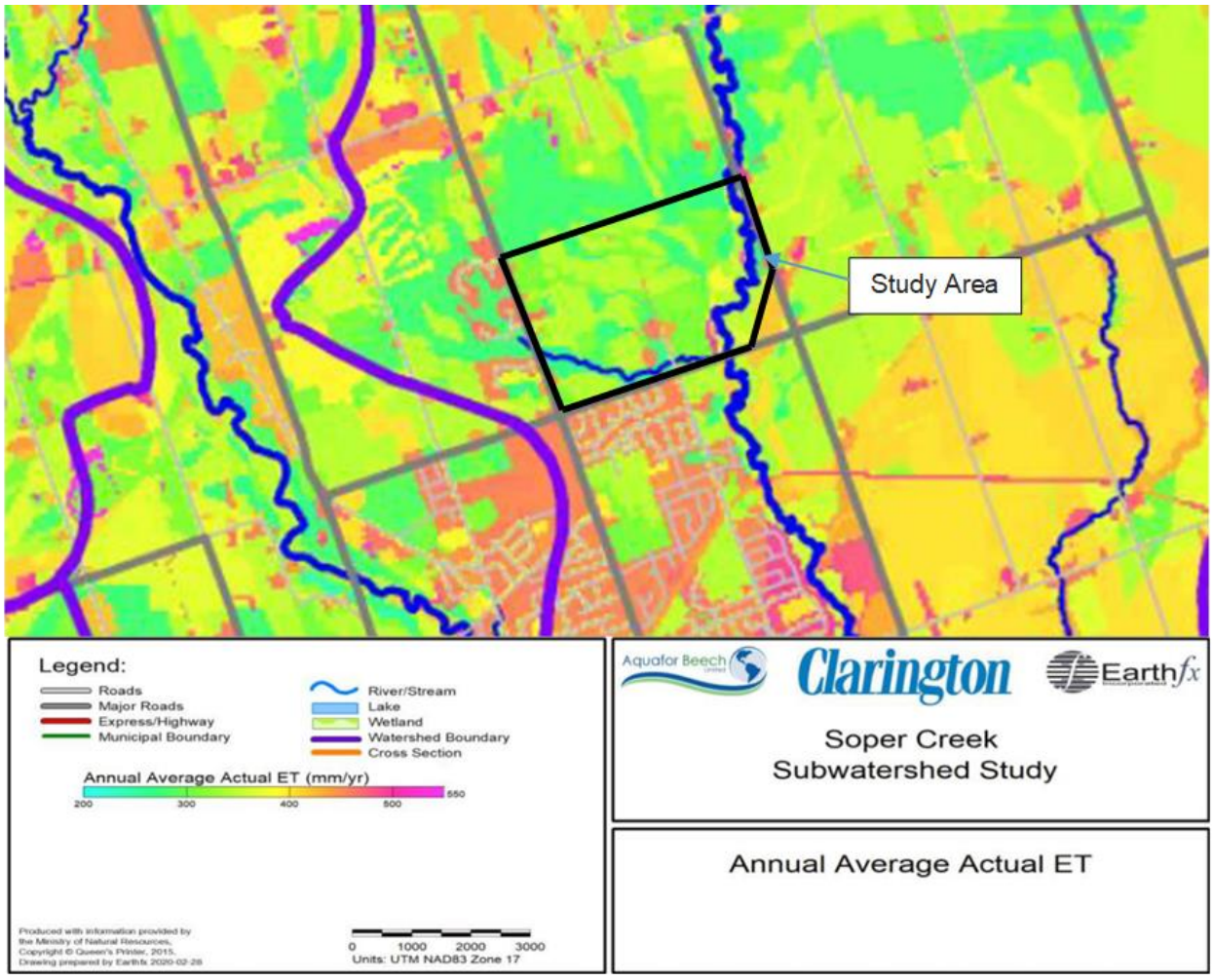


Figure 3-3 Annual Average Runoff

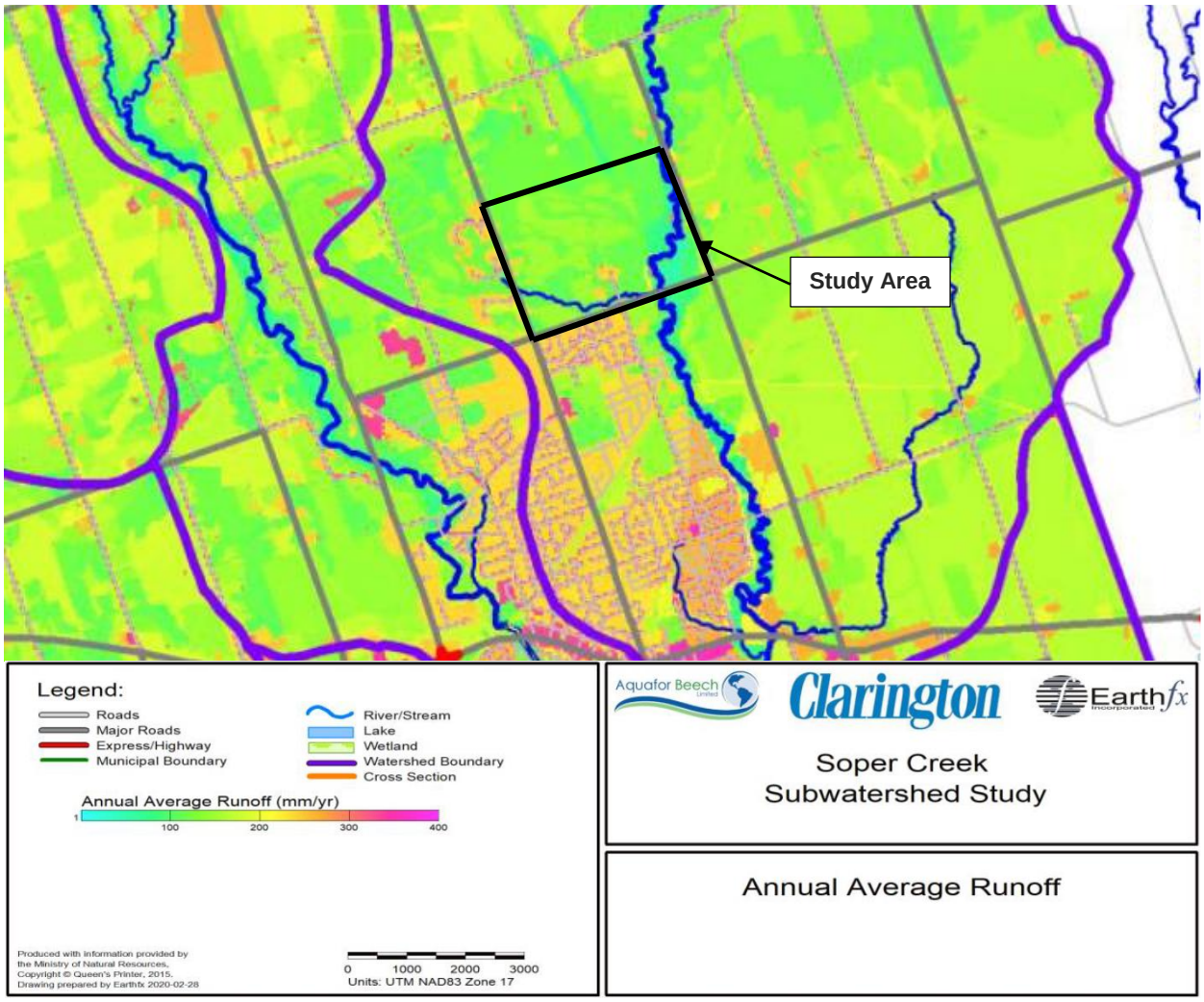
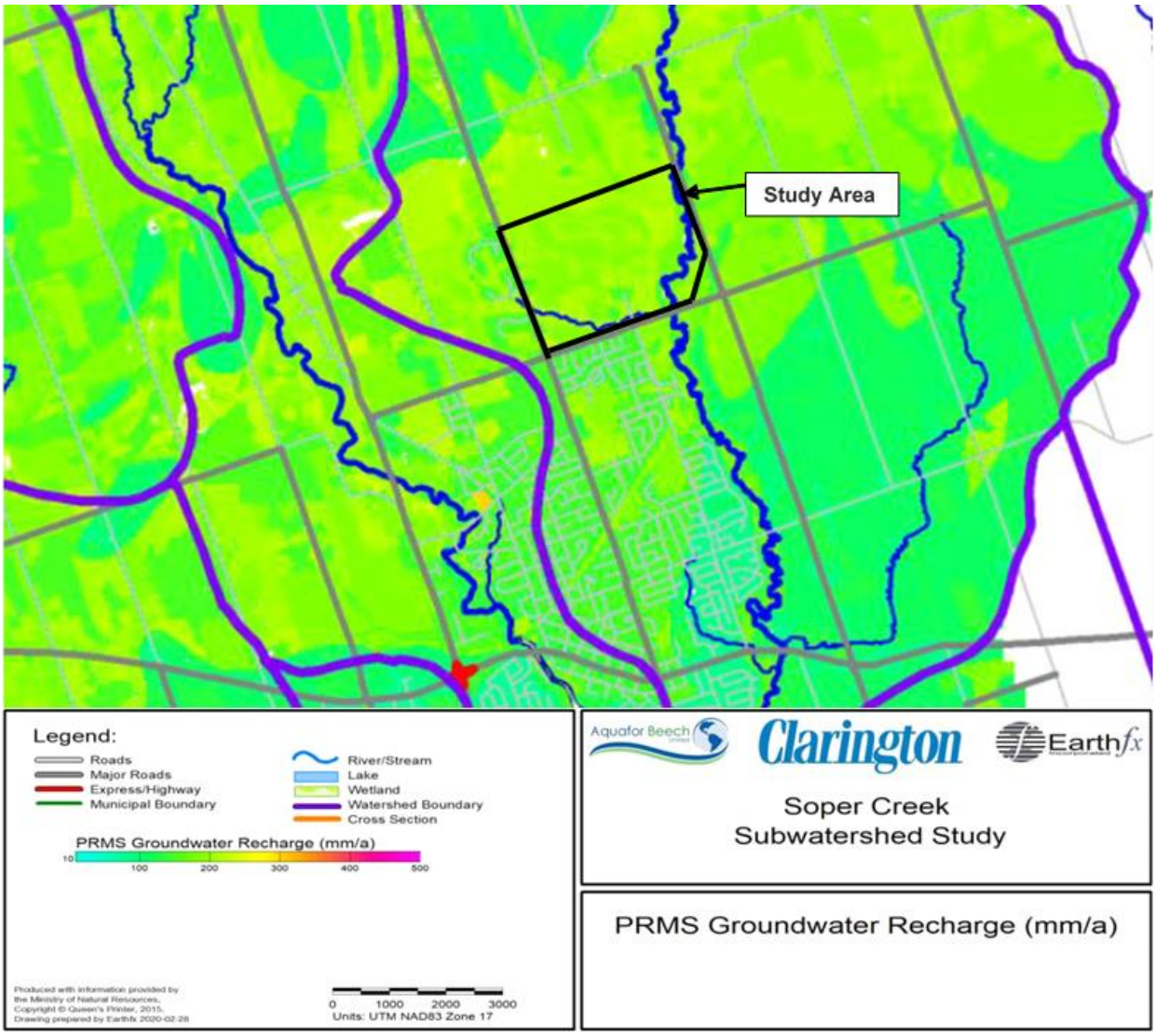


Figure 3-4 Average Annual Groundwater Recharge



Analyses was completed using the Thornthwaite and Mather method and the results for the study area are shown in **Table 3-1**.

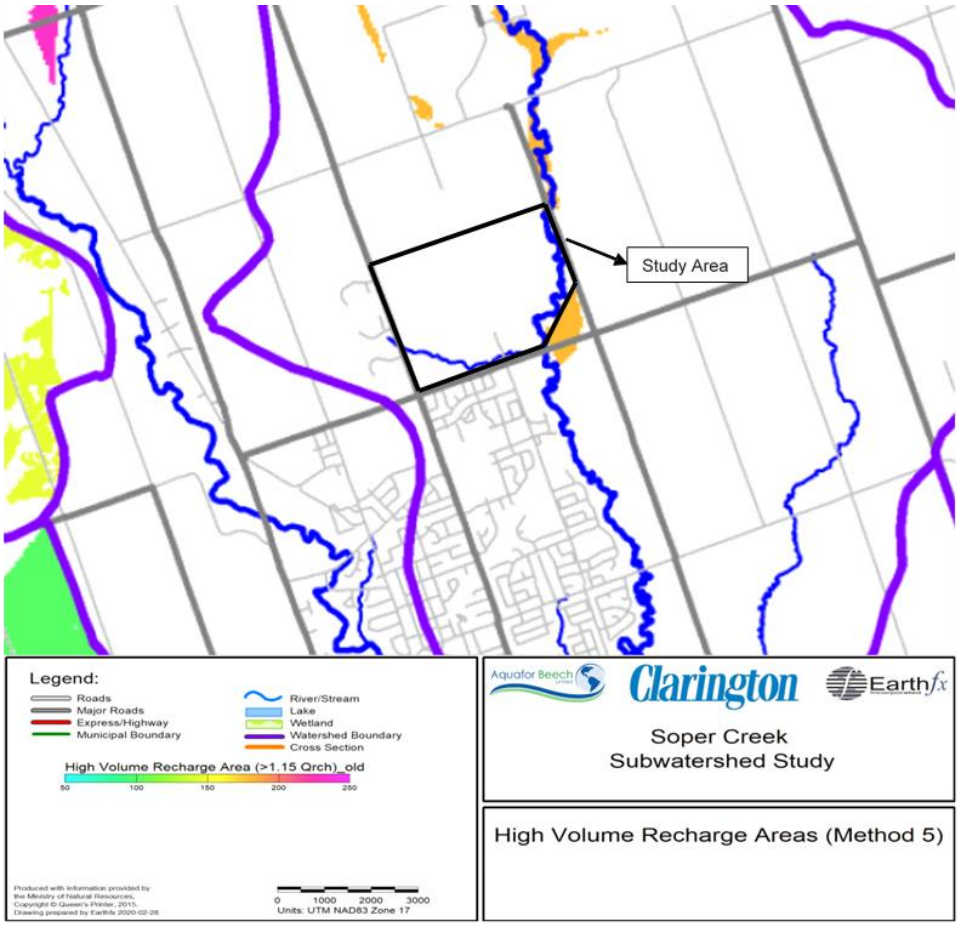
Table 3-1 Existing Study Area Water Budget

Water Budget Component	Average Annual Depth (mm/yr)
Annual Precipitation (mm)	710
Annual ET	548
Water Surplus	163
Runoff	39
Infiltration	124

3.4.4 Source Water Protection

The SCSWS included an assessment of high-volume recharge areas in the watershed. Consistent with the approach used for the Source Water Protection Plan, high volume recharge areas are defined as areas where the local recharge estimates exceed 1.15 times the average recharge over the sub-watershed. **Figure 3-5** shows that there are no high-volume recharge areas in the SSSP area, although a high-volume recharge area was identified immediately adjacent the SSSP, between the main branch of Soper Creek and Lamb's Road.

Figure 3-5 High Volume Recharge Areas



3.5 Surface Water

The surface drainage systems through the study area are characterized in the Soper Creek Subwatershed Study – Phase 1 Report (Aquafor Beech Limited, 2023). The following sub-sections summarize the findings from the SCSWS related to surface water resources in the SSSP study area. This includes flood and erosion hazard considerations for the streams as well as restoration opportunities.

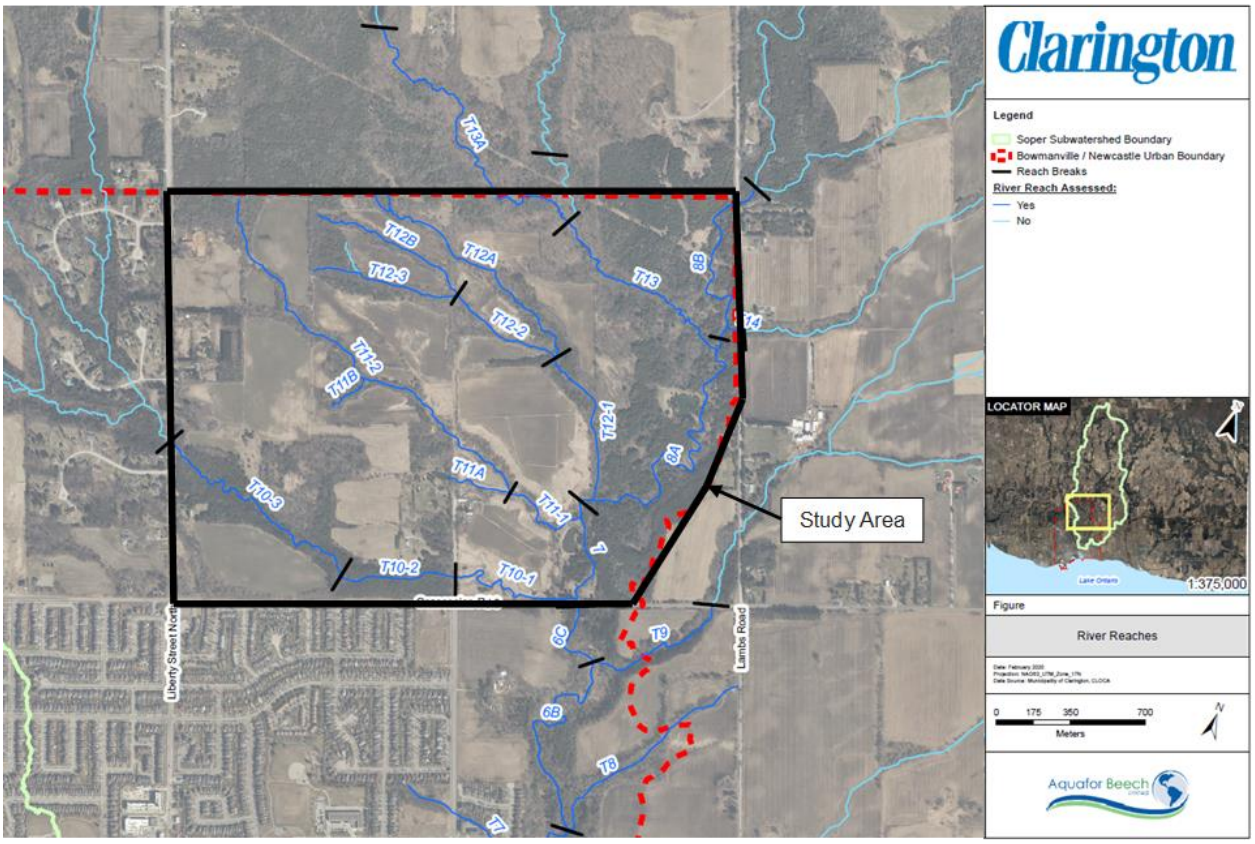
3.5.1 Fluvial Geomorphological Assessment

The fluvial geomorphological investigations completed for the SCSWS included desktop analyses to define stream reaches, followed by field investigations to characterize creek morphology and sediments. These included Rapid Geomorphic Assessments, measurements of channel dimensions and the identification and characterization of erosion sites. The different reaches through the study area are illustrated in **Figure 3-6**.

3.5.1.1 Rapid Geomorphic Assessments

A Rapid Geomorphic Assessments (RGA) is a standardized method to help determine if a watercourse is stable or in adjustment (i.e., eroding or filling with sediment). RGA's were completed the main branch of Soper Creek (Reaches 7 and 8) as well as Tributaries 10 and 13 within the study area. All of the assessed reaches in the study area were classified as being transitional with the dominant adjustment processes being aggradation for the main branch and Tributary 13 and widening for Tributary 10.

Figure 3-6 Geomorphic Assessed Reaches in the Study Area



3.5.1.2 Erosion Sites

The fluvial geomorphology field investigations identified erosion sites through the study area. These are locations where erosion is threatening infrastructure or public health and may require mitigation.

Four erosion sites were identified in the SSSP area, of which two are considered high priority for mitigation. As per the SWS, further assessment and monitoring will be required to address risks to infrastructure and determine critical timing for mitigative actions.

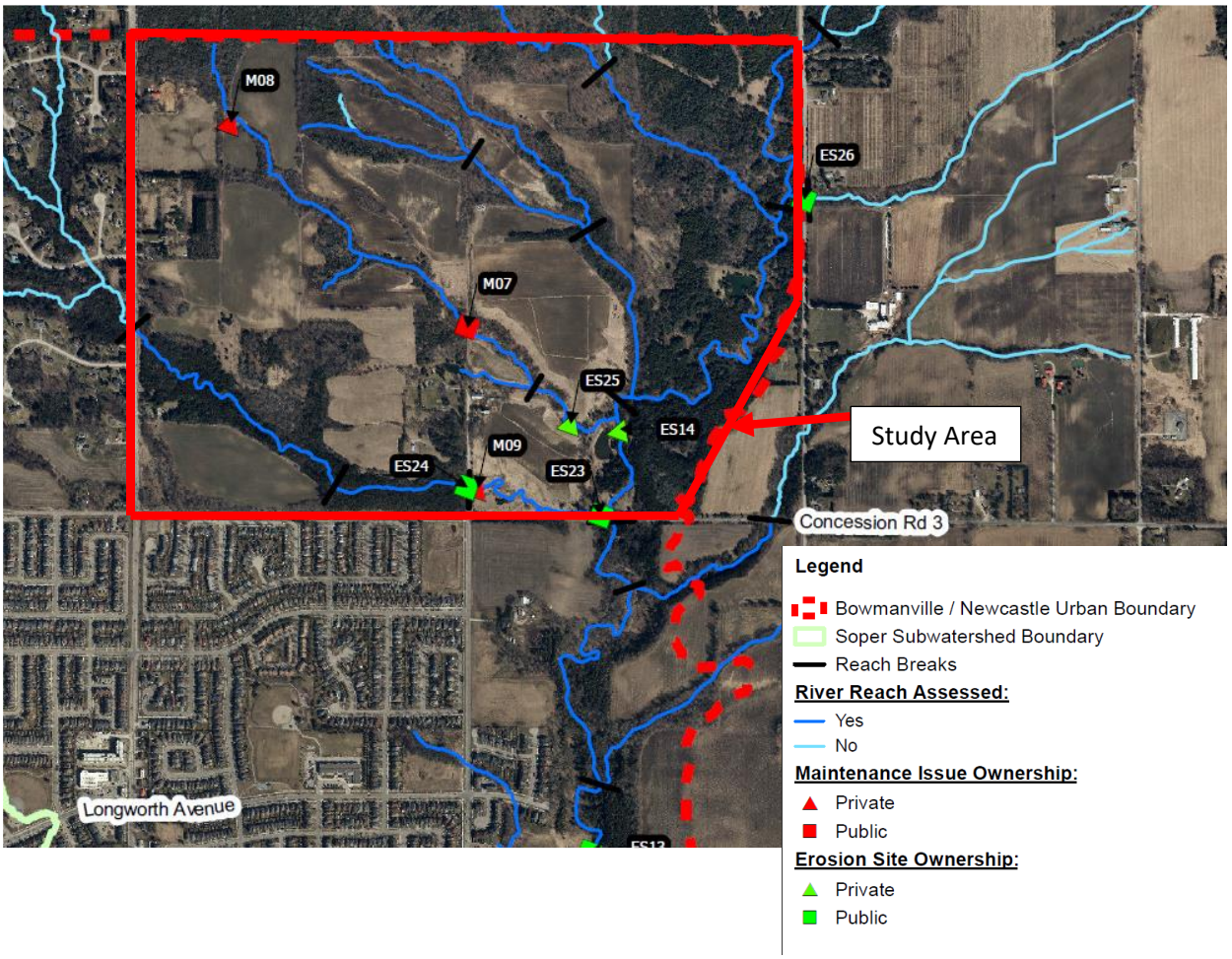
The locations of the erosion sites are shown on **Figure 3-7** and the issues are summarized on **Table 3-2.**

Table 3-2 Soper Creek Erosion Sites

Erosion Site	Channel Reach	Property Ownership	Description of Issue
ES14	7	Private	Grade control structure is causing potential fish passage barrier.
ES23 *	T10-1	Public	Bank erosion is posing risk to guardrail and road
ES24 *	T10-2	Public	Road embankment is failing, culvert inlet is outflanked.
ES25	T11-1	Private	Channel is confined to small culvert

** Priority Erosion Site*

Figure 3-7 Erosion Sites and Maintenance Issues



3.5.1.3 Erosion Hazard Assessment

The erosion hazard limit is established through a combination of a meander belt assessment and a geotechnical slope stability assessment, where warranted.

Meander Belt Assessment: For the SCSWS, meander belt widths were estimated using Procedure 3 from the TRCA Belt Width Delineation Protocol (2004), including a 20% factor of safety to account for future erosion. The results of the meander belt delineation are summarized in **Table 3-3** and illustrated in **Figure 3-8**.

Table 3-3 Meander Belt Delineation

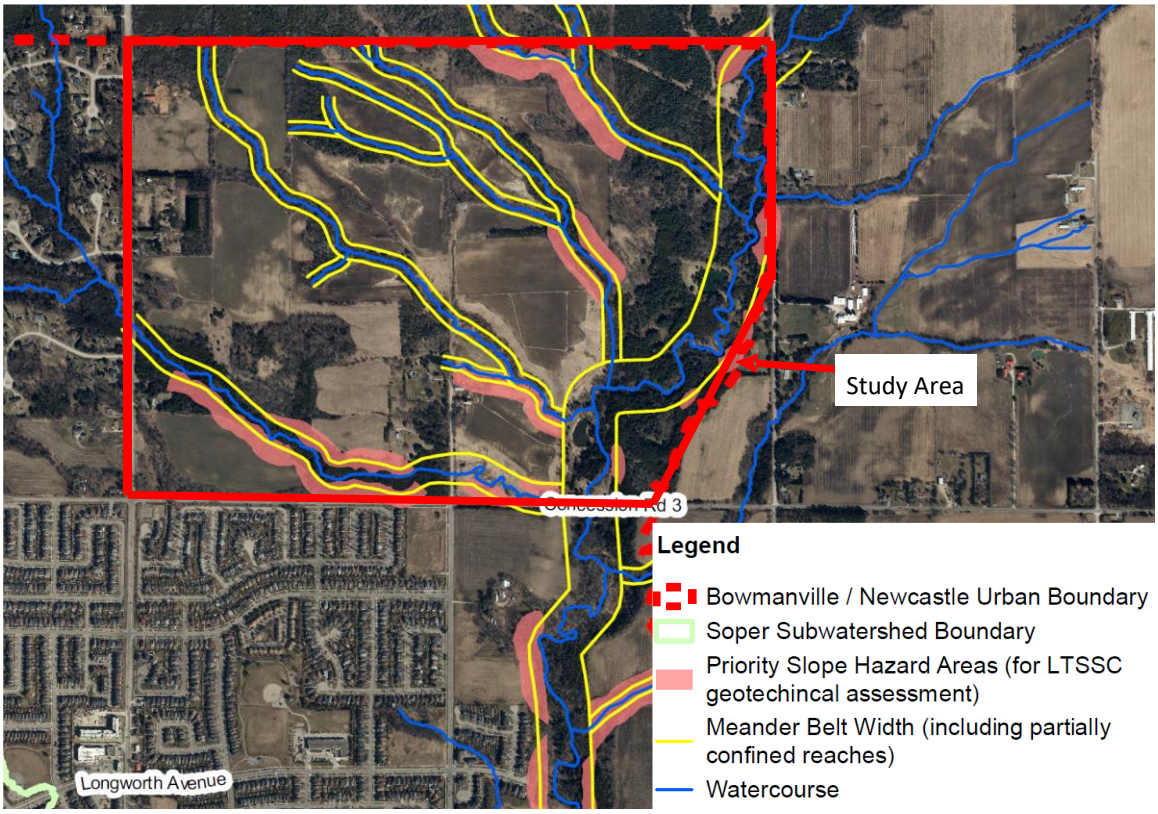
Channel Reach	Preliminary Belt Width (m)	Bankfull Width (m)	Existing Belt Width (m)	Final Belt Width (m)	Slope Hazard Present
7	51	11	113	136	Yes
8A	50	9	109	131	Yes
8B	50	9	109	131	No
T10-1	30	4	64	77	Yes
T10-2	25	4	54	65	Yes
T10-3	20	4	44	53	Yes
T11-1	15	2	32	38	Yes
T11-2	15	2	32	38	No
T11A	-	-	-	30	Yes
T11B	-	-	-	30	No
T12-1	17.5	2	37	44	Yes
T12-2	15	2	32	38	No
T12-3	-	2	-	30	No
T12A	15	2	32	38	No
T12B	-	-	-	30	No
T13-1	17.5	4	39	47	Yes
T13-2	17.5	4	39	47	No

Bankfull width was estimated from aerial imagery
Includes erosion allowance of existing belt width x 1.20.

Erosion Hazard Long-Term Stable Slope Allowance: While the erosion hazards for unconfined systems can be defined based solely on meander belt delineation or similar techniques, confined systems require greater effort to include geotechnical assessments of the valley walls to establish the erosion hazards. The SCSWS did not carry out the detailed geotechnical investigations, but identified priority stable slope hazard areas where detailed assessments will be required to delineate the final erosion hazard limit as part of future development applications. These are defined by reaches where the channel is within 15 m of the toe of the valley slope for embankments with slopes steeper than 15% and heights greater than 3 metres (MNR, 2002).

The areas where detailed slope stability assessments will be required to establish the erosion hazard limit are illustrated in **Figure 3-8**.

Figure 3-8 Erosion Hazards

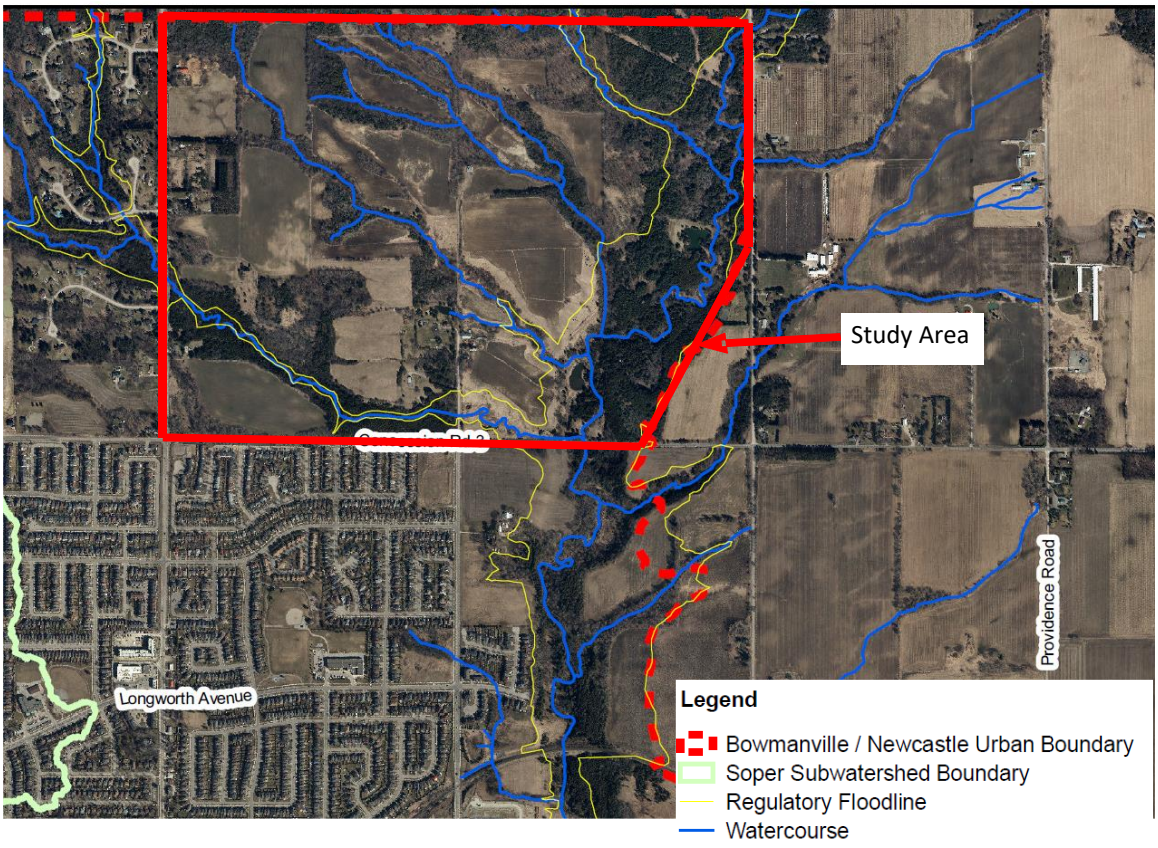


3.5.2 Hydrology, Hydraulics and Flood Plain Mapping

CLOCA maintains hydrologic and hydraulic modelling for the Soper Creek subwatershed, and this modelling was relied upon for the SCSWS existing conditions analyses. The hydrologic modelling was developed by ABL as part of the Bowmanville Creek and Soper Creek Floodplain Mapping Study in 2009, and subsequently refined by CLOCA in 2011. The existing conditions hydrology model was set up using both the 12-hour Chicago and 24-hour SCS storm distributions to establish the flow rates for the 2-year through 100-year return period storm events and using Hurricane Hazel to establish the Regional storm flow rates. The Regional Storm generally produces higher flows than the 1:100-year storm and is used as the regulatory event by CLOCA.

The 2009 ABL study also prepared hydraulic models and flood plain mapping for the Soper Creek watershed. The hydraulic models and flood plain mapping were developed in accordance with provincial guidelines, and the topographic mapping information was augmented with field measurements of bankfull channel dimensions and bridge and culvert surveys. The resulting Regulatory flood plain through the study area is illustrated in **Figure 3-9**. Additional floodplain mapping may be required for unmapped reaches within the study area which will be carried out as part of the SWS or through future studies.

Figure 3-9 Regulatory Flood Plain



3.6 Natural Environment

The natural environment conditions through the study area are documented in the Soper Creek Subwatershed Study – Phase 1 Report (Aquafor Beech Limited, 2023).

The natural environment through the Soper Creek watershed was inventoried through a desktop review of available resources, followed by field investigations on lands were permission to access granted.

Aquatic habitat as assessed using standard habitat mapping techniques, fish and benthic sampling and identification of barriers to fish movement.

Botanical inventories were completed to establish the vegetation through the watershed, which were categorized using the Ecological Land Classification (ELC) system. Breeding bird and amphibian surveys were completed and augmented with incidental sightings to determine wildlife species present in the study area, and potential salamander habitat was established by identification of vernal pools and egg mass surveys.

A summary of the findings is included in the following sections.

3.6.1 Aquatic Habitat

Detailed field investigations were completed at two sites along the southern tributary of Soper Creek within the study area (Tributary T10 on **Figure 3-6**). The tributary was found to have permanent flow, and the presence of rainbow trout in this tributary confirms that it provides habitat for sensitive cold-water species, despite potential barriers to fish passage at Mearns Avenue and Liberty Street.

3.6.2 Vegetation

Vegetation communities through the study area were inventoried and classified using the ELC system. All the ELC communities are considered common and secure. No significant wetlands were observed in the SSSP area.

Most individual species observed are common and secure, although 35 species were observed in the SCSWS study area that are locally significant, and 17 of those are considered rare in Durham Region.

Finally, a few Butternut trees were observed in the study area. Butternut is an endangered species and protected under Species at Risk (SAR) legislation.

3.6.3 Wildlife

Many bird species were recorded during the breeding bird surveys. Most of these species are provincially common, but seven SAR bird species were recorded during the surveys, and an additional two SAR bird species were observed during other ecological fieldwork.

Very low numbers of amphibians were recorded during the calling surveys, which is not surprising given the lack of extensive wetland areas or ponds in the SSSP area.

Other common insect, mammal and amphibian species were observed or were evident in the study area.

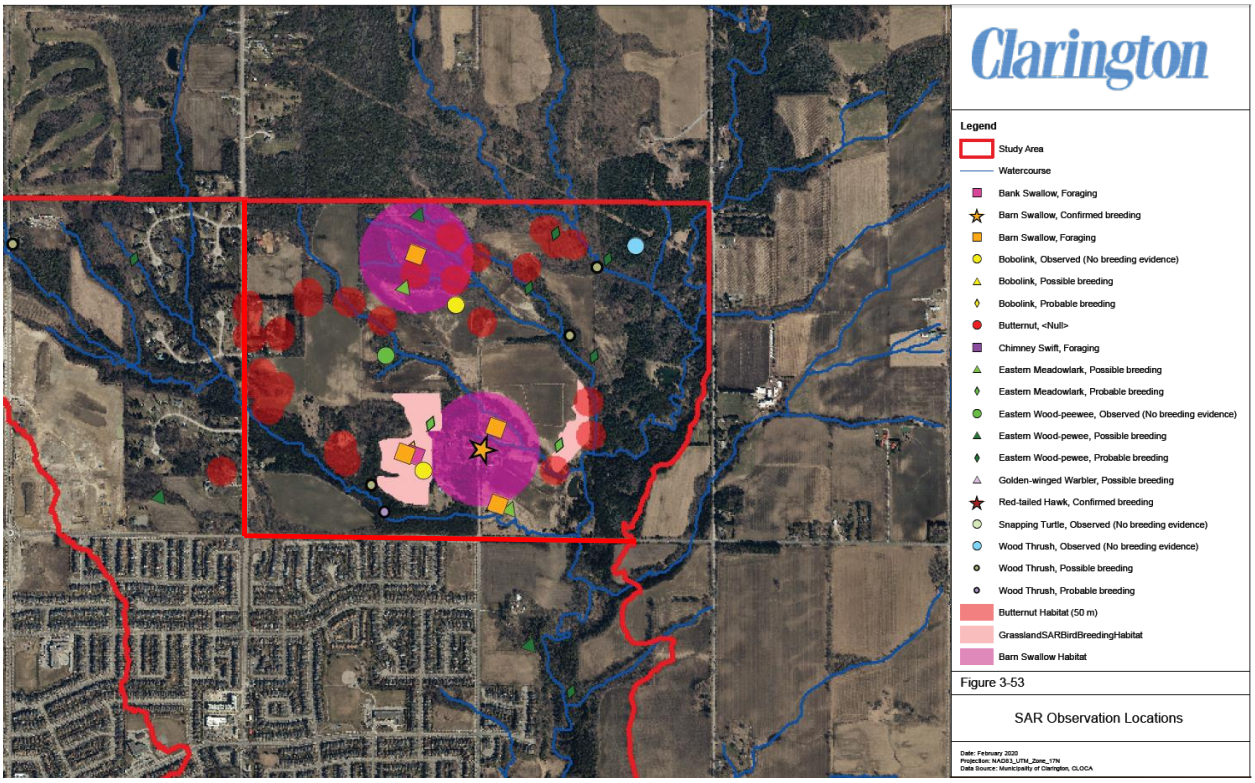
3.6.4 Species at Risk

Several Species at Risk were observed in the SSSP area, as noted in the sections above. The species present or potentially present in the study area are listed in **Table 3-4** and illustrated in **Figure 3-10**.

Table 3-4 Species at Risk

Species	Status
Bank Swallow	Threatened
Barn Swallow	Threatened
Bobolink	Threatened
Eastern Meadowlark	Threatened
Eastern Wood-pewee	Special Concern
Wood Thrush	Special Concern (ESA), Threatened (SARA)
Monarch	Special Concern
Butternut	Endangered

Figure 3-10 SAR Observation Locations



3.6.5 Overall Natural Heritage System

The findings from the background review and field investigations were used to establish the existing Natural Heritage System through the SSSP area. The Natural Heritage System and its components are defined in the Clarington Official Plan, and include natural heritage features,

hydrologically sensitive features, and linkages.

The range of features in the study area that meet the criteria for inclusion in the Natural Heritage System are illustrated in **Figure 3-11**. The overall Natural Heritage System, including Vegetation Protection Zones, Linkages and Restoration Opportunities is illustrated in **Figure 3-12**.

Figure 3-11 Natural Heritage Features

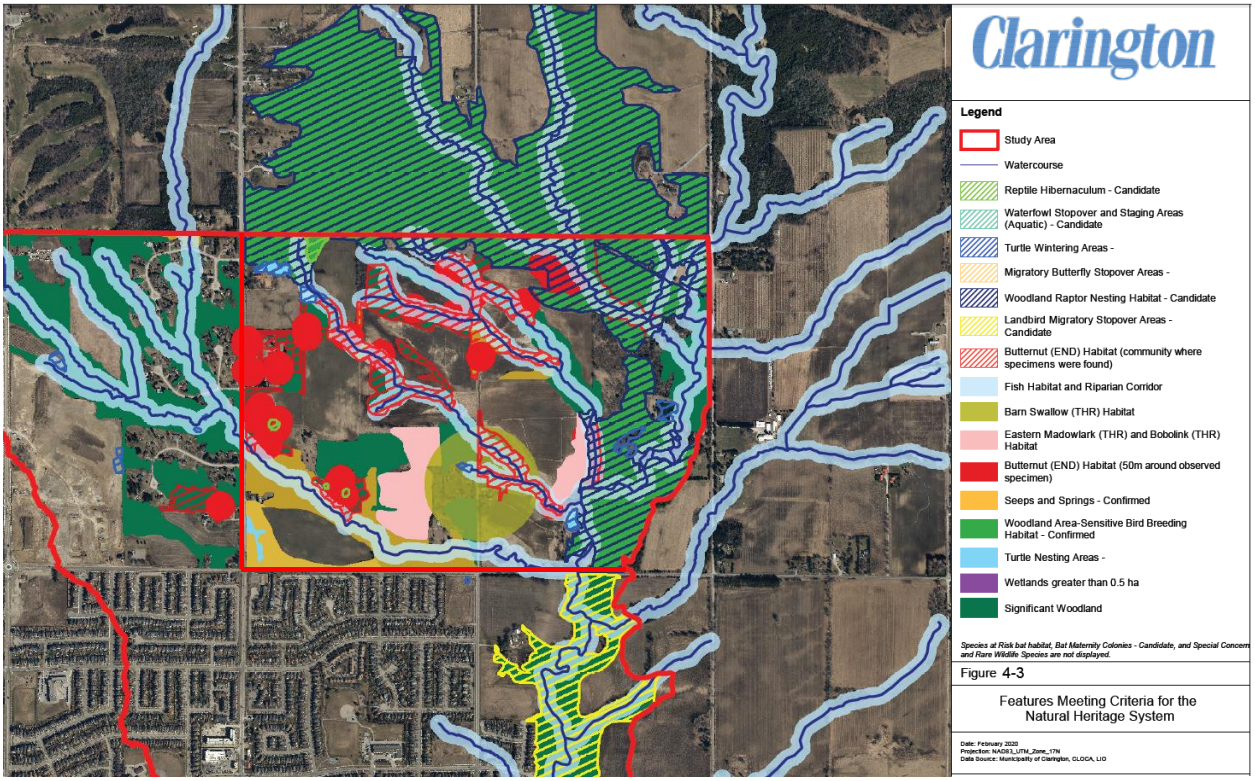
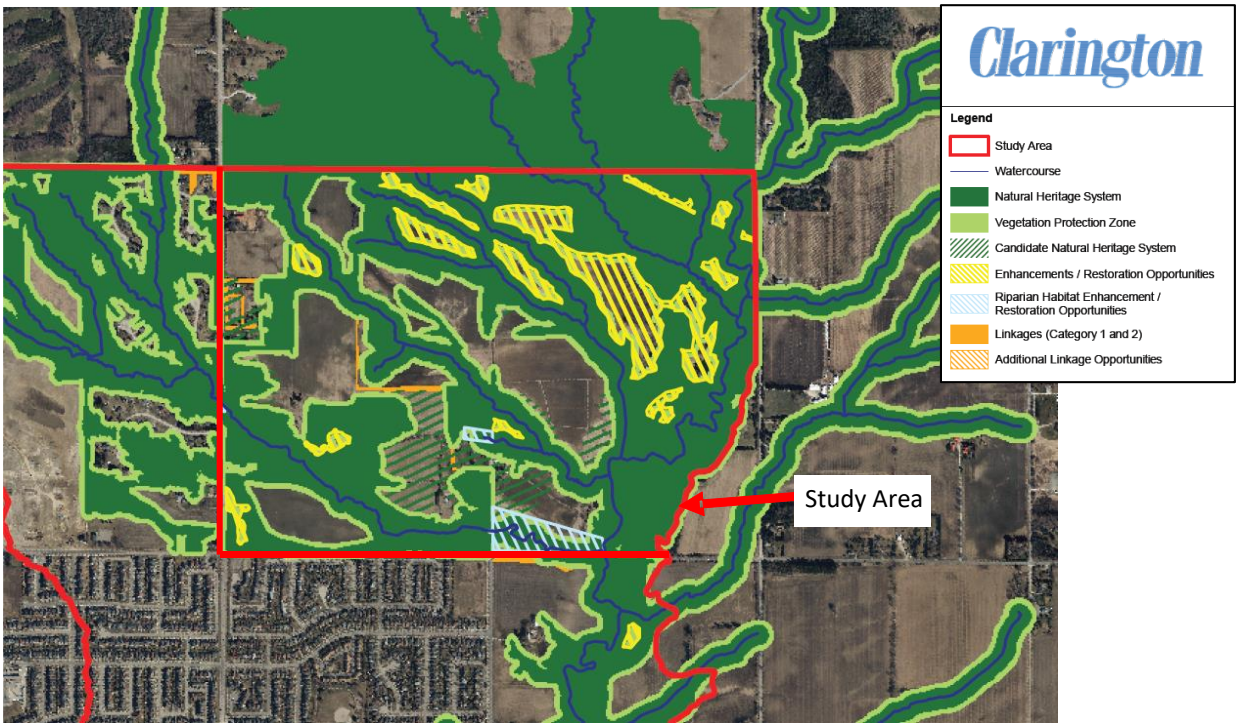


Figure 3-12 Natural Heritage System, Including VPZ's and Linkages



3.7 Water Supply and Distribution

The Bowmanville Drinking Water System provides potable water to consumers in Town of Bowmanville in the Municipality of Clarington. There is one water supply plant (Water Treatment Plant) with an approved capacity of 36,368 m^3/day. This plant feeds a Distribution system and trunk distribution system. This system and plant are owned and operated by Regional Municipality of Durham. The source water for this plant is drawn from Lake Ontario.

3.7.1 Existing Water Distribution Infrastructure

The current water network covers the developed area of Bowmanville. There is an existing watermain (300mm diameter) along Liberty St North, adjacent to the study area. The existing Bowmanville Zone 2 reservoir is located northwest of the study area near Liberty St North and Concession Rd 4.

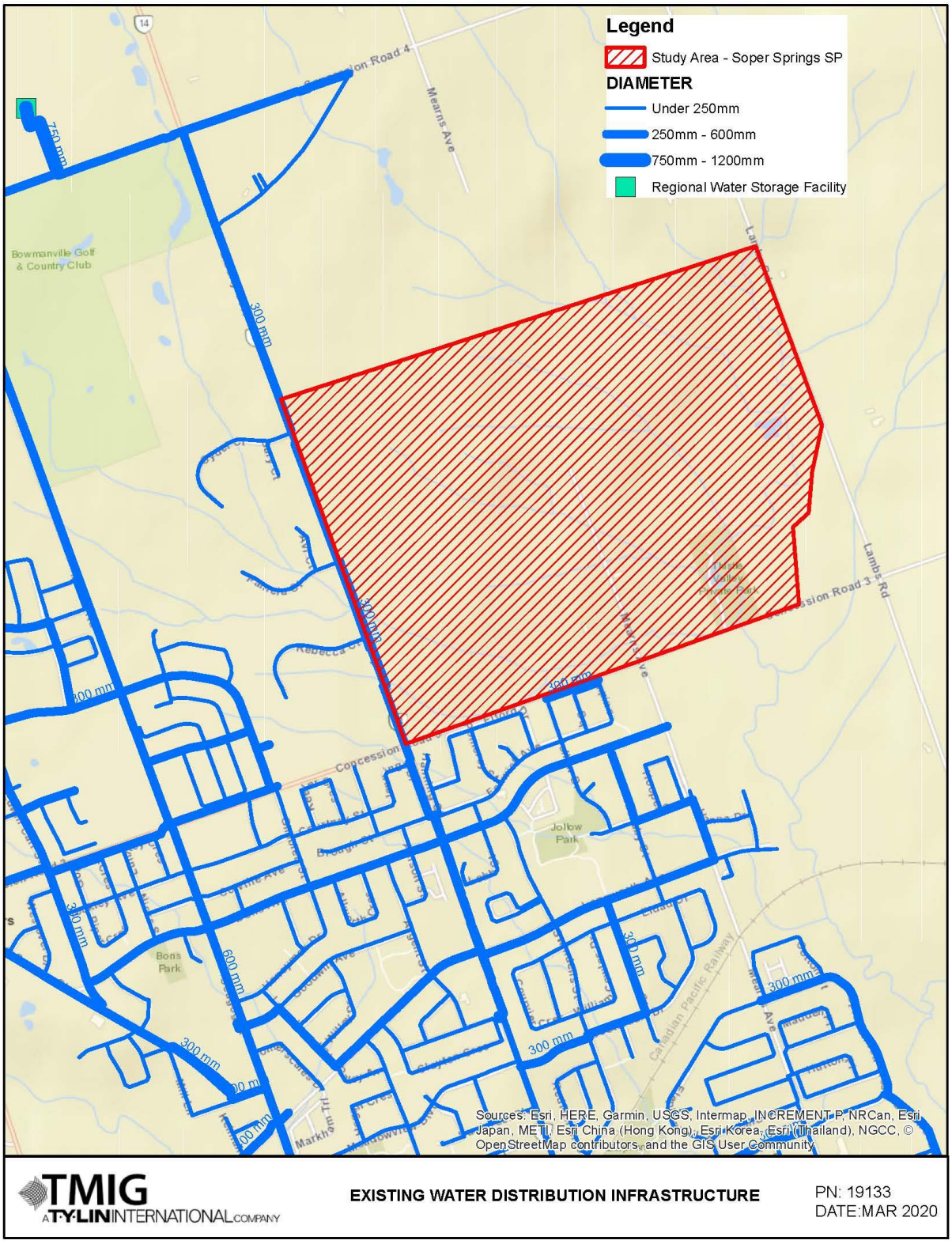
The water system in Bowmanville has two zones. Everything south of the railway is serviced via Pressure Zone 1. As the entirety of the Study Area is north of the railway, it is assumed that the Zone 2 hydraulic grade line will be appropriate for the entire SSSP area. According to Durham Region, the Zone 1 top water level is 150 m and the maximum ground elevation for Zone 1 service is 120 m +/-. The Zone 2 top water level is 180 m and the maximum ground elevation for Zone 2 service is 150 m +/-.

Existing ground elevations range from a high of approximately 150 m at the north-west corner study area to a low of approximately 100 m in the Soper Creek valley at Concession Road 3.

The water in Bowmanville and the Municipality of Clarington is supplied from Lake Ontario through the Bowmanville Water Treatment Plant and a network of transmission and supply mains.

Figure 3-13 shows existing water infrastructure near the Soper Springs Secondary Plan area. The information shown on the figure is from GIS files provided by the Region.

Figure 3-13 Existing Water Infrastructure



3.7.2 Planned Water System Improvements

3.7.2.1 Durham Region Capital Projects

The Region of Durham updated its Development Charge (DC) Background Study in 2023. This study is to establish the future development-related capital projects. Several projects were identified in the Town of Bowmanville; however, all budget items and forecast dates are subject to review, change and approval on an annual basis. The Bowmanville DC water projects are summarized below in **Table 3-5** and shown in **Figure 3-14.**

Table 3-5 Bowmanville DC Projects by Construction Funding Forecast Date – Water

ID	Description	2023	2024	2025	2026	2027	2028
300	Expansion of Bowmanville WSP from 36 to 55 MLD			X			X
301	New Liberty St. N. Zone 1 Reservoir and demolish existing tank	X			X		
302	Expansion of Zone 2 Reservoir		X		X		X
303	New Zone 2 PS at Zone 1 Liberty Reservoir	X					
306	Zone 1 feeder-main on Hwy. 2 (King St.), Lambs Rd., Third Concession Rd. to Liberty Zone 1 Reservoir	X	X				
308	Zone 2 feedermain from Zone 2 Liberty PS to Zone 2 Reservoir	X			X		

Project 301 is shown in two locations on the DC Figure. The northern-most point (Liberty Street, to the limit of the Urban Boundary) is the proposed new reservoir location. The point in Central Clarington (south of the railway) is the existing elevated tank, which will ultimately be demolished.

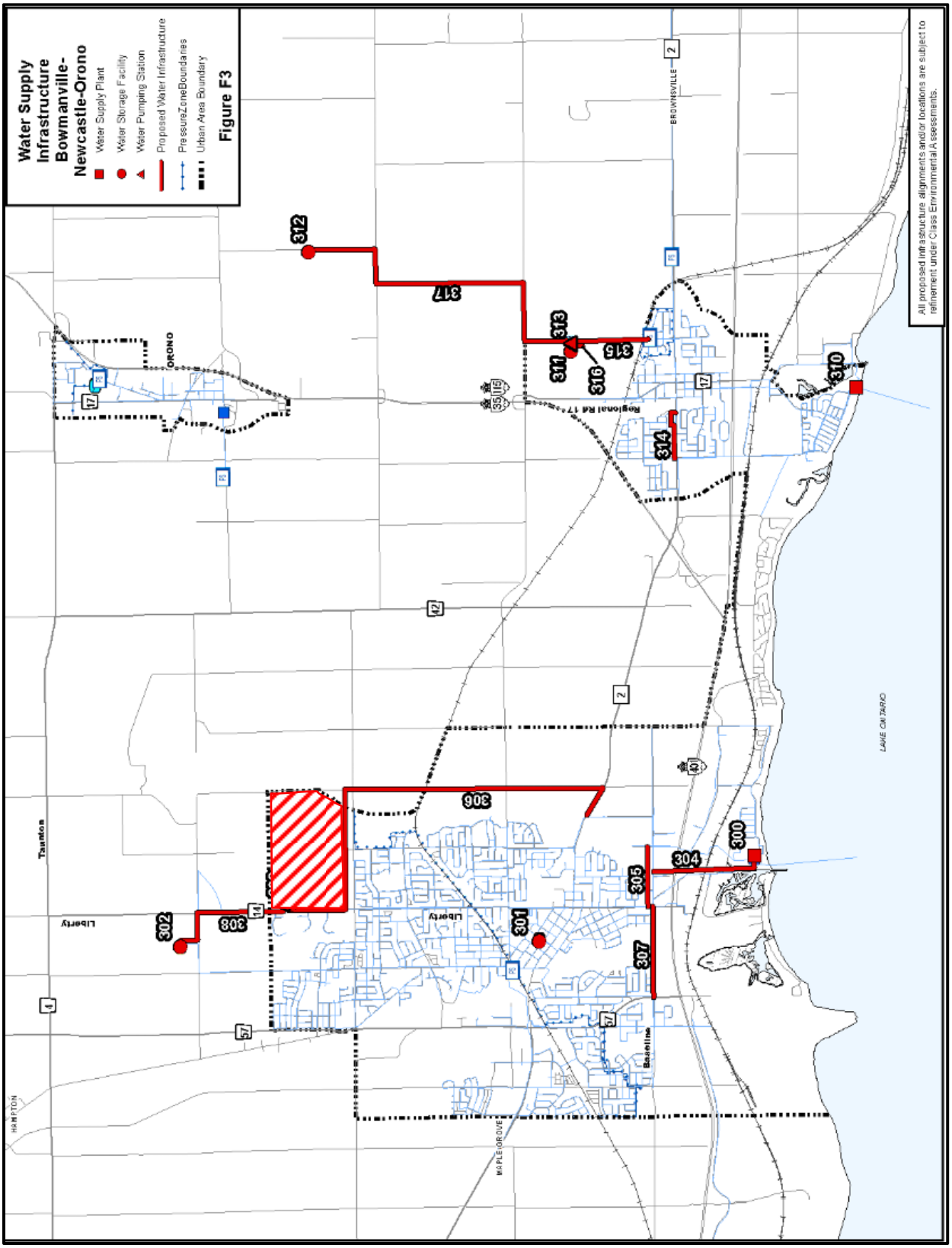
The Study Area is surrounded by various DC Projects. Along Liberty St N, is project 301 and 303: Project 301 includes constructing the Zone 1 Reservoir on Liberty St N in the northwest corner of the study area and demolishing the existing elevated tank. Project 303 involves a new Zone 2 pumping station at the Zone 1 Reservoir.

Based on information supplied by the Region, the first phase of the Zone 1 feedermain (along Hwy 2 and Lambs Road to Concession Street) is in construction and will be completed in 2025. Design to continue the watermain on Lambs Road, Concession Road 3 and Liberty Street are in

detailed design. The design on the Liberty St Reservoir is underway with construction funding allocated for 2026.

There will be more than sufficient water available for the SSSP area based on the proximity with existing water storage facilities and feedermains. Additional looping through the Secondary Plan area would ultimately fortify the water servicing network.

Figure 3-14 Region of Durham – DC Water Projects



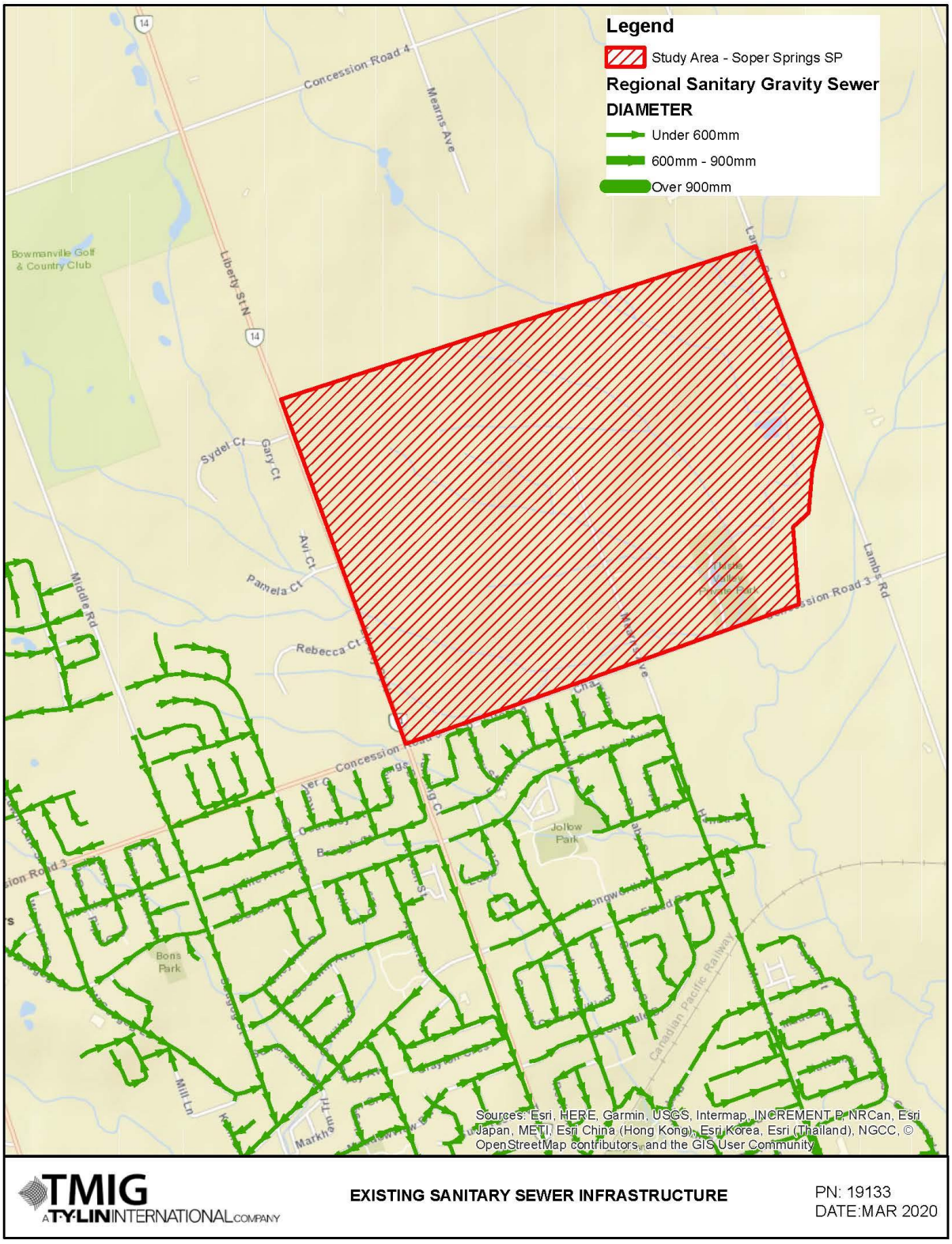
3.8 Sanitary Infrastructure

3.8.1 Existing Sanitary Services

The current sanitary sewer network covers the developed area of Bowmanville, with sanitary sewers only extending as far north as the existing residential developments south of Concession Road 3. These systems converge and continue south in a trunk sewer aligned within the Mearns Avenue right-of-way.

Figure 3-15 shows existing sanitary infrastructure near the SSSP study area. The information shown on the figure is from GIS files provided by the Region.

Figure 3-15 Existing Sanitary Sewer Infrastructure



3.8.2 Planned Sanitary System Improvements

3.8.2.1 Durham Region Capital Projects

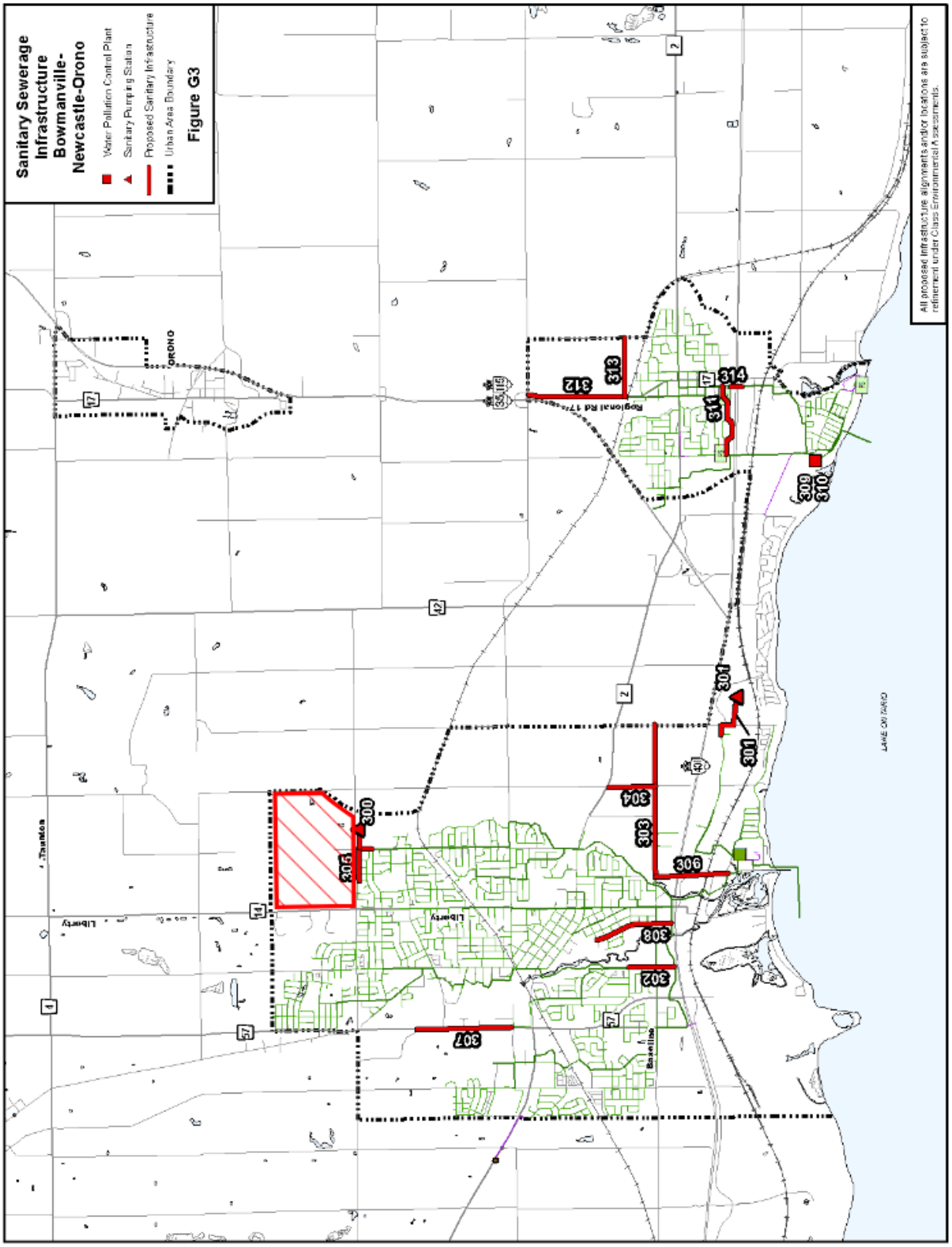
The Region of Durham updated its Development Charge Background Study in 2023. This study is to establish the future development-related capital projects. Several projects were identified in the Town of Bowmanville. The relevant Bowmanville DC sanitary projects are summarized below in **Table 3-6** and shown in **Figure 3-16**.

Table 3-6 Bowmanville DC Projects by Construction Funding Forecast Date – Sanitary

ID	Description	2024	2025	2026	2027	2028	2029	2030
300	Northeast SSPS, forcemain allowance – Conc. Rd. 3 and Mearns Ave.			X		X		X
305	Trunk sewer on Mearns Ave. and on Conc. Rd. 3 (Region share)	X						

Project 305 is located adjacent to the southern limit of the study area. This project was identified for 2024 funding and includes the extension of the Soper Creek trunk sewer along Mearns Avenue and Concession Road 3. Additionally, the Region has included a provision for a sanitary sewer pumping station and associated forcemain located at the intersection of Mearns Avenue and Concession Road 3. The pumping station is not required to service the Soper Springs area as discussed in **Section 5.4**.

Figure 3-16 Region of Durham – DC Sanitary Projects



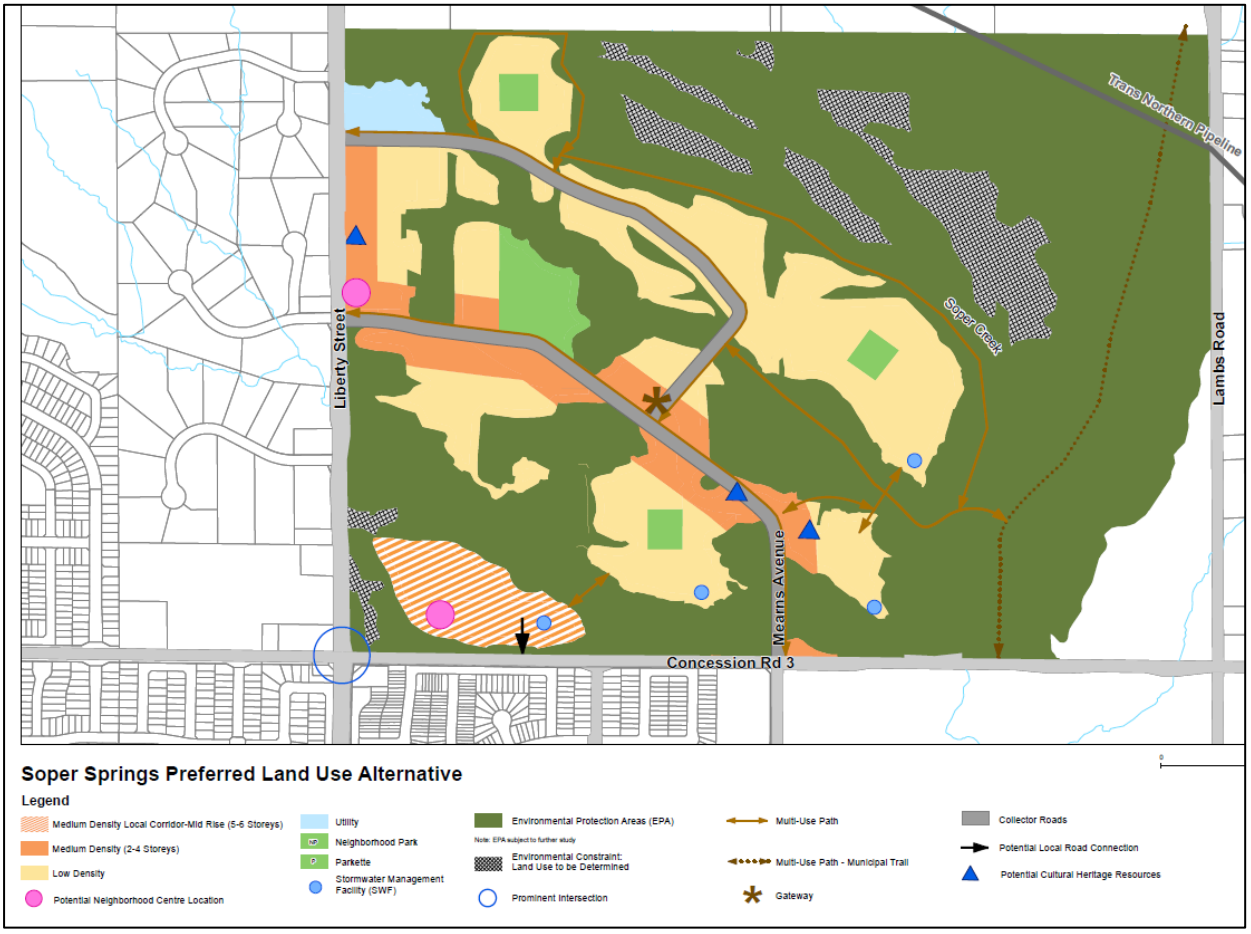
4 PLANNED DEVELOPMENT

A range of land use alternatives were developed based on the work done in Phase 1, with input from public and stakeholders, background review, and consideration of relevant policies and standards.

The development and evaluation of the alternative solutions is documented in the Soper Springs Phase 2 Summary Report (SGL Planning and Design Inc, 2022), and a more focused evaluation to satisfy the requirements of the Municipal Class Environmental Assessment for the collector roads is documented in the Transportation Assessment Report (TYLin, 2024).

The resulting preferred land use plan is illustrated in **Figure 4-1**.

Figure 4-1 Preferred Land Use Plan



5 PROPOSED SERVICING

5.1 Grading and Drainage

Site grading for the Soper Springs Secondary Plan area shall adhere to criteria outlined the Municipality of Clarington Design Guidelines and Standard Drawings document, updated 2010. Key design criteria are listed below:

- Minimum road grades for all road classifications shall be 0.5%;
- Maximum road grades for local roads shall be 4.0%;
- Maximum road grades for collector roads shall be 5.0%; and
- Vertical road grade changes in excess of 1.5% shall be designed using vertical curves.

The grading design employs the full allowable range of road grades per the municipality standards to minimize the need for large scale earthworks. Where required, the exact details of the vertical curve design shall be determined as the overall grading design is refined through future development applications.

In general, the lands will be graded towards the proposed SWM ponds, which are located adjacent to the Soper Creek tributaries that traverses the study area. At this study stage, the FSR is only suggesting the general locations for the SWM ponds, which have been coordinated with the SWS. Actual siting and sizing of SWM ponds will be carried out in future studies (See **Section 6**). The preliminary grading design is detailed on Drawing **SG01** in **Appendix A**.

5.1.1 Grading Adjacent to Existing Roadways

The preliminary grading design completed for the SSSP area examined the surrounding roadways (i.e. Concession Road 3, Lambs Rad, Liberty Street) and was based on matching existing grades at the existing road right-of-way limits. It is understood the existing road grades along portions of the Mearns Avenue roadway that are within the study area will be redefined as part of the development of the secondary plan area. The grading design is expected to be refined through future development applications, and boundary conditions may be updated based on future potential right-of-way widenings and road improvement projects.

Durham Region should be contacted during subsequent grading design refinements to confirm required grades at the limit of future Regional road rights-of-ways. The Region will likely require grades to be 0.2 m above the existing centerline elevation at the future right-of-way limit and positive draining boulevard areas.

5.1.2 Grading Adjacent to NHS Features

Proposed grades are to match existing elevations where the development is adjacent to existing developed lands, undeveloped lands, and the Natural Heritage System. The preliminary grading design makes every effort to minimize or eliminate the need for retaining walls along the Natural Heritage System. Under extenuating circumstances, the need for retaining walls along the boundaries of the NHS may be unavoidable. The grading design will be advanced through future studies. In the unlikely event that retaining walls are unavoidable, they shall be located on private land with full consideration for access requirements for ongoing maintenance and maximum height restrictions.

5.1.3 Design Criteria – Minor System

5.1.3.1 Minor System

The minor drainage system (storm sewers) for the SSSP lands has been designed to convey runoffs to the four proposed stormwater management facilities prior to discharging to Soper Creek. The servicing strategy is conceptual, and designs will be refined in future study phases. The storm sewer pipe sizing has been based on the Municipality of Clarington Design Guidelines and Standard Drawings document, updated 2010:

- A minimum slope of 0.50% for all local sewers;
- Flow velocities are to be no less than 0.98 m/s and no more than 5.00 m/s;
- The minimum pipe size is specified at 300 mm;
- The minimum cover for the storm sewers is 1.2m, however, 1.8m is preferred; and

Although not specified in the Municipality's design guidelines, the storm sewers have been sized to capture storm runoff from up to 5-year events. This is a typical return period used to size storm sewers in the Greater Toronto Area.

5.1.3.2 Major System

Design of major system overland flow routes within the roadway or defined swales should follow Clarington Design Guidelines. The design should ensure that:

- Major storm flooding does not encroach onto private property.
- Ponding on roadways and/or major system flow capture / piping/infrastructure must be avoided.
- Depth of water at centreline of collector roads not to exceed 0.15m
- Major system flows are directed to the main cell of the SWM Pond.

5.1.4 Proposed Storm Servicing Plan

The proposed storm sewers generally follow the road alignments within the plan and consist of storm sewers ranging in diameter from 300 mm to 1200 mm, all sewers will have a minimum gradient of 0.50%. A preliminary storm sewer network plan has been prepared for the study area and is presented in Drawing SS03 in **Appendix A**. The drawing illustrates the proposed sewer layout as well as the relationships between proposed road elevations and storm sewer obvert elevations. The sizes and slope gradients of the storm sewers have also been identified in the drawing. The captured runoff will be conveyed to the four proposed SWM ponds within the subject site for quantity and quality control prior to discharging to Soper Creek.

The storm drainage catchment areas to the SWM ponds are approximately 19.62ha, 17.75ha, 3.68ha and 5.19ha in size. The primary proposed land use within the catchment area is low-rise residential, with some medium-density lands throughout. To account for impervious areas from the roadway, an average run-off coefficient of 0.65, equivalent to what is used for medium density residential development, was used throughout the SSSP Lands to size the storm sewers. Preliminary storm sewer design sheet is provided in **Appendix A**.

Overland flow routes have been identified in Drawing SS03, in the event of catchbasin blockage at the low points, the runoff will flow overland along the proposed roadways which ultimately direct the overland flow to the SWM ponds. The roadways and blocks designated for storm overland flow shall be designed such that they have sufficient capacity to convey the expected major flows.

Drawing SS03 in **Appendix A** illustrates the Conceptual Site Storm Servicing Plan. **Drawing STM01** in **Appendix A** illustrates the Conceptual Storm Drainage Area Plan.

5.2 Watercourse Crossings

Implementation of the planned network of Collector Roads through the study area will require three new crossings of the tributaries of Soper Creek. Details for the roads, trails and multi-use paths crossing tributaries will need to be confirmed and coordinated with proposed watermain and sanitary sewer alignments. Crossings of the NHS were minimized to the extent possible during the development of the Secondary Plan, but several new road crossings are proposed and include:

- The north-south road extension of Mearns Ave. crossing a western Soper Creek tributary.
- Street 1- The north easterly Collector Road from the extended Mearns Avenue, crossing a western Soper Creek tributary, and
- Street 1- The extension of the northern Collector Road crossing a Soper Creek tributary, east of Liberty Street.

In addition to the above, there is a potential crossing of the NHS outside of the road network, located in the southeast area of the plan. This crossing will facilitate a sanitary sewer to convey flows to the Mearns Avenue sewer. See **Section 5.4** for further information.

Measures to incorporate wildlife movement such as, oversized drainage culverts with a terrestrial 'bench' are recommended to mitigate potential impacts. Clear-span bridges or open bottom culverts are preferred with appropriate spans to accommodate natural channel migration.

The sizing of the crossings should have regard for openness index and wildlife passage and provide a sufficient sized span as to not be impacted by ice or debris jams.

Watercourse crossings will need to be sized based on the Regulatory floodline and the standards provided by CLOCA (2020). The impact of the proposed watercourse crossings will also have to be incorporated into the HEC-RAS hydraulic model to ensure that there will be no unacceptable impacts on upstream flood levels.

The report provides general direction for sizing the crossings, which will be carried out during future study phases. In all cases, the culvert design process should ensure appropriate sizing and siting to allow for water flow, fish passage, and terrestrial wildlife movement.

5.3 Water Supply and Distribution

5.3.1 Design Criteria

The water distribution system for Bowmanville and within the Municipality of Clarington was designed according to the most recent version of the Region of Durham's Design Specifications for Watermains (April 2023) and relevant MECP criteria. Relevant criteria from the Region's standards are summarized in **Table 5-1**.

Table 5-1 Watermain Design Criteria

Domestic Average Day Demand	364 Lpcd
Maximum Day Demand	550 Lpcd
Commercial generation rate	Shopping centres= 2500-5000 L/day/1000m^3 Hospitals = 900-1800 L/bed/day Schools = 70 – 140 L/student/day
Institutional generation rate – Average Day	45 m^3/ha/day
Institutional generation rate – Maximum Day	90 m^3/ha/day
Minimum Required Fire Flow for single family, detached dwellings	4,500 L/min (75 L/s)
Hazen-Williams 'C' Factor	150mm: C=100 200mm to 300mm: C=110 350mm to 600mm: C=120 Over 600mm: C=130
System Pressure Range under Normal Condition	275 kPa (40 psi) – 700 kPa (100 psi)
Minimum System Pressure under Maximum Day plus Fire Demand	140 kPa (20 psi)
School Maximum Day Factor	1.5
Peaking Factors	Average Day – 1.0 Maximum Day – 2 Peak Hour - 3

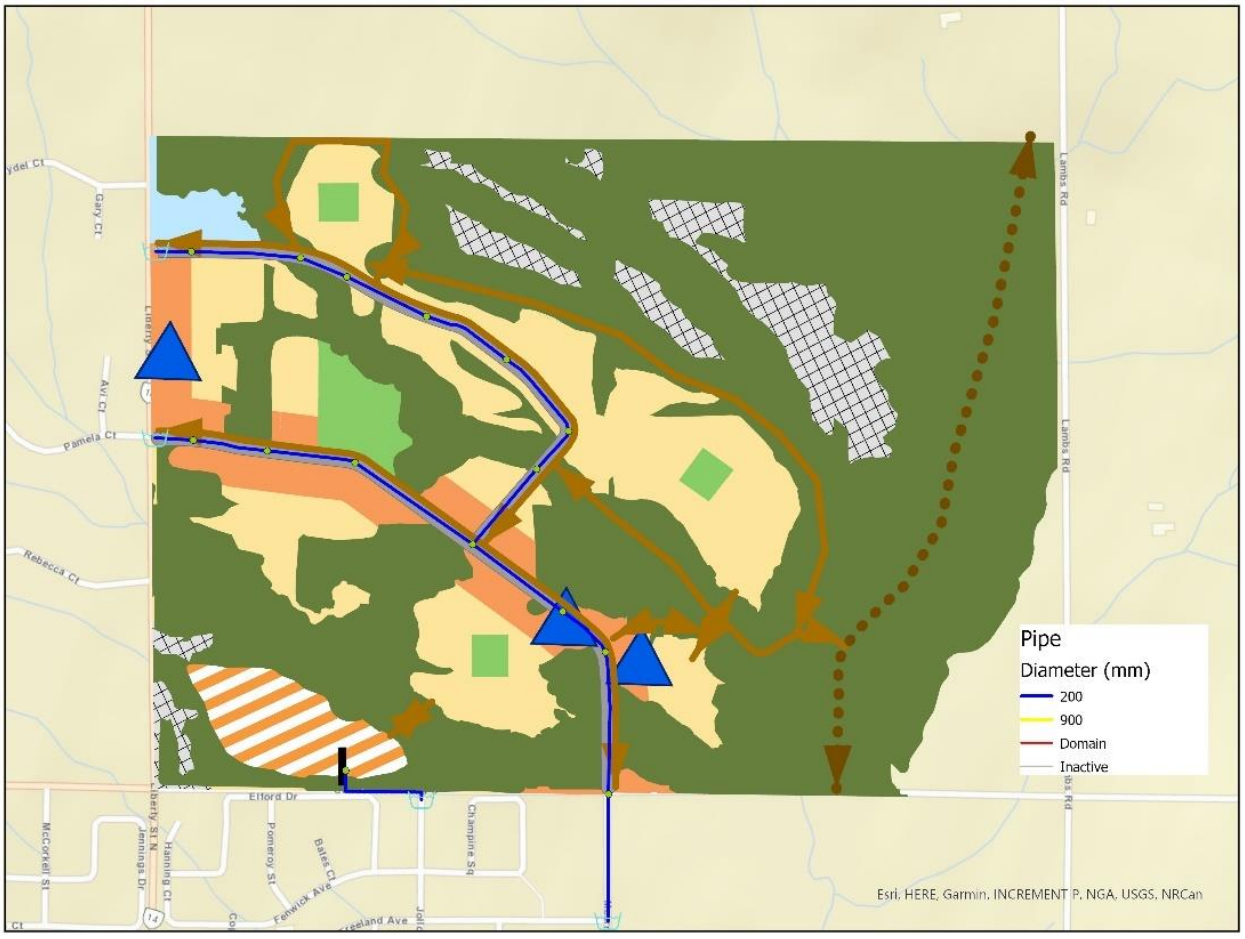
**Based on Region of Durham's Design Specifications for Watermains (April 2023)*

5.3.2 Water Supply and Boundary Conditions

The Region of Durham provided an InfoWater hydraulic model to inform the conception water servicing for the SSSP area. This model contained several scenarios, including future growth scenarios. The Region indicated that the ultimate condition (YEAR_UTL_ADD_EPS) is the correct scenario to be used in this analysis.

The ultimate condition scenario shows a variety of watermains in the vicinity of Soper Springs, as shown below in **Figure 5-1**.

Figure 5-1 Watermain Network



Upon discussion with the Region, water can be brought to Soper Springs via from the 300mm watermain along Liberty Street along the western boundary of Soper Springs, the 300mm watermain along Mearns Avenue and Freeland Avenue and the 300mm watermain along Champine Square to the south. Another connection is proposed off Jollow Drive to service a section of Soper Springs at the corner of Liberty Street and Concession Road 3. These four connections are more than adequate to service Soper Springs.

The Region also recommended that the ultimate condition model can provide the boundary conditions for our analysis. Based on the Region's model, boundary reservoirs were added as reservoirs in the skeleton model created for Soper Springs.

The reservoirs were inserted in the model at the connection points of the external watermain network to the proposed watermain network for Soper Springs. Four such connection points are identified in the figure above. The first such connection point is proposed to the watermain along Liberty Street North. Another connection point is to the same watermain further south located at the intersection of the Liberty Street North and Pamela Crescent. Another connection is proposed

at the cul-de-sac along Jollow Drive. The southern most connection is located at the intersection of the Mearns Avenue and Freeland Avenue. The pressure/head values at these connection points were obtained under three different scenarios (Average Day Demand, Maximum Day Demand and Peak Hour Demand) from the steady state run of the watermain network model provided by the Region. The values obtained are summarized in **Table 5-2**:

Table 5-2 Boundary Condition Details

Connection points	Head value under Average Day Demand Scenario (meters)	Head value under Maximum Day Demand Scenario (meters)	Head value under Peak Hour Scenario (meters)
Liberty Street North/Sydel Crescent	179	181	177
Liberty Street North/Pamela Crescent	178	178	170
Cul-de-Sac at Jollow Drive	178	178	169
Freeland Avenue/Marnes Avenue	178	178	169

5.3.3 Model Development

Using the Region's model as a basis, an InfoWater skeleton model was created for Soper Springs. This model uses reservoirs to represent boundary conditions (as discussed above) with the Region's system and the model was populated with current Soper Springs development details. The latest Soper Springs development plan is included in **Appendix B**.

Using the provided Soper Springs development plan, the skeleton water model was populated with appropriate water demands, as shown below in **Table 5-3**.

Table 5-3 Soper Springs Water Model Demands

Junction ID	Population	Average Day	Maximum Day	Peak Hour
J10	109	0.46	0.92	1.37
J14	601	2.53	5.07	7.6
J16	238.5	1.01	2.01	3.02
J20	238.5	1.01	2.01	3.02
J30	238.5	1.005	2.01	3.02
J32	423.3	1.79	3.57	5.35
J34	301.5	1.28	2.45	3.82
J38	127	0.54	1.07	1.61
J44	400.5	1.70	3.37	5.07
J46	53	0.22	0.45	0.67
J54	1,032	4.35	8.7	13.04
TOTAL	3,763	15.87	31.63	47.59

5.3.4 Model Results

Four different simulations were done using InfoWater:

- Average Day Demand
- Maximum Day Demand
- Peak Hour Demand
- Maximum Day Demand + Fire Flow

The model created pressure maps for the scenarios. The pressure maps are shown in **Appendix B. Table 5-4** below summarizes the model results:

Table 5-4 Water Model Output Summary

Scenario	Minimum Water System Requirements	Modeling Results within SSSP
Average Day	275 kPa – 700 kPa	275 – 700 kPa (40-100 psi)
Maximum Day	Minimum 275 kPa	275 – 700 kPa (40-100 psi)
Peak Hour	Minimum 275 kPa	275 – 620 kPa (40 – 90 psi)
Max Day + Fire	Minimum 140kPa	Available Fire Flow = 150 L/s under Maximum Day conditions

As shown above, the proposed water system can meet the necessary water demands of Soper Springs. All internal nodes have an available fire flow of 150 L/s under maximum day demand.

Note that the above analyses are based on the Liberty Zone 2 Pumping Station and associated feedermains on Concession Road 3, Lamb's Road and Highway 2 being in service at the time of development (refer to **Section 3.7.2**).

The above analyses demonstrate that water can be delivered to the study area in a manner that will satisfy current standards for pressure and fire flows.

In their review of this servicing strategy, staff from Durham Region noted that additional looping of watermains (which is beyond the scope of this study) may be needed for system security and to ensure that no more than 20 properties are serviced by a single feed. It is possible this may warrant new crossings of the NHS outside of the proposed collector road alignments. The water servicing strategy will be refined and the need for any additional crossings of the NHS will be determined through future study (refer to **Section 6**).

5.4 Wastewater

5.4.1 Design Criteria

The conceptual sanitary servicing design was carried out in according with the most recent version of the Region of Durham's Design Specifications for Sanitary Sewers (April 2023). Relevant criteria from the Region's standards are summarized in **Table 5-5**.

Table 5-5 Wastewater Design Criteria

Average Domestic Flow	**364 Lpcd**
Infiltration Rate	22.5 m^3/gross ha/day (0.26 L/s/day) when foundation drains are not connected to the sanitary sewer; 45.0 m^3/gross ha/day (0.52 L/s/day) when foundation drains are connected to the sanitary sewer
Peaking Factor	Harmon Peaking Factor
Population densities – Detailed information not available	Single Family Dwelling – 60 persons/ha Townhouse – 125 persons/ha Apartment: Low-density (62 units/ha) – 150 persons/ha Med-low density (86 units/ha) – 210 persons/ha Med density (124 units/ha) – 300 persons/ha High density (274 units/ha) – 600 persons/ha
Commercial	180 m^3/gross floor area / day (2.08 L/s/day), including infiltration and peaking Floor space index: 0.50 of gross lot area unless otherwise on approved plan
Industrial / Schools and Institutions	180 m^3/gross site area / day (2.08 L/s/day), including infiltration and peaking for local sewers 90 m^3/gross site area / day (1.04 L/s/day), including infiltration and peaking for trunk sewers

**Based on Region of Durham's Design Specifications for Sanitary Sewers (April 2019)*

Other key criteria from the Design Specifications for Sanitary Sewers include, but are not limited to, the following:

- A minimum slope of 0.50% for all local sewers, and 1.00% on the first upstream run;
- Flow velocities are to be no less than 0.60 m/s and no more than 3.65 m/s;
- The minimum pipe size is specified at 200 mm; and
- The minimum depth of the sanitary sewer, measured from the finished road centerline to the sewer obvert, shall be 2.75 m in all residential areas.
  The Region's April 2023 Design Specifications for Sanitary Sewers don't include a maximum depth criterion. In the proposed design documented in the following section, most sanitary sewers are proposed at a depth of approximately 3 m, but depths of up to 7 m are required locally on Mearns Avenue north of Concession Road 3 in order to achieve a gravity connection to the existing sewer on Mearns Avenue to the south

5.4.2 Proposed Sanitary Servicing Plan

The Soper Springs Secondary Plan area shall be serviced with gravity sewers throughout. The proposed sanitary sewers generally follow the road alignments within the plan and consist of sewers ranging in diameter from 200 mm to 375 mm. A preliminary sanitary sewer network plan has been prepared for the study area and is presented in Drawing SS01 in **Appendix C**. The drawing illustrates the proposed sewer layout as well as the relationships between proposed road elevations and sanitary sewer obvert elevations.

The study area will be serviced via the future Soper Creek trunk sanitary sewer (Region Sanitary Project 305), located south of the SSSP lands on Concession Road 3 and Mearns Avenue. To maintain the direction of flow, while reducing the cover on the proposed network, several locations and methods of crossing Soper Creek were explored.

The upstream sanitary creek crossing is proposed along a multi-use path alignment, on the east side of the site, where the sewer could be integrated with a potential multi-use path across the NHS . Crossing over this location of Soper Creek reduces the depth of cover for all upstream sewers and avoids the need for a sanitary pumping station for the development. In the latest Phase 2 and 3 SWS Report, prepared by Aquafor Beech, there is a proposed (3m span by 1.8m rise) box culvert at the Mearns Avenue crossing, North of Concession Road 3. To service this area, the downstream sanitary network is proposed to cross the Soper Creek watercourse within the roadbed over the culvert

Based on the preliminary grading and sanitary servicing designs, all the Secondary Plan study area can be adequately serviced with gravity sanitary sewers alone.

The sanitary servicing design, including the potential additional crossing of the NHS and integration into the proposed collector road crossings of the NHS, will be explored as part of future studies. In the event that the additional crossing of the NHS is determined to be infeasible, a sanitary pumping station may be needed to service some or all of the study area.

The SSSP sanitary drainage catchment is approximately 46.13ha in size and has a proposed equivalent of 4,347 persons. The primary proposed land use within the catchment area is low-rise residential, with some medium-density lands throughout. Preliminary wastewater generation calculation and sanitary sewer design sheet are provided in **Appendix C**. Further discussion with the Region is required to confirm the existing capacity of the wider sanitary system and to better understand potential upgrades to the current sanitary infrastructure that may be required due to the development of the study area.

5.5 Stormwater

5.5.1 Stormwater Management Approach

The approach to stormwater management for the SSSP was established through the Soper Creek Subwatershed – Phase 2 and 3 Report (Aquafor Beech Limited, 2024). The approach proposed in the SCSWS meets the required flood control criteria, and uses LID measures to achieve the water quality, erosion control, water balance, and thermal mitigation criteria. This approach is aligned with the requirements of CLOCA and Clarington's MECP CLI ECA (Appendix A), which prioritizes LID measures to achieve an Enhanced level of treatment within the Soper Creek Subwatershed.

5.5.2 Applicable Criteria

The SCSWS provides the background information and analysis used to develop the stormwater criteria for development within the Soper Creek Watershed. Five criteria have been identified that must be met through the preferred stormwater strategy, these criteria are as follows:

- **Flood control:** Potential to reduce the impact of new development on peak flows, such that the 2-year through 100-year post-development flows are less than or equal to the predevelopment flows, and that the post-development uncontrolled flows are less than the existing regulatory floodline.
- **Water quality:** The water quality target is to control of the runoff generated from a 27 mm event using infiltration LID measures as a priority, followed by filtration measures if full infiltration is not feasible. Alternative measures to promote evapotranspiration and re-use are permitted, as well as stormwater management facilities and manufactured treatment devices.
- **Erosion control**: To protect against increased rates of erosion and unstable channels, stormwater management facilities and LIDs will be needed to mitigate against increased peak flow rates and durations of critical discharge exceedance. The 27 mm event is the erosion control target. There may be technical constraints preventing infiltration and filtration practices from controlling the full 27 mm event. If retention of the full 27 mm runoff is not feasible, the remaining runoff volume that is not retained should be detained on site and slowly released over 24 to 48 hours, in these cases, a minimum volume retention of 5 mm is still required.
- **Water balance:** The purpose of maintaining pre-development water balance in developments within HVRA and ESGRA to mitigate the impacts of increased runoff and reduce the risk of flooding but also to sustain natural features within and downstream of the study area. High Volume Recharge Areas (HVRAs) and Ecologically Significant

Groundwater Recharge Areas (ESGRAs) will require a site-specific water balance to be completed as a component of the stormwater management submission.

- **Thermal impacts:** Potential to maintain cooler water temperatures discharged into streams to sustain cool water habitat. Impervious surfaces, such as roads and rooftops, can reach very high temperatures, especially during the summer months, and this heat is transferred to stormwater running over it.

5.5.3 Stormwater Management Plan

5.5.3.1 Flood Control

All stormwater management facilities must be designed to meet the design requirements set out in the Municipality of Clarington Design Guidelines, the Technical Guidelines developed by CLOCA (2020), and the MECP Stormwater Management Planning and Design Manual (SWMPDM) which provides technical and procedural guidance for the planning, design, and review of stormwater management practices.

A total of 4 SWM facilities are proposed, with drainage areas ranging from 3.7 ha to 19.6 ha. The flood control strategy for up to the 100-year and Regional storms is to ensure that proposed development does not increase flows within the creeks or their tributaries. The 12hr Chicago storm distribution has been carried forward, as it produces higher peak flows. CLOCA requires the following criteria for flood control:

- Post-development flows per catchment throughout the watershed from the 2-year through 100-year events were less than or equal to the 2–100-year existing flows.
- Post-development flows at key nodes throughout the watershed from the 2-year through 100-year events were less than or equal to the 2–100-year existing flows, and
- Uncontrolled flows were less than the existing regulatory flows, where the regulatory flow is defined as the larger of the 100-year or Regional flow.

The required detention can be provided within the end-of-pipe stormwater ponds as recommended as part of the preferred stormwater strategy. See Drawing **STM 01** in **Appendix D**.

Note that the grading plan (**Section 5.1**) is based on directing storm runoff from the developable areas to 4 end-of-pipe SWM facilities. The list of the proposed stormwater control facilities and their storage volumes are presented in **Table 5-6**, The preliminary footprint of each facility is provided using an average depth of 2m. The ultimate storage volumes and footprints will need to be confirmed through the design process.

Table 5-6 Summary of Stormwater Management Ponds

Pond	Catchment	SWS Drainage Area (ha)	FSR Drainage Area (ha)	Volume Required from SWS (m^3) [1]	Assumed Total Footprint from SWS (ha) [1]
1	SM9_35	28.21	19.62	14,875	1.97
2	SM10_36	19.08	17.75	7,803	1.34
3	SM9_28	4.90	3.68	2,742	0.24
4	SM10_31	3.46	5.19	1,897	0.34

[1] Storage requirements and footprints area based on the drainage areas from the SWS

5.5.3.2 Water Quality

An Enhanced level of treatment corresponds to a long-term load reduction of total suspended solids of 80%. The water quality target for new developments in the Soper Creek Subwatershed is control of the runoff generated from a 27 mm event using infiltration LID measures as a priority. If full infiltration is not feasible, other LID techniques that utilize filtration, evapotranspiration (ET) or re-use as the primary processes can be considered. If using LID measures for the full 27 mm is still not possible, then the use of stormwater management facilities or manufactured treatment devices (e.g. oil and grit separators) are permitted. This approach is aligned with the requirements of CLOCA and the MECP CLI ECA, which prioritizes LID measures to achieve an Enhanced level of treatment within the Soper Creek Subwatershed.

The use of infiltration LID measures may be limited by site-specific factors such as: shallow bedrock, high groundwater, zoning, setbacks or other land-use requirements, property or infrastructure restrictions, poor soils (low infiltration rates, highly compacted, contaminated), or areas with highly vulnerable aquifer. Additionally, the presence of high-risk site activities may also restrict the use of infiltration LIDs. Infiltration practices should not accept runoff from drainage areas within the site which are associated with higher risks.

The list of the proposed drainage areas is presented in **Table 5-7**, with the associated runoff control volume required for each. The ultimate storage should be refined based on updating development statistics and hydrologic modeling.

Table 5-7 Water Quality Runoff Volumes

Pond	Catchment	Area (ha)	27mm Runoff Equivalent Depth (mm) [1]	27mm Runoff Volume (m^3) [2]
1	SM9_35	19.62	12.85	2,521
2	SM10_36	17.75	11.12	1,974
3	SM9_28	3.68	16.40	604
4	SM10_31	5.19	12.90	670

[1]. From SCSWS Phase 2/3 Draft Report Table 6.24 (Aquafor Beech Ltd, 2024)

5.5.3.3 Erosion Control

As noted in **Section 5.5.2**, the 27 mm event is used as the erosion target. If the site conditions or land uses are not conducive to infiltration of the full volume, minimum volume retention of 5 mm is still required. The SSCSWS also recommends that a continuous hydrologic model be developed at the detailed design stage to assess potential impact of the planned development on erosion rates and refine the stormwater management strategy as required.

5.5.3.4 Water Balance

Direction on water balance and location of LIDs has been taken from the SWS. The Thornthwaite-Mather method of estimating pre-development groundwater recharge provides an annual infiltration rate of approximately 124 mm/year for the Soper Springs area. The average infiltration rate per event is relatively low at approximately 3 mm. The values on a site-by-site basis will vary depending on soil type, slopes, vegetation cover and depth to water table and these factors should be verified at the design level.

The recharge targets can be achieved by incorporating appropriate LID source and conveyance control measures, together with the requirements to meet the Water Quality targets. Site LID measures should ensure that post-development annual infiltration equals or exceed pre-development levels.

Areas of special interest High Volume Recharge Areas (HVRAs) and Ecologically Significant Groundwater Recharge Areas (ESGRAs) are located throughout the development area. A detailed water budget is required as part of the stormwater management submission when the development contains an HVRA or ESGRA. Site specific infiltration rates should be determined in situ using test pits and/or boreholes, and post-development infiltration rates should match pre-development rates on an annual basis. Refer to the SCSWS for more details.

5.5.3.5 Thermal mitigation

Soper Creek was characterized as a system with a cold-warmwater thermal regime.

LID measures act to reduce stormwater temperature and implementation of the recommended stormwater strategy, combined with best management practices throughout the site is expected to provide adequate cooling of stormwater. The latest mitigation technologies should be considered in addition to more common practices.

5.5.4 Stormwater Management Summary

A total of 4 SWM facilities are proposed, with two larger facilities on the north and west sides of Soper Creek and two smaller facilities servicing the south-east corner of the study area. It is expected that the end-of-pipe facilities will be configured as quantity control dry ponds, with all water quality treatment and erosion mitigation storage provided by upstream LIDs. However, if LIDs are not capable of achieving all applicable water quality and erosion targets, the end-of-pipe facilities may need to be reconfigured to incorporate extended detention and/or permanent pool storage.

Refer to the SWS regarding use of LIDs. Ultimate locations and footprints will be determined through the MESP or MDP.

6 PHASING AND IMPLEMENTATION

6.1 Future Studies

Neither this FSR nor the SCSWS undertook the full scope of studies required for an overall Master Environmental Servicing Plan (MESP) or Master Drainage Plan (MDP). For the Soper Springs lands, an MESP/MDP covering the entire Secondary Plan area will be required to support subsequent land use planning approvals.

The SWS makes recommendations regarding additional geomorphic analysis relating to stormwater management, creek erosion control / erosion threshold analysis and associated outfalls, erosion sites and maintenance issues, including costs estimates. Additional floodplain mapping will also be required for unmapped reaches within the study area.

Additional review of the proposed SWMP locations and associated outfalls relative to the natural hazards / constraints will be required and the exact location of the proposed SWMPs and associated outfall/outlets are to be refined in consultation with the Municipality and CLOCA. The outlet invert elevation of the SWMFs should be higher than the 2-year floodline. The MESP/MDP must follow all requirements outlined by CLOCA and the Municipality.

Sizing of new bridges and culverts is beyond the scope of this FSR. New watercourse crossings will need to be sized based on the Regulatory floodline and the standards provided by CLOCA (2020). The impact of the proposed watercourse crossings will have to be incorporated into CLOCA's most up-to-date HEC-RAS model to assess the impact on adjacent upstream lands. In some cases, it may be necessary to oversize structures to preserve lands that are proposed for development and to protect existing lands. The crossings must ensure the free movement of water and the passage of fish throughout the year. Clear-span crossings or open bottom culverts are preferred with to accommodate natural channel migration.

The MESP must also refine the water and sanitary servicing strategies presented in this FSR. The Region should be contacted at the initiation of the MESP to confirm the status and schedule for the planned water and sanitary system upgrades affecting the study area, and to confirm the existing and future development beyond the study area that is to be serviced by the water and sanitary systems for the SSSP area. As noted in **Sections 5.3.4** and **5.4.2**, the MESP must specifically evaluate the need for and feasibility of any additional servicing crossings of the NHS outside of the collector road network. In the event that new crossings of the NHS are not feasible, a new sanitary pumping station may be needed, and alternative strategies to improve system security and minimize the number of homes serviced by a single feed will need to be reviewed with the Region.

A Functional Servicing Report (FSR) is required to support future plans of subdivision based on

requirements of the Municipality and Region and should include information regarding top of bank and or slope stability, preliminary sizing for stormwater infrastructure, and stormwater minor and major flow routes, preliminary grading and preliminary water and wastewater servicing strategies. Stormwater outfall locations may require a site walk with approval agencies prior to finalizing suitable locations. LID infrastructure strategy, design, footprints, locations, soils and infiltration rates should be defined at this function level of design. The FSR should also include operation and maintenance plans, complete with costing, for all LIDs and SWM facilities

A Stormwater Management Report / Stormwater Management Brief is also required to build on the information presented at the functional level of design and will require detailed designs and calculations for stormwater and LID infrastructure. Related studies and reports such as hydrogeological assessments are required to verify local soil and groundwater conditions and inform the locations and configurations of LIDs. Geotechnical assessments are needed to characterize soils properties and inform design and construction. Geomorphic recommendations for stormwater management facility outlets, related to creek erosion and erosion threshold analysis for the associated outfalls. to be implemented into the FSR / SWM design process (when available).

Additional requirements may be subsequently identified by the Municipality.

6.2 Phasing

It is anticipated that the development within the Soper Springs Secondary Plan area will occur through phases, with the first phase located near Concession 3 and Mearns Avenue, due to the location of the proposed sanitary connection at Mearns Avenue that will convey flows from the entire SSSP area to the existing sewer continuing south on Mearns Avenue. The first phase should also include the extension of Mearns Avenue to Liberty Street to alleviate traffic concerns and provide an opportunity for looping of the water distribution system. It is recognized that both SWM Ponds 1 and 4 would be required to provide full treatment of the runoff from the recommended initial phase of development, with SWM Ponds 2 and 3 constructed as development extends north of Tributary T11 and south of Tributary T10, respectively.

If the logical progression of water, sanitary and storm servicing extending from a spine system along the Mearns Avenue extension cannot be feasibly implemented due to non-participating landowners or other constraints, additional servicing investigations would need to be undertaken to determine how the plans presented herein could be modified or to identify interim servicing strategies, including temporary stormwater management facilities, to allow development to proceed.

Specific to water servicing, the entire length of the 400mm Zone 2 watermain on Concession Road 3, between Liberty Street and Mearns Avenue, may be constructed in conjunction with the Region of Durham Capital Works Zone 1 feedermain project prior to any works required to service the

Secondary Planning Area (Refer to **Section 3.7.2**). If the Zone 1 feedermain and the 400mm Zone 2 watermain have not both been constructed at the time development within the SSSP area advances, the developer(s) may be responsible for the design and construction of these water services along Concession Road 3, within the limits of any road improvements required along Concession Road 3 to support development. The objective is to disturbance and road closures on Concession Road 3 as much as possible.

Development phasing will need revisited and refined through future studies, and will be subject to approval by the Region and Municipality.

7 SUMMARY

This Report provides support to the Soper Springs Secondary Plan study on a range of municipal servicing and engineering matters. It outlines existing conditions relating to surface water, groundwater, terrestrial and aquatic resources, and assesses and recommends stormwater management, site grading, water, and wastewater servicing requirements.

This Report identifies development scenarios, potential impacts and mitigative measures, such as conceptual design requirements for water and sanitary servicing, stormwater management strategies, Low Impact Development (LID) measures, site grading, and road crossings.

The findings and recommendations from this FSSR will be refined through a future MESP/MDP for the entire SSSP area and more detailed studies as development proceeds through the land use planning process.

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8 REFERENCES

Aquafor Beech Limited. (2023). *Soper Creek Subwatershed Study - Phase 1 Report*. Prepared for the Municipality of Clarington.

Aquafor Beech Limited. (2024). *Soper Creek Subwatershed Study - Draft Phase 2 and 3 Report*. Prepared for the Municipality of Clarington.

SGL Planning and Design Inc. (2022). *Soper Springs Secondary Plan Phase 2 Summary Report*. Prepared for the Municipality of Clarington.

TYLin. (2024). *Transportation Assessment Report*. Prepared for the Municipality of Clarington).

APPENDIX A

GRADING AND DRAINAGE

APPENDIX B

WATER SUPPLY AND DISTRIBUTION

APPENDIX C

WASTEWATER SERVICING

APPENDIX D

STORMWATER MANAGEMENT