Town of Amherstburg
Southeast Quadrant Sanitary and Water Servicing Study

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Town of Amherstburg

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The intent of this servicing study is to review the existing municipal infrastructure and identify upgrades or new infrastructure required to provide sanitary and water servicing for the proposed new developments, within the southeast quadrant of the Town of Amherstburg. This report discusses our assessment of the existing municipal infrastructure and includes various development scenarios as well as preliminary design and development of design criteria for the preferred strategy.

This study comprises of Sections 1 to 8 inclusive and Appendix A to C inclusive. A brief description of each section follows.

SECTION 1 – INTRODUCTION

This section describes the circumstances necessitating a sanitary and water servicing study for the Town of Amherstburg's southeast quadrant and provides background history of the existing infrastructure in the Town and current conditions of the southeast quadrant.

SECTION 2 – INFRASTRUCTURE AND SERVICE AREAS

This section describes the existing infrastructure in the Town of Amherstburg as it relates to sanitary sewers, water distribution and the boundaries of the AWWTP. This section also describes the proposed sanitary and water servicing requirements needed for proposed new developments in southeast quadrant of the Town.

SECTION 3 – WATER DESIGN CRITERIA

This section outlines the design parameters utilized to carry out a hydraulic analysis of the Town's water distribution system. Updates were made to the Town's previous hydraulic model from the 2010 Water (Distribution) Master Plan and Water Tower Class EA (Stantec Consulting Ltd.) to represent current conditions of the distribution system and includes servicing for the proposed new developments in the southeast quadrant of the Town.

SECTION 4 – SANITARY DESIGN CRITERIA

This section outlines the existing and projected wastewater flows based on established tributary areas, estimated total population densities and the Town of Amherstburg design standards. The sanitary design criteria establish the parameters utilized to develop projected flows, evaluate system capacities and determine future needs. For the southeast quadrant sanitary service area, various development scenarios were examined to determine the proposed new forcemain and pumping station size and location as well as verify if the existing infrastructure in the Town has sufficient capacity for the additional wastewater flows.

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In order to accommodate ultimate buildout of all the potential developments identified in this report, a new sanitary pumping station with a firm capacity of 188.92 L/s should be constructed along Lowes Sideroad approximately 500 m east of Fryer Street, near 2nd Concession Road Drain South with a 350 mm dia. forcemain heading north along Fryer Street and discharging to the existing 525 mm dia. sanitary sewer south of Simcoe Street. The sewage from the ultimate buildout is to be collected by a new 675 mm dia. sanitary trunk sewer installed on Lowes Sideroad, east of Fryer Street, which would discharge to the new pump station.

A second pumping station (PS No.2) with a firm capacity of 35.61 L/s should also be constructed west of Big Creek within the Amico development with a 200 mm dia. forcemain heading east under Big Creek to Concession Road 2 South. The forcemain is to discharge to a new 450 mm dia. sanitary trunk sewer along Concession Road 2 South that will collect additional flows from the proposed new developments and discharge to the proposed 675 mm dia. sanitary truck sewer along Lowes Sideroad.

SECTION 6 – OPINION OF PROBABLE COST AND COST SHARING

This section summarizes probable costs for proposed works with respect to capital budget probable costs and assessments to benefitting property owners (in 2017 dollars).

SECTION 7 – SUMMARY

This section summarizes recommendations that are made with respect to this study.

It is recommended that the Town proceed to detailed design and construction of the following works in accordance with available funding from the capital budget and assessments to benefitting property owners:

- A sanitary pumping station with a firm capacity of 188.92 L/s should be constructed along Lowes Sideroad with a 350 mm dia. forcemain heading north along Fryer Street and discharging to the existing 525 mm dia. sanitary sewer south of Simcoe Street. The pumping station will require three phase power, and a generator for backup power.
- A 675 mm dia. sanitary trunk sewer should be constructed along Lowes Sideroad (east of Fryer Street), which would collect wastewater from the proposed new development and existing residential lots and discharge to the new pumping station.
- Upsizing the watermains along Lowes Sideroad (east of Fryer Street) and Concession Road 2 South (south of Lowes Sideroad) from 50 mm to 300 mm in diameter are recommended. It is also recommended to extend the proposed 300 mm dia. watermain along Lowes Sideroad up to Meloche Road for better looping and water distribution.
- A sanitary pumping station with a firm capacity of 35.61 L/s should be constructed on the west side of Big Creek within the Amico development with a 200 mm dia. forcemain heading east under Big Creek to Concession Road 2 South. The forcemain is to discharge to a new 450 mm dia. sanitary trunk sewer along Concession Road 2 South that will collect additional flows from the proposed new developments and discharge to the proposed 675 mm dia. sanitary truck sewer along Lowes Sideroad.

Furthermore, Stantec recommends borehole testing be conducted along Lowes Sideroad prior to any works taking place to verify bedrock depths. Nearing the ultimate buildout of the southeast quadrant, flow monitoring should also be completed to ensure surcharging does not occur in the 525 mm dia. sanitary sewer south of Simcoe Street.

SECTION 8 – REFERENCES

This section lists previously completed reports referenced in this sanitary and water servicing study.

Abbreviations

AWWTP	Amherstburg Wastewater Treatment Plant
AVDY	Average Day Demands
ECA	Environmental Compliance Approval
ERCA	Essex Region Conservation Authority
FUS	Fire Underwriters Survey
ICI	Industrial, Commercial, and Institutional
I&I	Inflow and Infiltration
kPa	Kilopascal
L/cap/day	Liters per capita per day
MOECC	The Ontario Ministry of the Environment and Climate Change
MXDY	Maximum Day Demands
psi	Pounds per square inch
TDH	Total Dynamic Head
WTP	Amherstburg Area Water Treatment Plant

1.0 INTRODUCTION

1.1 BACKGROUND

Proposed new developments are expected in the Town of Amherstburg's southeast quadrant which covers approximately 289.01 hectares (ha), as identified in **Figure S-1** within **Appendix A**. The southeast quadrant comprises mostly of rural agricultural land with small pockets of residential land use. The area is not presently serviced by an existing municipal wastewater collection system and the existing watermain system is not sized sufficiently to support future growth. Within the southeast quadrant, existing residential lots are generally serviced by private on-site sewage disposal systems, typically consisting of septic tanks and leaching beds, and watermains ranging from 50 mm dia. to 300 mm dia. in size. The Towns Official Land Use for the southeast quadrant is low density residential with a section of medium density residential to the west off County Road No. 20 as identified in **Figure S-2**.

A Southeast Quadrant Master Servicing Study was completed in 2008 by RC Spencer Associates Inc. to implement recommended solutions for servicing Simcoe Street (Fryer Street to Meloche Road) and Fryer Street (Simcoe Street to Pickering Drive). The construction of a 375 mm dia. sanitary sewer on Simcoe Street and a 525 mm dia. sanitary sewer on Fryer Street was completed in 2009. The 525 mm dia. sanitary sewer on Fryer Street was installed to service future development in the southeast quadrant of the Town via a proposed new forcemain and pumping station.

In 2010, the Town of Amherstburg completed the removal and replacement of the Town's water tower (elevated storage tank) due to major structural issues documented in a 2005 Water Rate Study (C.N. Watson Limited & CH2M Hill Canada Limited, 2005). The replacement of the tank was assessed again in a 2010 Water (Distribution) Master Plan and Water Tower Class EA (Stantec Consulting Ltd.) and determined that providing more storage and capacity with a new tank would increase the level of service of the distribution system. However, the Town decided to maintain the current level of service, thus replacing the tank with one of similar volume and height.

In 2012, the Town completed watermain upgrades along Lowes Sideroad (Sandwich Street South to Fryer Street) and Meloche Road (Simcoe Street to Lowes Sideroad). 300 mm dia. watermains were installed for adequate looping to service future development in the southeast quadrant, as recommended in the 2010 Water (Distribution) Master Plan and Water Tower Class EA (Stantec Consulting Ltd.).

In 2014, the Town of Amherstburg completed upgrades and expansion of the existing Amherstburg Wastewater Treatment Plant (AWWTP) and upgrades to the Main Sewage Pumping Station (Pumping Station No. 2), located in the commercial plaza north of the AWWTP, to accommodate current and future wastewater flows. Wastewater generated by the proposed

new developments in the southeast quadrant is to be conveyed to the Main Sewage Pump Station No. 2 and ultimately to the AWWTP.

Some developers have requested that the Town of Amherstburg install the necessary sanitary and water servicing infrastructure in the southeast quadrant to allow for the orderly development of the lands.

1.2 REVIEW OF ALTERNATIVE SOLUTIONS

The Provincial Policy Statement, 2014 (PPS) sets the policy foundation for regulating the development and use of land. Section 1.6.6.2 of the PPS clearly states that municipal sewage services and municipal water services are the preferred form of servicing for settlement areas. Section 1.6.6.4 states that where municipal sewage services and municipal water services or private communal sewage services and private communal water services are not provided, individual on-site sewage services and individual on-site water services may be used provided that site conditions are suitable for the long-term provision of such services with no negative impacts. In settlement areas, these services may only be used for infilling and minor rounding out of existing development. Further, Section 1.6.6.5 states that partial services shall only be permitted where they are necessary to address failed individual on-site sewage services and individual on-site water services in existing development; or within settlement areas, to allow for infilling and minor rounding out of existing development on partial services provided that site conditions are suitable for the long-term provision of such services with no negative impacts. The Town considered feasible alternatives to service the designated future residential growth area based on the long-term needs of the municipality, Council direction and the land use policy framework set out in the PPS. For this reason, the following alternatives were screened out from further consideration in this design study:

- **Do Nothing** – this alternative is not feasible or desirable by the Town of Amherstburg as it would restrict future development of lands within the growth area of the Town.
- **Individual/Communal Water Wells/Cisterns** – this alternative is not feasible or desirable by the Town of Amherstburg as numerous wells and / or tanks would be required. Also, existing watermains already exist within the study area and the water servicing for the proposed developments follows the proposed plan outlined in the 2010 Water (Distribution) Master Plan and Water Tower Class EA (Stantec Consulting Ltd.).
- **Septic Tank/Weeping Bed Systems** – this alternative is not feasible or desirable by the Town of Amherstburg as numerus tanks/weeping beds would be required. The ground conditions in the study area do not support this (i.e., clay, bed rock) and the proposed developments are near environmentally sensitive areas.
- **Low Pressure Sewers/Grinder Pumps** – this alternative is not feasible or desirable by the Town of Amherstburg as it would require servicing each individual building and new collector/trunk sewers or pumping stations. Forcemains would still be needed.

- **Vacuum Sewers** – this alternative is not feasible or desirable by the Town of Amherstburg as it would still require a more conventional means of sewage collection through the use of a pump station/force main system or gravity sanitary sewers.
- **Package Treatment Plants** – this alternative is not feasible or desirable by the Town of Amherstburg as numerous package plants would be required with a collection piping system. Also, the Town in recent years completed the necessary upgrades to the Main Sewage Pumping Station to accommodate current and future wastewater flows.
- **Alternate Routing of Wastewater** – Consideration was given to routing wastewater from the proposed new developments to the west along Lowes Sideroad to Sandwich Street South (County Road No. 20) but this alternative is not desirable by the Town of Amherstburg as it would at a minimum require additional costs to connect a new inlet sewer to the headworks of the Amherstburg Wastewater Treatment Plant (AWWTP) along with new sanitary trunk sewers, pumping stations and forcemains as the existing sewers within this area are at capacity.

1.3 OBJECTIVE

The intent of this servicing study is to review the existing municipal infrastructure and identify upgrades or new infrastructure required to provide sanitary and water servicing for the proposed new developments, within the southeast quadrant of the Town of Amherstburg. This report discusses our assessment of the existing municipal infrastructure and includes various development scenarios as well as preliminary design and development of design criteria for the preferred strategy.

We have reviewed the previous report and are updating and expanding upon the 2008 RC Spencer Associates Inc. servicing study. This servicing study seeks to implement a preferred solution which maximizes the use of the existing infrastructure and provides the necessary infrastructure for new growth in the designated growth areas within the Town.

This study also includes a conceptual opinion of probable cost for the preferred strategy and proposed cost sharing schemes for the developers.

1.4 DATA SOURCE

The sources of information referred to in this study include record drawings, reports, codes, standards and guidelines. The list of references includes:

- Town of Amherstburg Interactive Mapping Service
- Town of Amherstburg GIS data
- Town of Amherstburg Sanitary Sewer Design Criteria
- Town of Amherstburg Waterworks Design Criteria

- Ontario Ministry of the Environment and Climate Change (MOECC) Sewage Design Guidelines for Sewage Works (2008)
- Ontario Ministry of the Environment and Climate Change (MOECC) Design Guidelines for Drinking-Water Systems (2008)

Specific information addressing requests received from the developers and the staff of the Town of Amherstburg, together with the results of the Dalhousie Street flow monitoring project performed in 2017 were also used in preparing this report.

1.5 SERVICING STUDY METHODOLOGY

1.5.1 Overview

This study evaluates the existing water distribution and wastewater collection systems in the southeast quadrant of the Town of Amherstburg, with a focus on the sanitary and water infrastructure capacities that are ultimately serviced by the Town's water and wastewater treatment plants.

The water demands and wastewater flows are calculated based on current Town of Amherstburg design criteria and MOECC sewage design guidelines. The capacities of the existing systems are compared with the existing and proposed demands of the southeast quadrant service area to identify gaps which require new or upgraded infrastructure to address servicing needs.

Various development scenarios were considered and evaluated based on environmental and economic impacts.

1.5.2 Population Data

This study presents estimated total population density for the Town of Amherstburg based on existing number of homes, industrial, commercial, and institutional land use within the AWWTP sanitary drainage area. Apartments, schools, community halls, etc. have been accounted for and converted to equivalent number of residential lots for population estimating purposes. The Town's standard design criteria is used to conservatively estimate existing and future population for the various development scenarios and preferred servicing strategy.

1.5.3 Considerations

This servicing study considered the following:

- Physical and Natural Environment:
    - Impact on surface drainage, soil and geology
    - Impact on areas of natural and scientific interest, and environmentally sensitive areas
    - Review of topographical features

  - Review of the varying bedrock depths in the area

- Social and Economic Environment:
  - Impact on existing and proposed development
  - Impact on other utilities

- Financial Factors:
  - Construction, operation and maintenance (life-cycle) costs
  - Best use of existing infrastructure
  - Flexibility for scheduling works

- Technical Factors:
  - Level of service
  - Impact on existing infrastructure
  - Constructability
  - Impact on operations and maintenance
  - Meeting legislative criteria and regulations

1.6 EXISTING CONDITIONS

1.6.1 Topography

The Town of Amherstburg's southeast quadrant is somewhat flat. The land falls north to south between Simcoe Street and Lowes Sideroad with elevations varying from 182.0 m to 177.0 m. South of Lowes Sideroad the ground elevations vary between 178.0 m and 175.0 m, generally sloping towards the Big Creek wet lands. Refer to **Figure S-3,** within **Appendix A,** for a topographical map of the southeast quadrant.

1.6.2 Soil Conditions

Soil conditions for the site were determined based on the Soils Map of Essex County, Soil Survey Report No. 11. The soils for the southeast quadrant of the Town of Amherstburg can be generally classified as Perth clay (Pc) with a pocket of Brookston clay (Bc) within the north section of the future Rocksedge development. Bottom Land (B.L.) and Marsh (Ma) soil types can also be found along the low-lying drains and streams of Big Creek.

Bedrock depths fluctuate in the Town of Amherstburg tremendously. To the north of the southeast quadrant the bedrock is found to be at shallow depths. To the south area of the southeast quadrant, the bedrock is found to be at deeper depths. Since the bedrock depths fluctuate significantly, Geotechnical borehole studies should be completed for individual developments to ensure bedrock will not be an issue when installing underground utilities and constructing stormwater management ponds.

1.6.3 Environmental Conditions

The southeast quadrant in the Town of Amherstburg lies within the Big Creek watershed. The watershed is made up of various municipal drains that collect municipal residential and agricultural runoff and outlet to Big Creek. The majority of the southeast quadrant lies within Essex Region Conservation Authority (ERCA) regulated area and consists of numerous areas designated as Provincially Significant Wetland, Environmentally Significant Area, Carolinian Canada Signature Site and/or Important Bird Area.

Environmental protection zones are located around Big Creek and require buffer zones for land development in the southeast quadrant. The southeast quadrant also requires noise and vibration buffer zones for lands that abut the Amherst Quarry.

Developers in the southeast quadrant will potentially be required to complete studies such as, but not necessarily limited to traffic studies, noise studies, drainage reports, species at risk studies and archaeological assessments, etc. prior to gaining the necessary development and environmental approvals for land development.

2.0 INFRASTRUCTURE AND SERVICE AREAS

2.1 EXISTING INFRASTRUCTURE AND SERVICE AREAS

2.1.1 General

The Town of Amherstburg has six (6) wastewater treatment facilities servicing various urbanized areas within the Town limits as follows:

- Amherstburg Wastewater Treatment Plant (AWWTP)
- Big Creek Treatment Plant
- McLeod Sewage Treatment Plant
- Bob-lo Sewage Treatment Plant
- Edgewater Lagoons
- McGregor Lagoons

The Engineering and Public Works Department is responsible for the maintenance of the Town's sewage collection systems working in cooperation with Ontario Clean Water Agency (OCWA). Wastewater generated by the proposed new developments in the southeast quadrant of the Town will be conveyed to the AWWTP.

The Town of Amherstburg's water distribution servicing system is supplied by the Amherstburg Area Water Treatment Plant (WTP) located at the northwest corner of the Town adjacent to the Detroit River. The Town of Amherstburg owns and operates the water distribution system within the Town of Amherstburg, including metering facilities at the Town boundary. The water distribution system requires upgrades to service the proposed new developments in the southeast quadrant of the Town.

2.1.2 Existing Wastewater Collection System

2.1.2.1 Wastewater Treatment Plant

The AWWTP is located in the southwest corner of the Town adjacent to the Detroit River and services existing urban areas within the Town of Amherstburg. The Town's existing sewage collection system that discharges to the AWWTP services an area of approximately 560.52 hectares as identified in **Figure S-4**.

In 2014, the Town of Amherstburg completed upgrades and expansion of the existing Amherstburg Wastewater Treatment Plant (AWWTP) and upgrades to the Main Sewage Pumping Station (Pumping Station No. 2) to accommodate current and future wastewater flows.

Wastewater generated by the proposed new developments in the southeast quadrant is to be conveyed to the Main Sewage Pump Station No. 2 and ultimately to the AWWTP.

Typically, wastewater conveyance systems within a Town are designed and rated to deliver peak wastewater flows to the treatment facilities and the treatment plants themselves are rated for average day flows based on traditional plant rating. The upgraded design capacity was based on actual peak flows the Main Sewage Pumping Station No. 2 received from the Town's wastewater collection system. **TABLE 2-1** presents the rated capacity of the AWWTP for the treatment and disposal of sewage.

TABLE 2-1: AMHERSTBURG WASTEWATER TREATMENT PLANT CAPACITY

Daily Flow	Capacity
Average Daily Flow	9,500 m^3/d
Peak Daily Flow	31,000 m^3/d
Note: AWWTP capacity based on information provided by the Town of Amherstburg	

2.1.2.2 Sanitary Pumping Stations

There are approximately three (3) sanitary pump stations and forcemains that contribute wastewater to the Town's sewage collection system as identified in **Figure S-4**. Pumping Station No. 4 is located in the northwest corner of the Town adjacent to the Detroit River and services the Texas Road sewer system. The Nexen Pumping Station is located in the northeast corner of the Town and services the Town of Amherstburg Public Works Yard on Thomas Road near Alam Street. Pumping Station No. 3 is located in the southwest corner of the Town adjacent to the Detroit River and services the Crownridge Subdivision and Riverfront Park sewer systems.

The Town's sewage collection system conveys flows by gravity to the Main Sewage Pumping Station No. 2 that ultimately discharges to the AWWTP. The Main Sewage Pumping Station No. 2 is located on the west side of the Town in the commercial plaza, just north of the AWWTP. The pumping station has a reported combined sewage wet well consisting of three (3) compartments, measuring 5.2 m long by 4.5 m wide, 3.3 m long by 2.5 m wide, and 1.6 m long by 2.5 m wide. There are two (2) new raw sewage pumps each rated for 252 L/s at 24 m Total Dynamic Head (TDH), and one (1) new raw sewage pump rated for 112 L/s at 19 m TDH. A 400 mm dia. forcemain connected to a 600 mm dia. forcemain conveys flows to the AWWTP. The pumping station was upgraded in 2014 to accommodate the current and future wastewater flows which includes the southeast quadrant. The upgraded design capacity was based on actual peak flows the pumping station received from the Town's wastewater collection system.

TABLE 2-2 presents the four (4) sewage pumping stations that are part of the overall AWWTP service area and their respective pumping capacities.

TABLE 2-2: PUMPING STATION CAPACITY

Pump Station	Forcemain Size (mm)	Maximum Flow (L/s)
Pumping Station No. 3 – Crownridge Subdivision	200	48.0
Pumping Station No. 4 – Texas Road Service Area	300	57.0
Nexen Pumping Station – Thomas Road Public Works Yard	100	9.5*
Main Sewage Pumping Station No. 2 - AWWTP	400 to 600	616.0
*The Nexen Pumping Station Capacity was estimated based on a 10.0 ha area and the Town's standard design criteria.		

2.1.2.3 Sanitary Trunk Sewers

The Town's sewage collection system consists of four (4) sanitary trunk sewers that collect wastewater by gravity from the surrounding urban area and ultimately discharge wastewater flows to the Main Sewage Pumping Station No. 2 as identified in **Figure S-4**.

Dalhousie Street sanitary service area **(Trunk Sewer 1)** at the southwest side of the Town is currently serviced by a 300 mm dia. asbestos cement sewer that was installed in 1974 and conveys flows by gravity from County Road No. 20 to Pickering Drive. The sewage flows easterly through an easement to the Main Sewage Pumping Station No. 2. The sanitary sewer currently services an area of approximately 31.86 hectares. With a pipe slope of 0.15%. and a Manning's roughness coefficient of 0.013, the 300 mm dia. sanitary sewer peak flow capacity is approximately 37.5 L/s.

Pickering Drive sanitary service area **(Trunk Sewer 2)** is currently serviced by a 375 mm dia. sewer and conveys flows by gravity from the commercial developments along Sandwich Street South (County Road No. 20) between Pickering Drive and Crownridge Boulevard and residential developments located between Sandwich Street South (County Road No. 20), Fryer Street, Simcoe Street and Lowes Sideroad. The sewage flows westerly to a 1067 mm dia. sanitary sewer that flows southerly along an easement to the Main Sewage Pumping Station No. 2. The sanitary sewer currently services an area of approximately 91.90 hectares. With an average pipe slope of 0.23% and a Manning's roughness coefficient of 0.013, the 375 mm dia. sanitary sewer peak flow capacity is approximately 84.1 L/s. Crownridge Subdivision and Riverfront Park Pumping Station No. 3 at the south end of the Town contribute flows to this service area.

Park Street and Simcoe Street service area **(Trunk Sewer 3)** is currently serviced by a 750 mm dia. sewer and conveys flows by gravity from residential, institutional and commercial developments between Sandwich Street South (County Road No. 20) and Meloche Road. The sewage flows westerly to a 1220 mm dia. sanitary sewer that flows southerly along Dalhousie Street and

reduces to a 1067 mm dia. pipe through an easement to the Main Sewage Pumping Station No. 2. The sanitary sewer currently services an area of approximately 95.61 hectares. With an average pipe slope of 0.09% and a Manning's roughness coefficient of 0.013, the 750 mm dia. sanitary sewer peak flow capacity is approximately 334.0 L/s. In 2009 The Town extended the trunk sewer with a 375 mm dia. sanitary sewer along Simcoe Street from Fryer Street to Meloche Road and a 525 mm dia. sanitary sewer along Fryer Street from Simcoe Street to Pickering Drive. The wastewater generated from the proposed new developments in the southeast quadrant of the Town was intended to discharge to the 525 mm dia. sanitary sewer on Fryer Street.

Dalhousie Street, north of Pickering Drive, is currently serviced by the Town's main trunk sewer **(Trunk Sewer 4)** which is a 1220 mm dia. sanitary sewer and services an area of approximately 339.79 hectares. The trunk sewer conveys flows from the industrial, commercial, institutional, and residential areas from the northern section of the Town as well as collects additional wastewater from the Park Street 750 mm dia. trunk sewer. The 1220 mm dia. sanitary sewer flows southerly along Dalhousie Street and reduces to a 1067 mm dia. pipe through an easement. The 1067 mm dia. again collects additional wastewater from the Pickering Drive 375 mm dia. sanitary sewer and continues south through an easement to the Main Sewage Pumping Station No. 2. Ultimately, the 1067 mm dia. trunk sewer services an area of approximately 528.66 hectares. With an average pipe slope of 0.20% and a Manning's roughness coefficient of 0.013, the sanitary trunk sewer peak flow capacity is approximately 1274.80 L/s. Pumping Station No. 4 from the Texas Road sewer system and the Nexen Pumping Station on Thomas Road contribute flows to this service area.

2.1.3 Existing Water Distribution System

The Town's existing water distribution system consists of a treatment plant, a reservoir, a water tower (elevated storage tank) and approximately 326 km of trunk and distribution watermains. The Town's water distribution system is mostly comprised of small diameter pipes less than or equal to 200 mm and of PVC material. Other pipe materials include ductile iron, cast iron, as well as asbestos cement. The Town draws water from the Detroit River, which is treated at the Amherstburg Area Water Treatment Plant (WTP) that has a rated capacity of 18,184 m^3 per day (4,000,000 imperial gallons per day). Storage within the Town's distribution system consists of a reservoir (14,800 m^3), as well as a water tower located along Thomas Rd, providing 2,273 m^3 of storage. The elevated storage tank is operated between 60 – 98% full and is filled using three high lift Johnston Vertical Turbine pumps, operating at a head varying between 60 m and 70 m.

As part of a 2005 Water Rate Study (C.N. Watson Limited & CH2M Hill Canada Limited, 2005), it was identified that the Town's elevated storage tank, at the time of the study, presented major structural issues. Remedial works were completed to address the issues; however, it was recommended that the elevated water tower be replaced. The replacement of the tank was assessed again in a 2010 Water (Distribution) Master Plan and Water Tower Class EA (Stantec Consulting Ltd.) and was determined that providing more storage and capacity with a new tank would increase the level of service of the distribution system. However, the Town decided to

maintain the current level of service, thus replacing the tank with one of similar volume and height.

Several locations were evaluated for the new elevated storage tank, including the current site. Following a screening evaluation, criteria such as efficient use of the existing distribution infrastructure, level of service, land use compatibility, and visual impacts were examined. The screening assessment resulted in the current site as the preferred location along Thomas Rd (east side), approximately 160 meters north of Alma Street (refer to **Figure W-1** in **Appendix A**). The construction of the new water tower was completed in 2010 and has been in operation since.

2.2 PROPOSED DEVELOPMENT SERVICE AREAS

2.2.1 General

The southeast quadrant in the Town of Amherstburg covers an area of approximately 289.01 hectares and comprises mostly of rural agricultural land with small pockets of residential land use. The southeast quadrant is separated into five (5) different developments, as identified in **Figure S-1**. The Town's Official Land Use has the southeast quadrant zoned as low density residential with a section of medium density residential to the west off County Road No. 20, as identified in **Figure S-2**.

The southeast quadrant lies within the AWWTP service area and the existing residential lots are currently serviced by the Town's WTP watermain network. The area is not presently serviced by an existing municipal wastewater collection system and the watermain servicing requires upgrades to allow for the orderly development of the lands.

TABLE 2-3 summarizes the proposed developments in the southeast quadrant of the Town and the existing residential areas to be serviced.

TABLE 2-3: SOUTHEAST QUADRANT PROPOSED DEVELOPMENT

Development	Area (ha)
Rocksedge	67.64
Hunt Club Creek	96.25
Amico	27.50
Capo D'Aqua	42.67
Walker Aggregates	39.90
Existing Residential	15.05
Total	***289.01***

2.2.2 Proposed Wastewater Collection System

The existing residential lots along Lowes Sideroad, Fryer Street and Concession 2 South, within the southeast quadrant, are generally serviced by private on-site sewage disposal systems typically consisting of septic tanks and leaching beds.

To the west of the southeast quadrant, near the corner of Lowes Sideroad and County Rd 20, there are two (2) sanitary trunk sewers that convey flows to the Main Sewage Pumping Station No. 2 and ultimately the AWWTP. The upstream end of the 300 mm dia. sanitary trunk sewer servicing Dalhousie Street **(Trunk Sewer 1)** and the upstream end of the 350 mm dia. sanitary trunk sewer along Sandwich Street South (County Road No. 20) **(Trunk Sewer 2)**. These trunk sewers are too shallow and at capacity to be considered as viable options for the proposed new developments east of County Road No. 20.

To the north of the southeast quadrant, at the intersection of Fryer Street and Pickering Drive, there is a 525 mm dia. sanitary sewer that connects to a 750 mm dia. sanitary trunk sewer on Simcoe Street **(Trunk Sewer 3)** and conveys flows to the Main Sewage Pumping Station No. 2 and ultimately the AWWTP. The wastewater generated from the proposed new developments in the southeast quadrant of the Town is proposed to discharge to the 525 mm dia. sanitary sewer.

Since the lands generally fall from north to south (Simcoe Street to Lowes Sideroad) and the lands south of Lowes Sideroad are generally flat, as identified in **Figure S-3**, it is recommended that the servicing requirements for the proposed new developments within the southeast quadrant drain to a new sanitary pumping station located on Lowes Sideroad approximately 500 m east of Fryer Street, near 2nd Concession Road Drain South. The sewage is to be collected by a new 675 mm dia. sanitary trunk sewer installed on Lowes Sideroad, east of Fryer Street, which discharges to the new pump station. The sewage would then be lifted and pumped via 350 mm dia. forcemain northerly to the sanitary manhole at the upstream end of the 525 mm dia. sanitary sewer at the Fryer Street and Pickering Drive intersection as presented in **Figure S-5.2**.

It is also recommended that a new sanitary pumping station be constructed west of Big Creek within the Amico development with a 200 mm dia. forcemain heading east under Big Creek to Concession Road 2 South. The forcemain is to discharge to a new 450 mm dia. sanitary trunk sewer along Concession Road 2 South that will collect additional flows from the proposed new developments and discharge to the proposed 675 mm dia. sanitary truck sewer along Lowes Sideroad.

Actual location of the proposed new pumping stations to be determined during the detailed design stages.

2.2.3 Proposed Water Distribution System

In reviewing the existing watermains surrounding the new developments, it is proposed that the watermains along Lowes Sideroad (east of Fryer Street) and Concession Road 2 South (south of Lowes Sideroad) be upsized to 300 mm in diameter. The existing pipes in these locations are 50 mm in diameter and will not be sufficient to support future growth. It is also proposed to extend the watermains along Lowes Sideroad up to Meloche Road. Upsizing and extending these watermains will provide adequate looping and fire flow to the five (5) proposed developments. Water servicing for the proposed developments follows the proposed plan outlined in the 2010 Water (Distribution) Master Plan and Water Tower Class EA (Stantec Consulting Ltd.).

In regard to future watermains for the proposed developments in the southern portion of Town, they were aligned based on the proposed road layouts where information was available. For the Walker Aggregates development, watermain layouts were assumed and only included a main loop through the developments. Internal watermains based on future road alignments should be confirmed during the detailed design stages.

Proposed watermains were sized to provide required fire flows and pressures while keeping in mind the need for looping and future potential looping. However, it should be noted that internal pipe sizing within the developments should be confirmed for their ability to provide the required Fire Underwriters Survey (FUS) fire flow at the detailed design stage.

Oversizing pipes for fire flow requirements can result in water quality issues and therefore, FUS fire flows should be calculated when the proposed unit types and construction information is available. The proposed piping presented in **Figure W-2** focuses on the backbone watermains through the developments at this planning stage.

3.0 WATER DESIGN CRITERIA

3.1 OPERATING PRESSURES

Based on the Ontario Ministry of the Environment and Climate Change (MOECC) Design Guidelines for Drinking-Water Systems (2008), the desired range of operating pressure for watermains under basic day, maximum day and peak hour demands is 345 – 552 kPa (50 – 70 psi) and no less than 276 kPa (40 psi) at ground elevation. Furthermore, the maximum pressure at any point in the water distribution system should not exceed 689 kPa (100 psi); pressure reducing measures are required to service areas where pressures greater than 552 kPa (80 psi) are anticipated. Under maximum day demands with a simultaneous fire flow, pressures should not be less than 140 kPa (20 psi).

3.2 FIRE FLOW DEMAND

Fire flow requirements for specific developments are typically determined using the Fire Underwriters Survey (FUS). The FUS fire flows are specific to criteria such as building type, construction material and population density. The latest FUS requires fire flows to be calculated using a formula that takes these criteria into consideration. Previous FUS guidelines published in 1991 provided example fire flows for certain building types. For example, modern residential subdivisions of one and two story detached single-family homes with a separation of 3 to 6m required 4,000 to 5,000 L/min; whereas, a typical industrial park, 1 story ordinary, area 3,700 m^2 with average combustible contents required 14,000 L/min. Depending on the structures, FUS notes that fire flows for industrial application could reach up to 35,000 L/min.

For internal watermain and site-specific fire flow requirements, it is recommended that the Town of Amherstburg refer to the latest edition of the FUS to determine fire flow requirements. In the absence of specific building types (required to determine FUS fire flows) in the planning stage, it is recommended that “typical” fire flows be established. In accordance with the 2010 Master Plan, the fire flow target for the Town of Amherstburg is 7,500 L/min for residential areas. For areas with significant ICI development, it is recommended that a fire flow target of 15,000 L/min be used.

3.3 WATER DEMAND CRITERIA

The estimated future population along with flow rate data extracted from the Town’s Annual Water Treatment Plant (WTP) Summary Reports for 2012 to 2016 (**TABLE 3-1**) were used to develop average day demands (AVDY) and maximum day demands (MXDY) for the new developments.

During 2012 to 2016, the average flow rate obtained at the WTP was approximately 7,806 m^3/d, while the maximum flow rate obtained was approximately 14,053 m^3/d. The MXDY factor was therefore, calculated to be 1.80 (MXDY/AVDY). It should be note that these flow rates include residential as well as industrial, commercial, and institutional (ICI) water consumption and is

considered as mixed-use demands. The per capita mixed-use demands based on 2016 populations is calculated and presented in **TABLE 3-2**.

TABLE 3-1: HISTORICAL WATER DEMAND IN TOWN OF AMHERSTBURG (2012-2016)

Year	Average Day Flow (m^3/d)	Maximum Day Flow (m^3/d)
2012	7,787	14,053
2013	7,580	11,962
2014	8,025	11,804
2015	7,672	10,948
2016	7,721	13,951
AVG	7,806	-
MAX	-	14,053

TABLE 3-2: PER CAPITA WATER DEMANDS

Type	Demand (L/cap/day)
AVDY	356
MXDY	641

The per capita AVDY demand presented in **TABLE 3-2** falls within the 270 to 450 L/cap/day range as per MOECC Design Guidelines for Drinking-Water Systems(2008). Similarly, the maximum day factor of 1.80 is comparable to the maximum day factor of 1.90 proposed by the MOECC for a population between 10,000 and 25,000, when suitable historical data is not available. Therefore, the maximum daily flows observed at the Town's WTP can be classified as typical flows. The average AVDY and MXDY demands presented in **TABLE 3-2** were used to scale demands from the Town's most up-to-date model to reflect the changes in flow demands with respect to the previous demands.

Based on the per capita water demands calculated, the water demands of each development is estimated and presented in **TABLE 3-3**.

TABLE 3-3: ESTIMATED WATER DEMANDS OF NEW DEVELOPMENTS

Development	Average Day Flow (m^3/d)	Maximum Day Flow (m^3/d)
Rocksedge	623	1,121
Hunt Club Creek	1,247	2,245
Walker Aggregates	448	807
Amico	675	1,215
Capo D'Aqua	141	253
Total	***3,134***	***5,641***

3.4 HYDRAULIC MODEL UPDATE

A hydraulic analysis was carried out using H2OMAP Water v9.6 Software by Innovyze. Updates were made to the Town's previous model from the 2010 Master Plan to represent current conditions of the distribution system and includes the five (5) proposed developments for future conditions. The hydraulic analysis was performed to identify existing watermain updates, as well as providing a preliminary layout for the proposed developments.

The most up-to-date hydraulic model of the Town's water distribution system was compared with the Town's current GIS database for watermains to identify any recent upgrades. Updates were made to the model where discrepancies were found between the model and the Town's GIS database. Lands that have been developed after the Town's previous hydraulic model were also added as part of the model update. **Figure W-3** within **Appendix A** shows the location of pipes that were updated in the model based on the Town's current GIS data. The new elevated storage tank was also added to the model with the same dimensions and operations as the old tank.

3.4.1 Hazen-Williams Coefficients

Hazen-Williams coefficients (C-Factors) based on pipe diameters were applied to new watermain within the proposed developments in accordance with MOECC Design Guidelines for Drinking-Water Systems (2008) as presented in **TABLE 3-4**.

TABLE 3-4: HAZEN WILLIAMS C FACTORS FOR DIFFERENT PIPE SIZES

Pipe Diameter (mm)	C-Factor
150	100
200 to 305	110
305 to 600	120
> 600	130

3.4.2 Ground Elevations

Ground elevations of the southern part of Town were obtained from the Town's GIS database and assigned to model nodes within the proposed developments based on spatial distribution.

Ground elevations within the proposed developments vary from approximately 175m at the north-west corner of the Hunt Club Creek development (near the wetlands) to approximately 182m at the north end of the Rocksedge development. The lowest elevation attributed to a model node is 175.4m located in the Amico development. Whereas, the highest node elevation is 181.8m located in the Rocksedge development. The elevations for all nodes within the proposed developments if shown in **Figure W-4**.

3.4.3 Demand Allocation & Diurnal Patterns

The demands calculated for the five (5) proposed developments were allocated to the model nodes based on surrounding lots where information was available. Where watermain alignments were assumed (Walker Aggregates), the demands were distributed evenly amongst the model nodes within the area.

The diurnal patterns used for average day and maximum day were adapted from the previous model.

3.5 HYDRAULIC ANALYSIS

Hydraulic modeling was performed with the updated water model to examine the operating pressures and available fire flows at 20 psi within the proposed developments.

3.5.1 Peak Hour Demand

Results from hydraulic modeling showed minimum pressures ranging from 338 – 386 kPa (49 – 56 psi) with the elevated tank operating between 40 – 98% full. This meets the minimum pressure objective. Minimum pressures under peak hour demand within the proposed developments are shown in **Figure W-5**.

3.5.2 Average Day Demand

Results from hydraulic modeling showed maximum pressures ranging from 421 – 476 kPa (61 – 69 psi) with the elevated tank operating between 60 – 98%. This meets the maximum pressure objective. Maximum pressures under average day demand within the proposed developments are shown in **Figure W-6**.

3.5.3 Maximum Day Plus Fire Flow

Using the proposed pipe alignment and sizing, modeling results show available fire flows are anticipated to be greater than 7,500 L/min (125 L/s) in most areas in the new developments (refer to **Figure W-7**). Fire flows in the range of 4,500 – 7,500 L/min (75 – 125 L/s) were observed at a few locations where internal piping branched off of larger diameter watermains through the developments. Fire flows less than 4,500 L/min (75 L/s) were observed at three (3) dead-end locations.

As mentioned in **Section 3.2**, it is proposed that for residential developments, the Town of Amherstburg use 7,500 L/min as a fire flow target which is achieved at most locations in the new developments. Internal pipe sizing will need to be confirmed for their ability to provide the required FUS fire flow based on proposed unit types and construction at the detailed design stage.

4.0 SANITARY DESIGN CRITERIA

The sanitary design criteria utilized for the Town of Amherstburg Southeast Quadrant Sanitary and Water Servicing Study is based on the Town's current design standards and the MOECC Sewage Design Guidelines (2008).

The sanitary design criteria establish the parameters utilized to develop projected flows, evaluate system capacities and determine future needs.

4.1 WASTEWATER FLOW CRITERIA

Municipal wastewater flows are made up of waste discharges from residential, industrial, commercial, and institutional establishments plus extraneous non-waste flow components from sources such as groundwater and surface runoff.

Extraneous flow includes inflow and infiltration (I&I). Infiltration is water entering a sewer system and service connections from the ground through such means as defective pipes, pipe joints, connections and manholes. Inflow is water discharged into a sewer system and service connections from such sources as roof leaders, cellar, yard and area drains, foundation drains, cooling water discharges, drains from springs and swampy areas, manhole covers, cross connections from storm sewers and combined sewers, catch basins, storm water, surface run-off and street washes or drainage. In general, inflow increases with the amount of precipitation. Increases in inflow have also been observed during winter thaws that produce runoff from melting of accumulated snow cover.

According to the MOECC Sewage Design Guidelines for Sewage Works (2008), the recommended design value for average daily domestic flow ranges from 225 to 450 L/cap/day plus an extraneous flow allowance. The MOECC sewage design guidelines recommend an allowance of 90 L/cap/day average daily extraneous flow and 227 L/cap/day for peak extraneous flow. The guidelines further recommend the domestic component of the peak sewage flow be calculated using peaking factors in accordance with the Harmon Formula.

Projected wastewater flows for the existing sewer system in the Town and future development within the southeast quadrant was established based on the Town's standard design criteria. This design criteria generally complies with the MOECC sewage design guidelines noted above and is considered a conservative approach when estimating wastewater flows. Past experience and studies have shown that the design parameters used to estimate peak sewage flows are notably conservative and thus yield higher flow rates than measured actual peak flows.

The design criteria used in the analysis is present in **TABLE 4-1**

TABLE 4-1: SANITARY FLOW PROJECTION DESIGN CRITERIA

Parameter	Design Criteria
Hydraulic sewer sizing	Manning's Equation
Manning's Roughness Coefficient 'n'	0.013
Peaking Factor	Based on Harmon Formula
Infiltration allowance/peak extraneous flow	0.21 L/ha/s (18,144 L/ha/day)
Industrial/Commercial/Institutional (ICI) population densities	35 persons/ha
Residential population densities	3.5 persons/unit
Average daily domestic flow	450 L/cap/day
Note: The Town of Amherstburg design parameters are considered conservative values when estimating peak sewage flows.	

4.2 TRIBUTARY AREAS AND POPULATIONS

4.2.1 Existing Sanitary Servicing Area

For the existing AWWTP service area, the tributary areas and populations were estimated. Refer to **Figure S-5.1 and Figure S-5.2** within **Appendix A** for the proposed sanitary servicing plan. Tributary areas were estimated based on a review of the Town's existing sanitary sewer system while populations were estimated based on industrial, commercial, and institutional land use and the existing number of homes within the tributary areas. Equivalent residential population densities were estimated for schools, apartments and assisted living centers, within the tributary areas, as identified in **Appendix B**.

Error! Reference source not found. presents the estimated tributary areas and populations based on the Town's existing sanitary collection system.

TABLE 4-2: EXISTING TRIBUTARY AREAS AND POPULATIONS

Sub-Catchment Block	Estimated Tributary Area (ha)	Industrial, Commercial and Institutional (ICI) Area (ha)	Existing Number of Homes	Estimated Tributary population (persons)
A	334.11	71.00	2400	10885
B	0.93	0.00	14	49
C	4.75	2.91	27	196
D	1.36	0.00	30	105
E	5.03	0.00	95	333
F	2.30	0.00	28	98
G	1.22	0.62	6	43
H	2.42	0.16	26	97
I	1.91	0.00	23	81

TABLE 4-2: EXISTING TRIBUTARY AREAS AND POPULATIONS

Sub-Catchment Block	Estimated Tributary Area (ha)	Industrial, Commercial and Institutional (ICI) Area (ha)	Existing Number of Homes	Estimated Tributary population (persons)
J	6.00	0.00	63	221
K	3.15	0.00	41	144
L	3.63	0.00	44	154
M	6.32	2.95	35	226
N	3.89	1.00	62	252
O	14.81	6.40	84	518
P	3.99	0.00	44	154
Q	40.93	16.82	220	1359
R	16.95	10.36	199	1059
S	26.14	0.40	356	1260
T	13.40	3.27	108	492
U	35.41	1.87	332	1227
V	31.86	2.40	479	1761
Total	***560.52***	***120.16***	***4716***	***20712***

4.2.2 Southeast Quadrant Sanitary Service Area

For the southeast quadrant proposed sanitary service plan, as identified in **Figure S-5.2**, the proposed new developments and existing residential areas were established. The future population densities were conservatively estimated based on discussions with the Town, the developers and existing residential areas of similar size within the Town of Amherstburg. The site layouts provided were used for preliminary residential lot estimates only and will likely change due to the close proximity of environmentally protected lands, municipal drains and changing stormwater management design criteria by The Ontario Ministry of the Environment and Climate Change (MOECC).

4.2.2.1 Rocksedge Development

The Rocksedge development is approximately 67.64 ha in size and fronts Simcoe Street, Fryer Street, and Lowes Sideroad. Due to the fall of the land, as discussed earlier, it is recommended that the servicing requirements for the proposed new development drain by gravity to a new sanitary pumping station located on Lowes Sideroad. Stantec contacted the developer for a preliminary site layout, however, the developer could not provide site plans at this time. A future population density was estimated based on existing residential areas of similar size to ensure a new forcemain and pumping station, within the southeast quadrant, are properly sized. An estimated 500 residential lots was used for the approximately 67.64 ha area. This value takes into consideration the possibility for future semi-detached housing.

4.2.2.2 Hunt Club Creek Development

The Hunt Club Creek development is approximately 96.25 ha in size and the developer was able to provide a preliminary site layout to estimate the future population density. The Hunt Club Creek development site layout depicts 592 single family residential lots, 104 semi-detached residential lots (208 units) and 1 existing single family residential lot to remain at the south end of Concession 2 South. There is also approximately 10.0 hectares (ha) of land to the west of Concession 2 South that the site layout does not provide details for. An estimated 150 residential lots was used for the approximately 10.0 ha area and accounts for possible semi-detached housing. In addition, 50 lots were added to the preliminary site layout to account for the possibility of additional semi-detached housing.

4.2.2.3 Amico Development

The Amico development is split into an approximately 17.2 ha area and an approximately 10.3 ha area by the Big Creek wet lands. The developer was able to provide Stantec with a preliminary site layout to estimate future population density. The Amico development site layout depicts the 17.2 ha area east of Big Creek with 98 single family residential lots and 32 semi-detached residential lots (64 units). The 10.3 ha area west of Big Creek depicts 29 single family residential lots, 23 semi-detached residential lots (46 units), a 75 unit apartment complex and a 120 unit apartment complex.

4.2.2.4 Capo D'Aqua Development

The Capo D'Aqua development is 42.67 ha in size, however, only approximately 30.36 ha is proposed to be developed just north of the section of Big Creek that crosses through the property. The developer was able to provide a preliminary site layout to estimate the future population density. The Capo D'Aqua development site layout depicts 113 single family residential lots.

4.2.2.5 Walker Aggregates Development

The Walker Aggregates development is 39.9 ha in size, however, approximately 13.17 ha is Big Creek wet lands. This leaves the land spit into an approximately 9.06 ha area west of the Big Creek wet lands and an approximately 17.67 ha area east of the Big Creek wet lands. For the Walker Aggregates development, Stantec contacted the developer and requested any available information for future development plans. Walker Aggregates responded by stating there is currently no future development plans for the area and will continue to be used for agricultural purposes and a buffer for Amherst Quarries. Although Walker Aggerates does not have future development plans for the area, a future population density was estimated based on existing residential areas of similar size to ensure a new forcemain and pumping station, within the southeast quadrant, are properly sized. An estimated 150 residential lots was used for the approximately 9.06 ha area and an estimated 200 residential lots was used for the approximately 17.67 ha area. These values take into consideration the possibility for future semi-detached housing.

4.2.2.6 Existing Residential

In addition to the proposed new developments, there are approx. 26 existing residential lots along Lowes Sideroad, Fryer Street and Concession Road 2 South, that would also need to be considered for servicing to ensure a new forcemain and pumping station, within the southeast quadrant, are properly sized. The existing residential lots in the southeast quadrant covers an area of approx. 15.05 ha

TABLE 4-3 presents the southeast quadrant sanitary service areas and populations based on discussions with the Town, the developers and existing residential areas of similar size. The methodology on how the future populations were calculated were based on a conservative approach to ensure existing sanitary trunk sewers, within the Town, had sufficient capacity to handle the wastewater generated by the southeast quadrant.

TABLE 4-3: SOUTHEAST QUADRANT TRIBUTARY AREAS AND POPULATIONS

Development	Estimated Tributary Area (ha)	Number of Residential Lots	Estimated Tributary population (persons)
Rocksedge	67.64	500	1750
Hunt Club Creek	96.25	1001	3504
Amico	27.50	432	1512
Capo D'Aqua	30.36*	113	396
Walker Aggregates	26.73*	350	1225
Existing Residential	15.05	26	91
Total	***263.53***	***2422***	***8477***

* Capo D'Aqua development has a total area of 42.67 ha, however, only approximately 30.36 ha to be developed. Walker Aggregates development has a total area of 39.90 ha, however, approximately 13.17 ha is Big Creek wet land.

4.3 EXISTING AND PROJECTED WASTEWATER FLOWS

The existing sanitary sewer capacities, within the AWWTP service area, were evaluated to determine if the existing sanitary sewer system is adequate to convey additional wastewater flows generated by the proposed new developments in the southeast quadrant of the Town.

The associated sanitary sewer design spreadsheets included in **Appendix C** were created using record drawings and the above noted design parameters for the AWWTP sanitary service area. The future sanitary sewers are preliminary designs only and should be confirmed during the detailed design stage. The associated sanitary sewer design spreadsheets were used to determine the theoretical Total Sewage and Infiltration Maximum Flow from the existing and proposed developments, within the Town of Amherstburg, that can be conveyed to the AWWTP without exceeding the sanitary trunk sewer capacities.

4.3.1 Existing Wastewater Flows and Capacity of Sewers

The Town's wastewater collection system is separated into four (4) sanitary trunk sewers that convey flows to the Main Sewage Pumping Station No. 2, as discussed earlier. The four (4) sanitary trunk sewers, as identified in **Figure S-4,** were evaluated to determine the existing peak flows they receive and their respective capacities.

The four (4) trunk sewer capacities were derived based on Manning Equation. The Manning Equation determines the capacity of a gravity pipe given the diameter, roughness coefficient, velocity and slope. Furthermore, the design of gravity sewers is typically based on maintaining a minimum self-cleaning velocity in the pipe through a combination of diameter and slope. The Town's standard design criteria state a minimum flow velocity of 0.76 m/s while the MOECC sewage design guidelines state a minimum flow velocity of 0.60 m/s to attain self-cleaning velocities.

With the use of the above noted design parameters, **Sanitary Sewer Design Sheet 1 – Existing Service Area** shows a Total Sewage and Infiltration Maximum Flow from the Town's wastewater collection system to the Main Sewage Pumping Station No. 2 of **481.59 L/s**, which ultimately discharges to the AWWTP.

The **Sanitary Sewer Design Sheet 1 – Existing Service Area** determined that Dalhousie Street south sanitary service area **(Trunk Sewer 1)** and Pickering Drive sanitary service area **(Trunk Sewer 2)** are currently at theoretical design capacity and would not be suitable to service the proposed new developments in the southeast quadrant. It also determined the Park Street and Simcoe Street service area **(Trunk Sewer 3)** and Dalhousie Street north sanitary service area **(Trunk Sewer 4)** have significant excess capacity and would be suitable to service the proposed new developments in the southeast quadrant.

Furthermore, flow monitoring was performed in 2017 by Civica Infrastructure Inc. for the Dalhousie Street south sanitary service area **(Trunk Sewer 1)**. The flow monitoring results show the 300 mm dia. sanitary sewer has inflow and infiltration (I&I) issues affecting the sewer capacity. It is expected that the 1974 constructed asbestos cement sewer along Dalhousie Street is experiencing higher than standard inflow and infiltration. It is considered that the excess amount of inflow and infiltration that enters the Dalhousie Street sanitary sewer system could be due to the age and poor condition of the asbestos cement sewer system, the presence of direct connections as well as the location of the sanitary sewer, which is near the Detroit River. It is not recommended that addition developments be added to Dalhousie Street south sanitary service area **(Trunk Sewer 1)** until rehabilitation and mitigation projects are identified and implemented for this sanitary sewer system.

The existing wastewater flows and the sanitary trunk sewer capacities for the AWWTP service area are presented in **TABLE 4-4** and were used for the design and analysis of the southeast quadrant servicing area.

TABLE 4-4: EXISTING WASTEWATER FLOWS AND TRUNK SEWER CAPACITY

Trunk Sewer No.	Service Area (ha)	Sewer Size(mm)	Capacity of Sewer (L/s)	Existing Theoretical Maximum Flow (L/s)	Excess Capacity (L/s)
Trunk Sewer 1	31.86	300	37.50	39.96	0
Trunk Sewer 2[a]	91.90	375	84.10	89.34	0
Trunk Sewer 3	95.61	750	334.00	**84.53**	249.47
Trunk Sewer 4[b]	528.66	1067	1274.80	**441.63**	833.17

Note: Existing wastewater flow was calculated based on record drawings and the Town's standard design criteria.

a) Pumping Station No. 3 contributes wastewater flows to the service area.

b) Trunk Sewer No. 2, Trunk Sewer No. 3, Pumping Station No. 4 and Nexen Pumping Station contribute wastewater flows to the service area.

4.3.2 Projected Wastewater Flows

For the southeast quadrant sanitary service area, various development scenarios were examined to determine the proposed new forcemain and pumping station size and location as well as verify if **Trunk Sewer 3** or **Trunk Sewer 4** have sufficient capacity for the additional wastewater flows. Projected peak wastewater flows from the existing residential lots and proposed developments were derived based on the above noted design parameters.

The following scenarios were also examined due to the probability that all five (5) proposed developments would not be developed at the same time. The proposed new forcemain and pumping station sizes and subsequent cost sharing schemes are dependent on the sequence in which the developers develop their lands.

For **Trunk Sewer 3** it should be noted that the 525 mm dia. sanitary sewer, approximately 262 m in length, along Fryer Street (Simcoe Street to Pickering Drive) has a sanitary sewer design peak flow capacity of approximately 160.90 L/s. The wastewater generated from the proposed new developments in the southeast quadrant that are greater than 160.90 L/s may encounter a bottleneck condition prior to discharging to the 750 mm dia. sanitary trunk sewer. Although, the design parameters used to estimate peak sewage flows are notably conservative and thus yield higher flow rates than measured actual peak flows, flow monitoring should be completed to ensure surcharging does not occur in the 525 mm dia. sanitary sewer.

4.3.2.1 Scenario 1 (Preferred Strategy)

The peak wastewater flows from the ultimate buildout of the southeast quadrant was first examined, as depicted in **Figure S-6** within **Appendix A**, to determine forcemain and pumping station size and determine if the Town's existing infrastructure had the capacity to receive the additional peak wastewater flows. **Sanitary Sewer Design Sheet 2 – Scenario 1**, located in **Appendix C**, shows a Total Sewage and Infiltration Maximum Flow of **188.92 L/s** from the five (5) proposed developments and approximately 26 existing residential lots.

It was determined that **Trunk Sewer No. 3** and **Trunk Sewer No. 4** currently have sufficient capacity to handle the additional peak wastewater flows from the ultimate buildout of the southeast quadrant. This scenario is the preferred strategy that will permit the development of any variation of land in the southeast quadrant.

4.3.2.2 Scenario 2

The peak wastewater flows from the following developments, as depicted in **Figure S-7**, was examined to determine forcemain and pumping station size:

- Rocksedge Development
- Hunt Club Creek Development
- The 26 existing residential lots within the southeast quadrant

Sanitary Sewer Design Sheet 3 – Scenario 2 shows a Total Sewage and Infiltration Maximum Flow of **127.16 L/s**.

4.3.2.3 Scenario 3

The peak wastewater flows from the following developments, as depicted in **Figure S-8**, was examined to determine forcemain and pumping station size:

- Rocksedge Development
- Hunt Club Creek Development
- Amico Development (17.2 Ha area east of the Big Creek wet lands)
- The 26 existing residential lots within the southeast quadrant

Sanitary Sewer Design Sheet 4 – Scenario 3 shows a Total Sewage and Infiltration Maximum Flow of **139.00 L/s**

4.3.2.4 Scenario 4

The peak wastewater flows from the following developments, as depicted in **Figure S-9**, was examined to determine forcemain and pumping station size:

- Rocksedge Development
- Hunt Club Creek Development
- Amico Development (Full)
- Capo D'Aqua Development
- The 26 existing residential lots within the southeast quadrant

Sanitary Sewer Design Sheet 5 – Scenario 4 shows a Total Sewage and Infiltration Maximum Flow of **166.51 L/s**

4.3.2.5 Scenario 5

The peak wastewater flows from the following developments, as depicted in **Figure S-10**, was examined to determine forcemain and pumping station size:

- Rocksedge Development
- Hunt Club Creek Development
- Amico Development (17.2 Ha area east of the Big Creek wet lands)
- Walker Aggregates Development (26.73 ha)
- The 26 existing residential lots within the southeast quadrant

Sanitary Sewer Design Sheet 6 – Scenario 5 shows a Total Sewage and Infiltration Maximum Flow of **161.97 L/s**

4.3.2.6 Scenario Summary

The projected peak wastewater flows for a proposed new pumping station capacity and forcemain size for the five (5) development scenarios in the southeast quadrant are summarized in **TABLE 4-5.** A new sanitary trunk sewer along Lowes Sideroad will be required to collect wastewater from the ultimate buildout of the southeast quadrant and discharge to the new pumping station.

TABLE 4-5: SOUTHEAST QUADRANT PROJECTED WASTEWATER FLOWS

Scenario	Estimated Tributary Area (ha)	Projected Maximum Flow (L/s)	New Forcemain Size (mm)	New Sanitary Trunk Sewer Size (mm)	Trunk Sewer No. 3 Maximum Flow (L/s)	Trunk Sewer No. 4 Maximum Flow (L/s)
1*	263.53	188.92	350	675	257.10	592.21
2	178.94	127.16	300	675	198.56	540.02
3	196.14	139.00	300	675	209.73	549.92
4	236.80	166.51	350	675	235.80	573.23
5	222.87	161.97	350	675	231.38	569.04

Note: Projected wastewater flow from the southeast quadrant were calculated based on the estimated tributary area and population density and the Town's standard design criteria.
*Preferred Strategy for servicing the southeast quadrant.

5.0 INFRASTRUCTURE REQUIREMENTS

5.1 SANITARY

An analysis was carried out to identify needs for sanitary sewage upgrades to adequately service the proposed new developments in the southeast quadrant of the Town. Various development scenarios were examined to determine the proposed new forcemain and pumping station size due to the probability that all five (5) proposed developments would not be developed at the same time. However, it was determined as the preferred strategy that since all the proposed developments identified in this report will likely eventually be constructed, the Town should consider installing the necessary infrastructure to service the ultimate buildout **(Scenario 1)**. It would be more cost effective for all five (5) proposed developments in the southeast quadrant to share the cost with the Town for installing the necessary infrastructure to service the ultimate buildout. If the necessary infrastructure isn't installed to service the ultimate buildout, future upgrades would be costly.

In order to accommodate ultimate buildout of all the potential developments identified in this report, a new sanitary pumping station (PS No. 1) with a firm capacity of 188.92 L/s should be constructed along Lowes Sideroad approximately 500 m east of Fryer Street, near 2nd Concession Road Drain South with a 350 mm dia. forcemain heading north along Fryer Street and discharging to the existing 525 mm dia. sanitary sewer south of Simcoe Street, as depicted in **Figure S-6**. The sewage from the ultimate buildout is to be collected by a new 675 mm dia. sanitary trunk sewer installed on Lowes Sideroad, east of Fryer Street, which would discharge to the new pump station.

A second pumping station (PS No.2) with a firm capacity of 35.61 L/s should also be constructed west of Big Creek within the Amico development with a 200 mm dia. forcemain heading east under Big Creek to Concession Road 2 South. The forcemain is to discharge to a new 450 mm dia. sanitary trunk sewer along Concession Road 2 South that will collect additional flows from the proposed new developments and discharge to the proposed 675 mm dia. sanitary truck sewer along Lowes Sideroad.

The proposed pumping stations will require three phase power, and a generator for backup power. The Town will need to acquire land for the proposed new pumping stations and actual location to be determined during the detailed design stages.

A review of the hydro infrastructure surrounding the southeast quadrant confirmed three phase power is available along County Road No. 20 and Lowes Sideroad to allow for the orderly development of the lands.

Stantec also considered locating the PS No. 1 at the more central intersection of Lowes Sideroad and Fryer Street, however it was found that the selected location is ideal to accommodate the lay of the land, which falls towards the Big Creek wetlands. It was also found that the sanitary

sewer could be constructed at higher elevations if the pumping station is at the selected location, which contributes to cost savings.

5.2 WATER

Water servicing for the proposed developments follows the proposed plan outlined in the 2010 Water (Distribution) Master Plan and Water Tower Class EA (Stantec Consulting Ltd.). Updates were made to the Town's previous model from the 2010 Master Plan to represent current conditions of the distribution system and includes the five (5) proposed developments for future conditions. A hydraulic analysis was carried out to identify needs for watermain upgrades to adequately service the proposed new developments in the southeast quadrant of the Town while taking into consideration future looping potential.

In order to accommodate future growth within the study area it is recommended to Upsize the watermains along Lowes Sideroad (east of Fryer Street) and Concession Road 2 South (south of Lowes Sideroad) from 50 mm to 300 mm in diameter. It is also recommended to extend the watermains along Lowes Side road up to Meloche Road for improved looping and water distribution, as depicted in **Figure W-2**.

Hydraulic modeling results show the existing water distribution system along with the proposed watermains can provide the domestic demands of the proposed developments. Furthermore, fire flows of 7,500 L/min and greater can be achieved at most locations in the new developments during maximum demand conditions. FUS fire flow calculations and internal pipe sizing will need to be confirmed at the detailed design stage.

6.0 OPINION OF PROBABLE COST AND COST SHARING

6.1 GENERAL

This section discusses and provides an opinion on the probable cost of the preferred strategy for the design and construction of new sanitary trunk sewers, forcemains and pumping stations for the ultimate buildout **(Scenario 1)** of the southeast quadrant in the Town of Amherstburg.

An opinion of probable cost for the design and construction of new sanitary trunk sewers, forcemains and pumping stations have been developed to project what someone else would be willing to contract for in the future to do design and construction work which has not yet been defined in detail and which is subject to changes in scope, design and market conditions.

6.2 LEVEL OF ACCURACY

Opinions of probable cost are typically provided throughout various stages of a project's life cycle. There are several classifications for estimates that identify typical minimum and maximum probable costs or levels of accuracy. These classifications vary widely by industry and the level of accuracy is directly proportional to the level of detail available at the time the opinions of probable cost are prepared at each stage of the project.

The level of accuracy increases as the project moves through the various stages of the project life cycle from planning to preliminary design to final design. A wide range of accuracy would be expected at the planning stage of project development because many details are unknown. As the project moves closer to completion of final design, the opinion of probable cost becomes more accurate due to the increased level of detail available and the reduced number of unknown issues.

The following **TABLE 6-1** summarizes typical cost classifications throughout a project's life cycle including a description of the project stage and range of accuracy.

The opinions of probable cost in **Section 6.3** below are estimated at the servicing study stage (Class 2) and the corresponding level of accuracy could range from –15% to +30% from the opinion presented in the report.

TABLE 6-1: CLASSIFICATION OF OPINIONS OF PROBABLE COST

Class	Description	Level of Accuracy	Stage of Project Lifecycle
1	Conceptual Stage	+50% to -30%	Screening of alternatives
2	Study Stage	+30% to -15%	Servicing study
3	Preliminary Stage	+25% to -10%	Pre-design report
4	Detailed Stage	+15% to -5%	Completed plans and specifications
5	Tender Stage	+10% to -3%	Tendered price (varies depending on the amount of contingency allowance consumed)

6.3 OPINION OF PROBABLE COST

The opinion of probable costs for the proposed servicing requirements for the southeast quadrant are presented below in **TABLE 6-2**. Refer to **Section 5.0** for explanation of proposed servicing requirements.

The following factors were considered when developing the opinions of probable cost:

- All estimates are 2017 dollars.
- It is assumed the Contractor will have unrestricted access to the site and will complete the work during normal working hours from 7:00 am to 6:00 pm Monday to Friday. There is no allowance for premium time included.
- Labour costs are based on union labour rates for the Windsor area.
- An allowance is included for mobilization and demobilization and the Contractor's overhead and profit.
- Equipment costs are based on vendor supplied price quotations and historical pricing of similar equipment.
- Bulk material and equipment rental costs used are typical for the Windsor area.
- Costs of application or permit fees are excluded.
- All taxes including HST are not included.
- Allowances for engineering and contingencies (15% and 10% respectively) are included.
- No allowance is included for interim financing costs or legal costs.
- Any costs for property acquisition is preliminary only. Actual cost may vary significantly.
- No allowance is included for escalation beyond the date of this report.

TABLE 6-2: OPINION OF PROBABLE COST

Scenario 1 (Preferred Strategy) Note: Refer to Section 5.0 for Explanation	
Section A - Fryer Street	
Construction of 350 mm Dia. Sanitary Forcemain	$449,550.00
Roadwork	$199,798.40
Miscellaneous Work	$33,700.00
Sub-Total for Section A	**$683,048.40**
Section B - Concession Rd 2 S	
Construction of 300 mm Dia. Watermain	$339,745.00
Roadwork	$124,073.76
Miscellaneous Work	$16,000.00
Sub-Total for Section B	**$479,818.76**
Section C - Lowes Side Road (East of Fryer Street)	
Construction of 675 mm Dia. Sanitary Sewer	$439,000.00
Construction of 350 mm dia. Sanitary Forcemain	$240,250.00
Construction of 300 mm Dia. Watermain	$717,305.00
Roadwork	$367,035.99
Miscellaneous Work	$49,300.00
Sub-Total for Section C	**$1,812,890.99**
Section D - Pumping Station Located on Lowes Sideroad	
Construction of a Pumping Station with Firm Capacity of 188.92 L/s and Backup Power	$1,750,000.00
Sub-Total for Section D	**$1,750,000.00**
Section E – Pumping Station Located West side of Big Creek	
Construction of 450 mm Dia. Sanitary Sewer (on Concession Rd 2 S)	$193,500.00
Construction of 200 mm dia. Sanitary Forcemain (under Big Creek)	$258,250.00
Construction of a Pumping Station with Firm Capacity of 35.61 L/s and Backup Power	$1,400,000.00
Roadwork	$86,900.50
Miscellaneous Work	$16,000.00
Sub-Total for Section E	**$1,954,650.50**
Sub - Total	**$6,680,408.65**
Contingency Allowance (+/-10%)	**$668,100.00**
Engineering, Inspection and Contract Administration (+/-15%)	**$1,102,400.00**
Class Environmental Assessment Report if Required	**$80,000.00**
Land Acquisition required for Pumping Station	**$450,000.00**
Utility Relocation	**$30,000.00**
Total (Not Incl. H.S.T.)	**$9,011,000.00**

6.4 COST SHARING

The cost sharing formulae are to be fair and equitable to all participants and the capital costs for provision of infrastructure is to include all applicable construction, engineering, legal and financing costs. The total costs of providing the infrastructure is to be reduced by any subsidies or grants received for the project. Costs for new roads as well as improvement to existing roads as identified by the Town's Transportation Engineer are **Not** included.

The capital cost sharing for the new sanitary sewers, forcemains and pumping stations are based on the proportion of each developers' land holdings (as identified in **TABLE 2-3**) to potentially utilize the infrastructure within the southeast quadrant of the Town.

The preliminary opinion of probable costs for the infrastructure required to service the developable lands includes a 10% allowance for contingencies and a 15% allowance for engineering fees, which is to be shared based on the percentage of each owner's land holdings for all properties within the southeast quadrant of the Town. Miscellaneous costs for geotechnical investigations, topographical surveys, transportation study, application fees, etc. will also be shared based on the percentage of each owner's land holdings for all properties within the southeast quadrant of the Town.

It is recommended that the Town take on the role of facilitator with respect to cost recovery. The costs for shared infrastructure are to be recovered incrementally based on the cost sharing formula described herein as well as the phasing of future developments within the southeast quadrant. Compensation will be recovered during the development approval process and full compensation will be obtained upon full buildout of the sites.

All costs presented in this study are preliminary opinions of probable cost and the cost sharing for these works is to be based on the final value of construction.

TABLE 6-3 outlines the respective owner's responsibility towards cost sharing the new sanitary sewer, forcemain and pumping station infrastructure.

TABLE 6-3: COST SHARING

Development	Total Area (ha)	Assessed Area (ha)	Assessment
Rocksedge Development	67.64	67.64	$2,452,929.97
Hunt Club Creek Development	96.25	96.25	$3,490,456.98
Walker Aggregates Development	39.9	26.73	$969,349.77
Amico Development	27.5	27.5	$997,273.42
Capo D'Aqua Development	42.67	30.36	$1,100,989.86
Total	**273.96**	**248.48**	**$9,011,000.00**
Price per hectare			**$36,264.49**

7.0 SUMMARY

7.1 RECOMMENDATIONS

In order to accommodate future development in the southeast quadrant of the Town of Amherstburg, upgrades to the existing sanitary sewer system and water distribution system will be required. It is recommended that the Town proceed to detailed design and construction of the following works in accordance with available funding from the capital budget and assessments to benefitting property owners:

- A sanitary pumping station with a firm capacity of 188.92 L/s should be constructed along Lowes Sideroad with a 350 mm dia. forcemain heading north along Fryer Street and discharging to the existing 525 mm dia. sanitary sewer south of Simcoe Street. The pumping station will require three phase power, and a generator for backup power.
- A 675 mm dia. sanitary trunk sewer should be constructed along Lowes Sideroad (east of Fryer Street), which would collect wastewater from the proposed new development and existing residential lots and discharge to the new pumping station.
- Upsizing the watermains along Lowes Sideroad (Fryer Street) and Concession Road 2 South (south of Lowes Sideroad) from 50 mm to 300 mm in diameter are recommended. It is also recommended to extend the watermains along Lowes Sideroad up to Meloche Road for better looping and water distribution.
- A sanitary pumping station with a firm capacity of 35.61 L/s should be constructed on the west side of Big Creek within the Amico development with a 200 mm dia. forcemain heading east under Big Creek to Concession Road 2 South. The forcemain is to discharge to a new 450 mm dia. sanitary trunk sewer along Concession Road 2 South that will collect additional flows from the proposed new developments and discharge to the proposed 675 mm dia. sanitary truck sewer along Lowes Sideroad.

Furthermore, Stantec recommends borehole testing be conducted along Lowes Sideroad prior to any works taking place to verify bedrock depths. Nearing the ultimate buildout of the southeast quadrant, flow monitoring should also be completed to ensure surcharging does not occur in the 525 mm dia. sanitary sewer south of Simcoe Street.

7.2 PERMITS AND APPROVALS

A MOECC Environmental Compliance Approval (ECA) (formerly known as a Certificate of Approval) is to be obtained prior to tendering the sanitary service portions of the project. Application is to be made upon completion of the design brief followed by completion of the detailed design drawings and specifications. A permit will also be required from the Essex

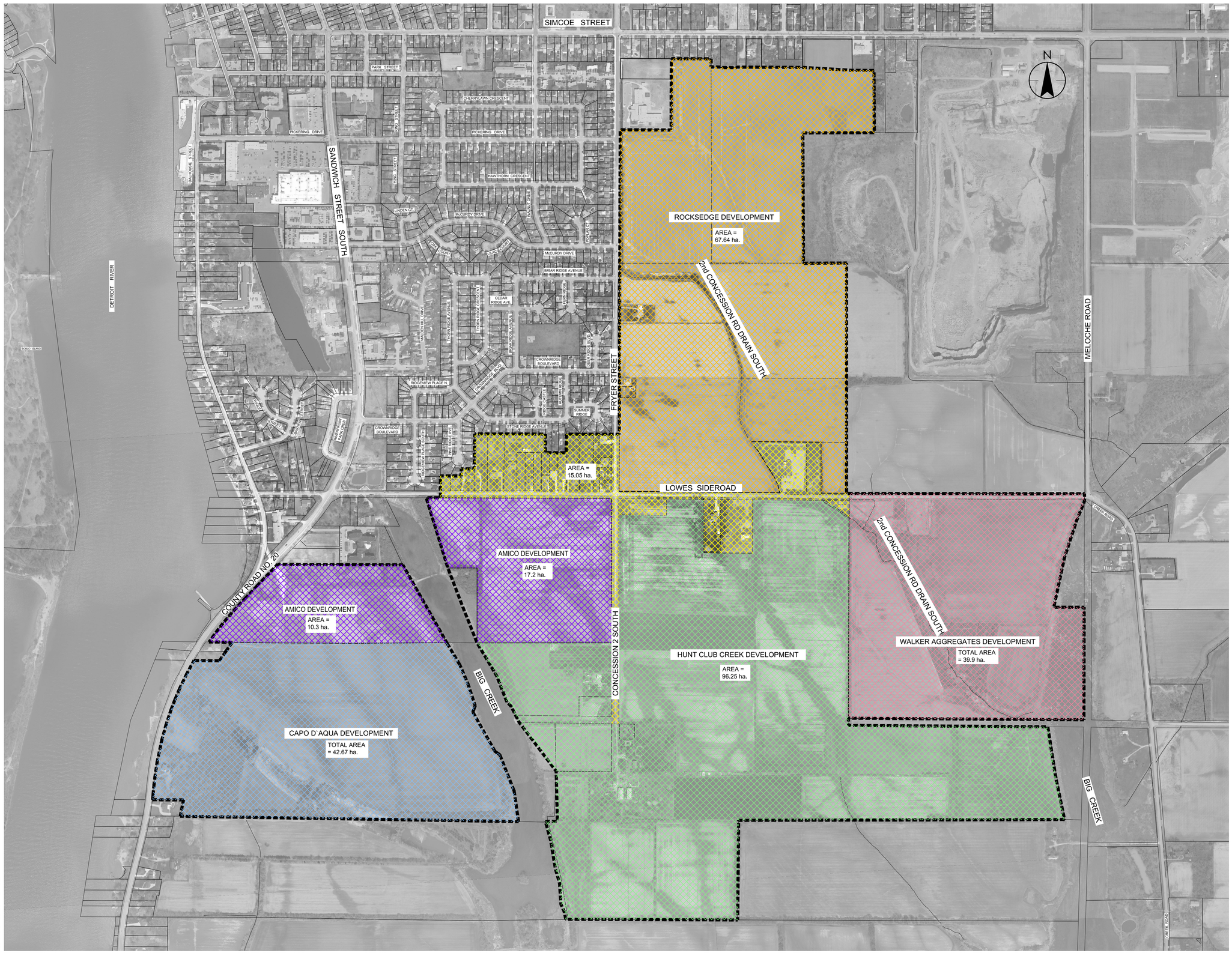
Regional Conservation Authority (ERCA) to cross any municipal drain and for all works in ERCA regulated lands. The permit should be obtained prior to tendering the project.

Stantec is not aware of any other regulatory permits and approvals that are necessary with respect to the proposed improvements.

8.0 REFERENCES

- C.N. Watson Limited & CH2M Hill Canada Limited. (2005). *Town of Amherstburg Water Rate Study.*
- RC Spencer Associates Incorporated. (2008). *Southeast Quadrant Master Servicing Study.*
- Stantec Consulting Limited. (2010). *Town of Amherstburg Water (Distribution) Master Plan and Water Tower Class Environmental Assessment*

Appendix A FIGURES



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Stantec

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Legend

- ROCKSEDGE DEVELOPMENT
- HUNT CLUB DEVELOPMENT
- WALKER AGGREGATES DEVELOPMENT
- AMICO DEVELOPMENT
- CAPO D`AQUA DEVELOPMENT
- EXISTING RESIDENTIAL
- SOUTHEAST QUADRANT SERVICE AREA

Notes

Revision	By	Appd.	YY.MM.DD

Issued	By	Appd.	YY.MM.DD

File Name: 165681084_FIG1.3-5 — Dwn. — Chkd. — Dsgn. — 2015.

Permit-Seal

PRELIMINARY
FOR DISCUSSION PURPOSES ONLY

Client/Project
TOWN OF AMHERSTBURG

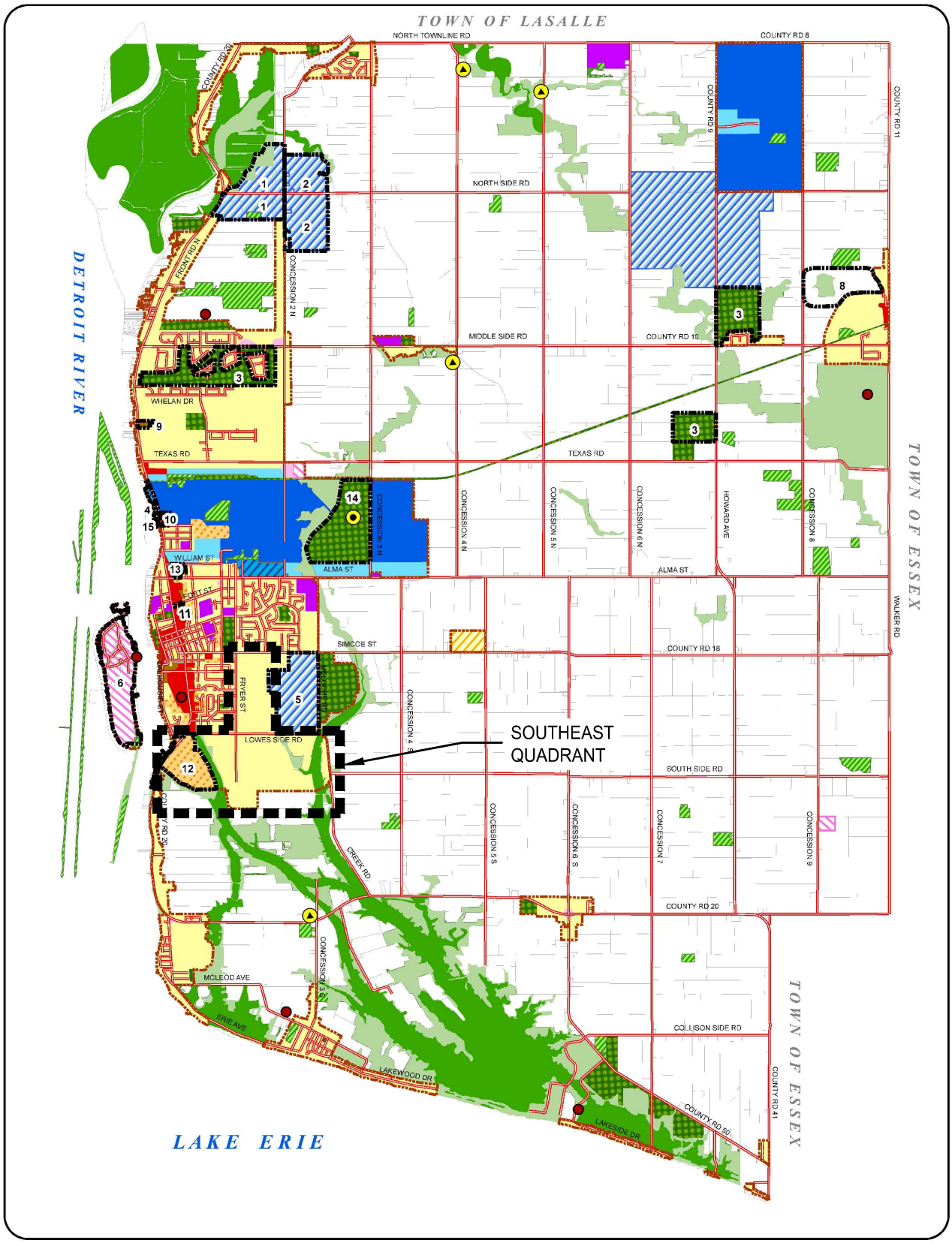
SOUTHEAST QUADRANT
SANITARY AND WATER SERVICING STUDY
Town of Amherstburg, ON Canada

Title
SOUTHEAST QUADRANT

Project No. 165620084 — Scale 1:5000

Drawing No. — Sheet — Revision

FIGURE S-1



TOWN OF AMHERSTBURG
OFFICIAL PLAN

SCHEDULE "A"
LAND USE PLAN

Legend

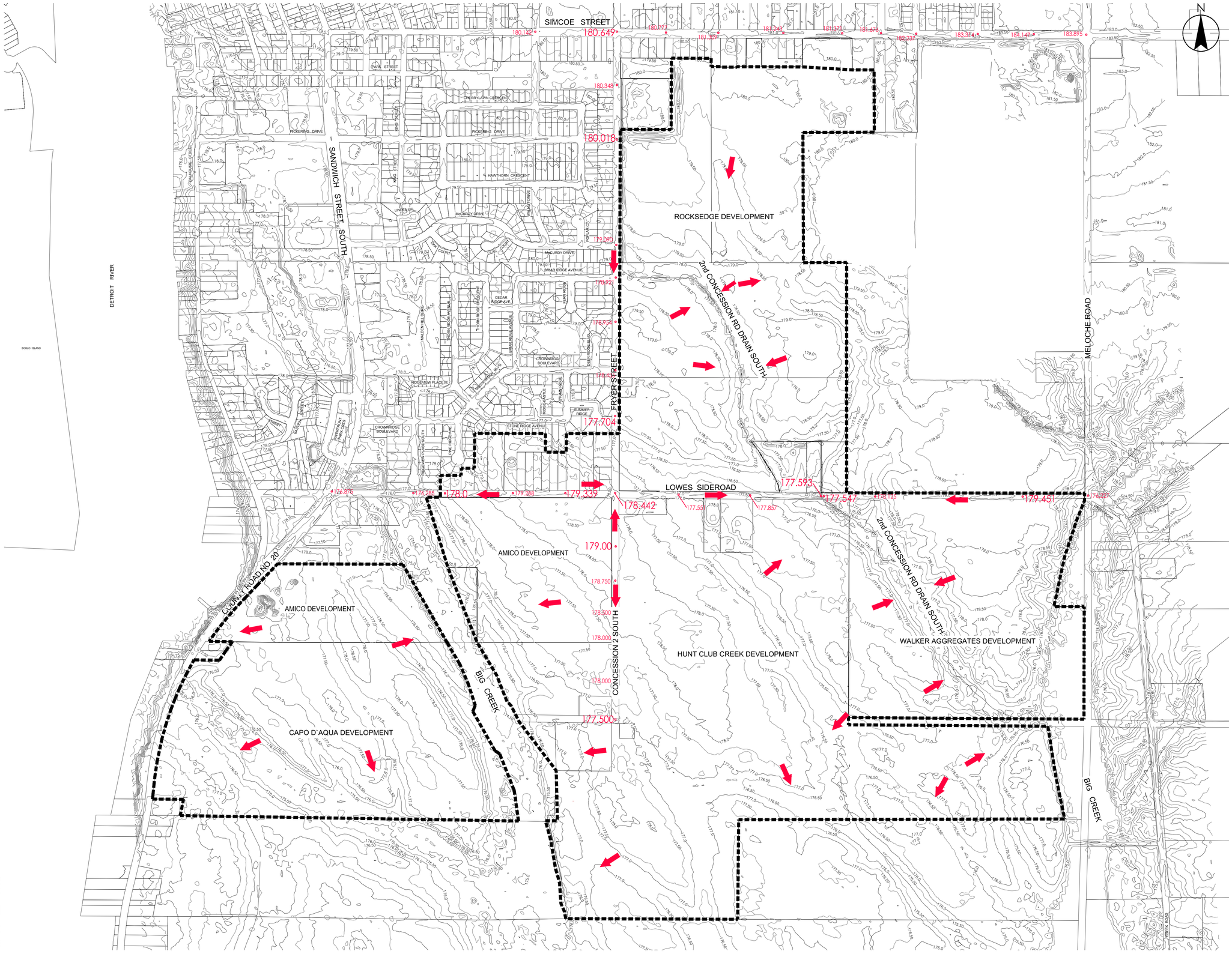
- Agricultural
- Settlement Area Boundary
- Provincially Significant Wetlands
- Natural Environment
- Woodlots
- Low Density Residential
- High Density Residential
- Medium Density Residential
- Office Residential
- Heritage Residential
- Modular Home Residential
- Neighbourhood Commercial
- General Commercial
- Special Industrial
- Light Industrial
- Heavy Industrial
- Extractive Industrial
- Institutional
- Recreational Development
- Open Space
- Special Policy
- Closed Landfill Site
- Open Landfill Site
- Sewage Treatment Facility

N

0 0.325 0.65 1.3 1.95 km

mbpc Monteith+Brown planning consultants

FIGURE S-2



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Legend

←	OVERLAND FLOW DIRECTION
•177.551	ROAD ELEVATION
*178.442	ROADWAY HIGH AND LOW POINTS

Notes

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File Name: 165681084_FIG1.3-5	Dwn.	Chkd.	Dsgn. 2015. YY.MM.DD

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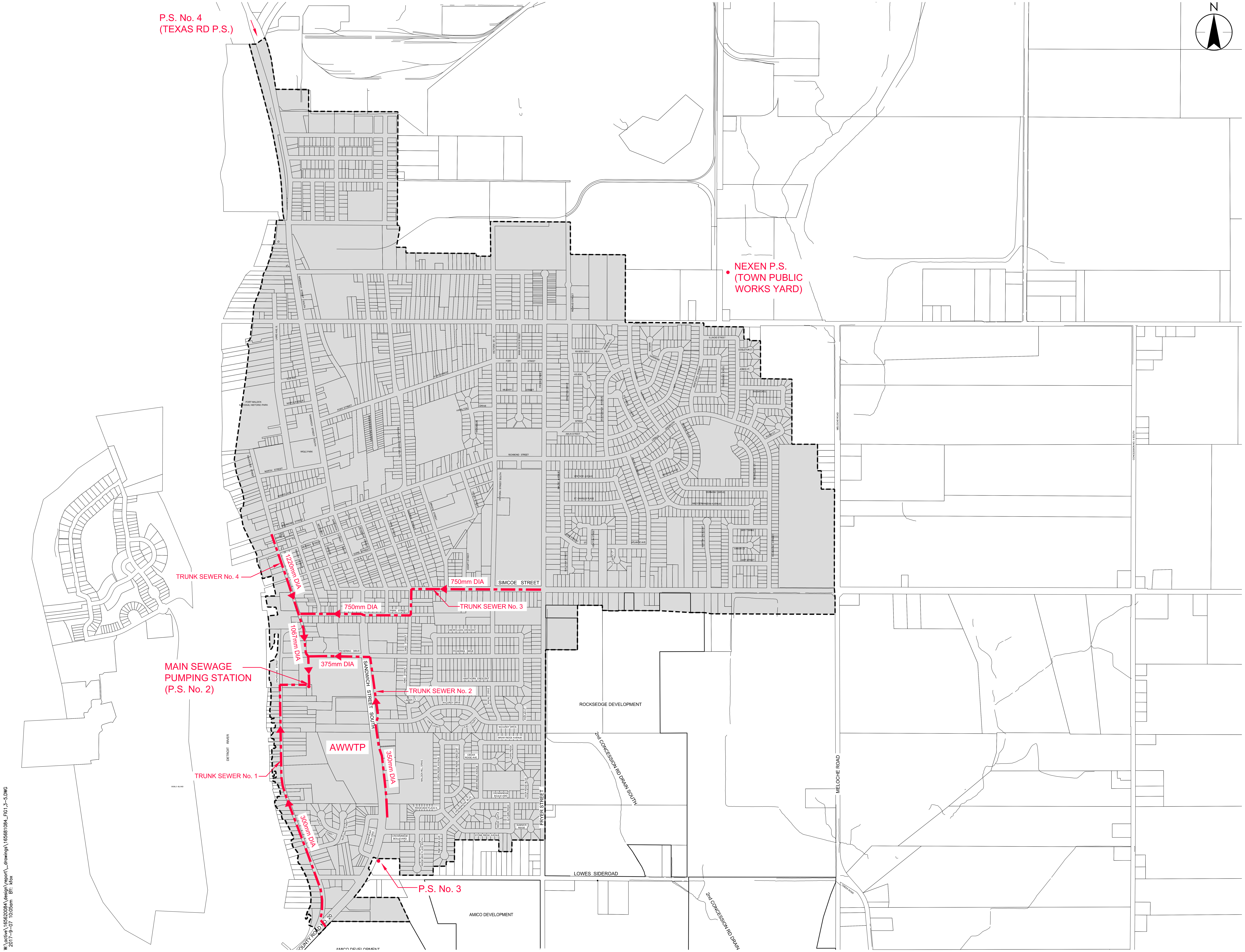
Client/Project
TOWN OF AMHERSTBURG

SOUTHEAST QUADRANT
SANITARY AND WATER SERVICING STUDY
Town of Amherstburg, ON Canada

Title
TOPOGRAPHY

Project No.	Scale	
165620084	1:5000	
Drawing No.	Sheet	Revision

FIGURE S-3



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Legend

EXISTING SANITARY SERVICE AREA (560.52 ha)

EXISTING TRUNK SANITARY SEWER

Notes

Revision	By	Appd.	YY.MM.DD

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File Name: 165681084_FIG1,3-5 | Dwn. | Chkd. | Dsgn. | 2015. YY.MM.DD

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Client/Project
TOWN OF AMHERSTBURG

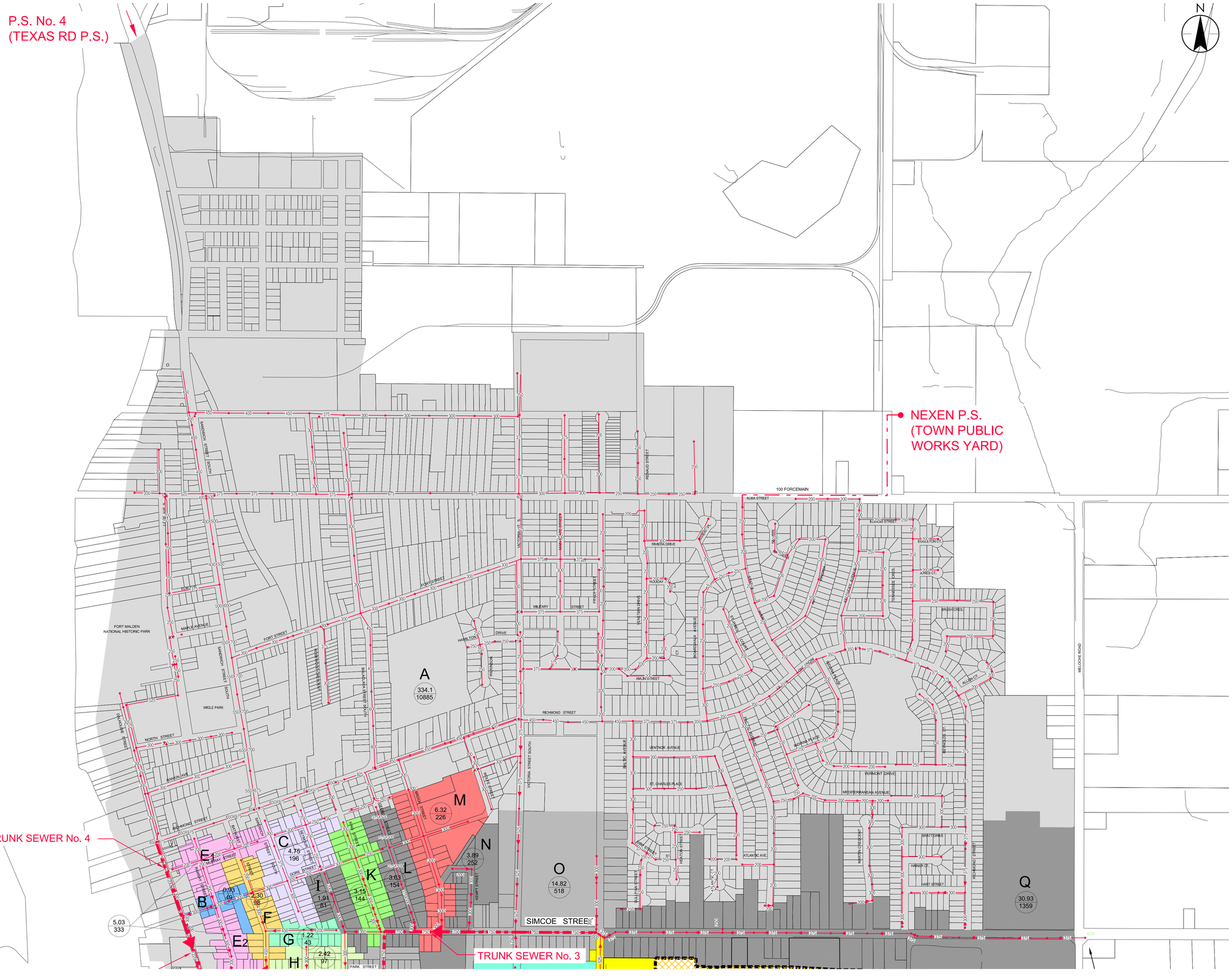
SOUTHEAST QUADRANT
SANITARY AND WATER SERVICING STUDY
Town of Amherstburg, ON Canada

Title
EXISTING SANITARY SERVICING PLAN

Project No. 165620084
Scale 1:8000

Drawing No. | Sheet | Revision

FIGURE S-4



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30.93 / 1359 — DENOTES AREA IN HECTARES / DENOTES NUMBER OF PEOPLE

Notes

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File Name: 165681084_FIG1.3-5 — Dwn. — Chkd. — Dsgn. — 2015.

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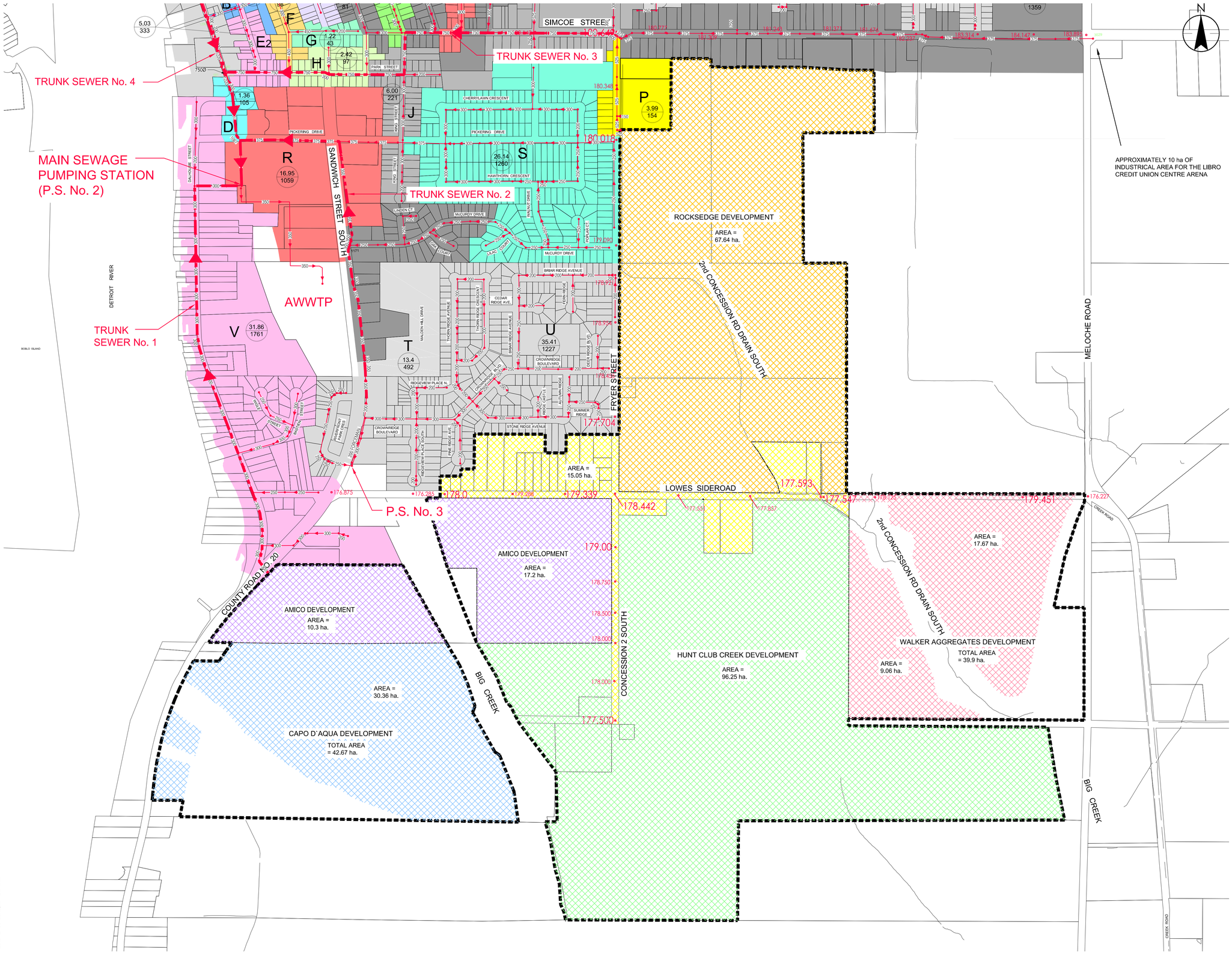
SOUTHEAST QUADRANT
SANITARY AND WATER SERVICING STUDY
Town of Amherstburg, ON Canada

Title
PROPOSED SANITARY SERVICING PLAN

Project No. 165620084 — Scale 1:5000

Drawing No. — Sheet — Revision

FIGURE S-5.1



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Legend

- ROCKSEDGE DEVELOPMENT (FUTURE POPULATION = 1750)
- HUNT CLUB DEVELOPMENT (FUTURE POPULATION = 3504)
- WALKER AGGREGATES DEVELOPMENT (FUTURE POPULATION = 1225)
- AMICO DEVELOPMENT (TOTAL FUTURE POPULATION = 1512)
- CAPO D`AQUA DEVELOPMENT (TOTAL FUTURE POPULATION = 396)
- EXISTING RESIDENTIAL (TOTAL FUTURE POPULATION = 91)
- SOUTHEAST QUADRANT SERVICE AREA
- 30.93 / 1359 — DENOTES AREA IN HECTARES / DENOTES NUMBER OF PEOPLE
- •177.551 — ROAD ELEVATION
- •178.442 — ROADWAY HIGH AND LOW POINTS

Notes

Revision	By	Appd.	YY.MM.DD

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File Name: 165681084_FIG1.3-10 — Dwn. — Chkd. — Dsgn. — 2015. YY.MM.DD

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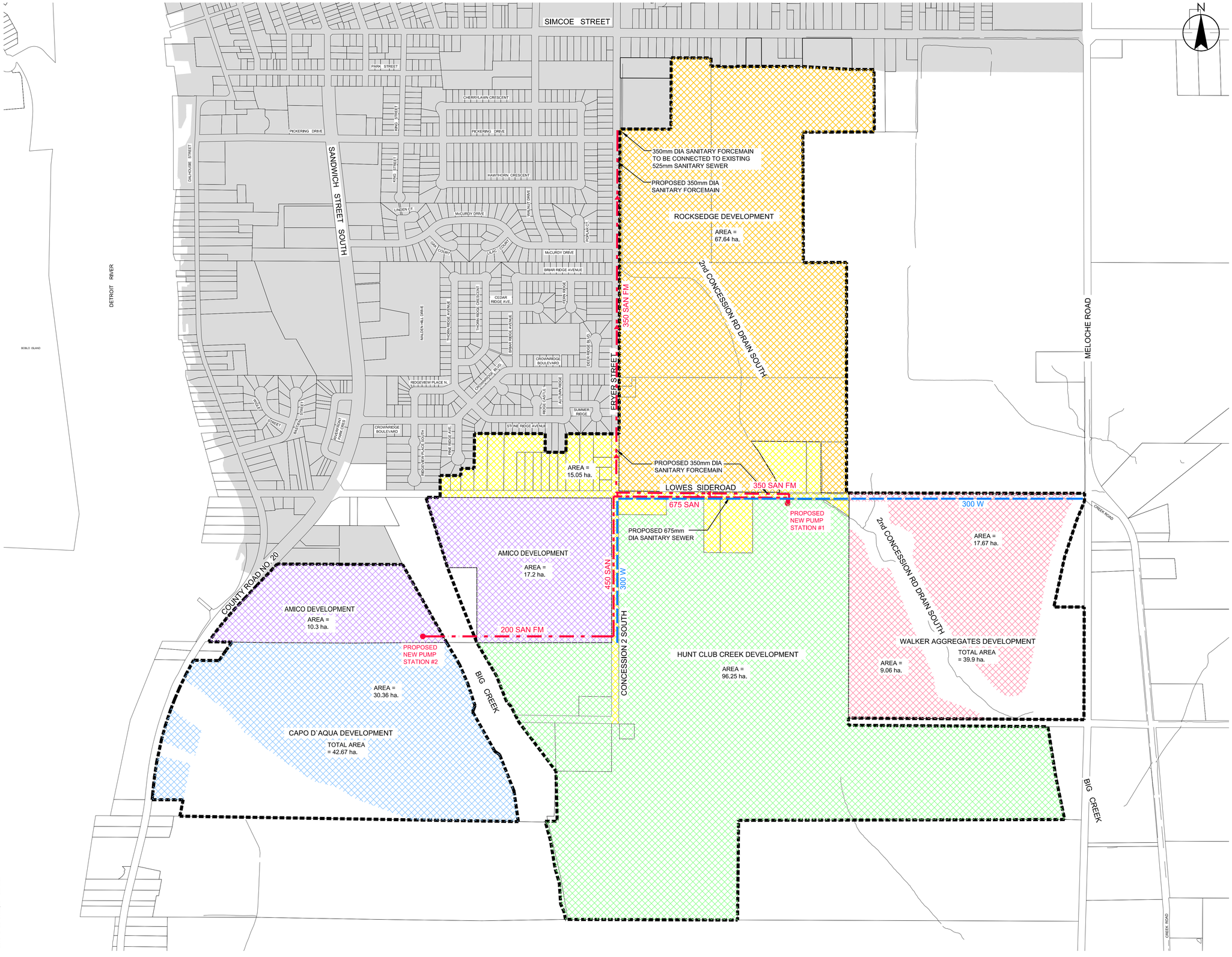
TOWN OF AMHERSTBURG

SOUTHEAST QUADRANT
SANITARY AND WATER SERVICING STUDY
Town of Amherstburg, ON Canada

Title
PROPOSED SANITARY SERVICING PLAN

Project No.	Scale	
165620084	1:5000	
Drawing No.	Sheet	Revision

FIGURE S-5.2



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Legend

- EXISTING SANITARY SERVICE AREA (560.52 ha)
- ROCKSEDGE DEVELOPMENT (FUTURE POPULATION = 1750)
- HUNT CLUB DEVELOPMENT (FUTURE POPULATION = 3504)
- WALKER AGGREGATES DEVELOPMENT (FUTURE POPULATION = 1225)
- AMICO DEVELOPMENT (TOTAL FUTURE POPULATION = 1512)
- CAPO D`AQUA DEVELOPMENT (TOTAL FUTURE POPULATION = 396)
- EXISTING RESIDENTIAL (TOTAL FUTURE POPULATION = 91)
- SCENARIO No.1 SERVICE AREA
- 30.93 / 1359 — DENOTES AREA IN HECTARES / DENOTES NUMBER OF PEOPLE
- PROPOSED NEW PUMP STATION (CAPACITY OF 1□□.92 L/S)
- PROPOSED 675 mm DIA SANITARY SEWER
- PROPOSED 350 mm DIA SANITARY FORCEMAIN

Notes

Revision	By	Appd.	YY.MM.DD

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File Name: 165620084_FIG1.3-10 — Dwn. — Chkd. — Dsgn. — 2015. YY.MM.DD

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Client/Project
TOWN OF AMHERSTBURG

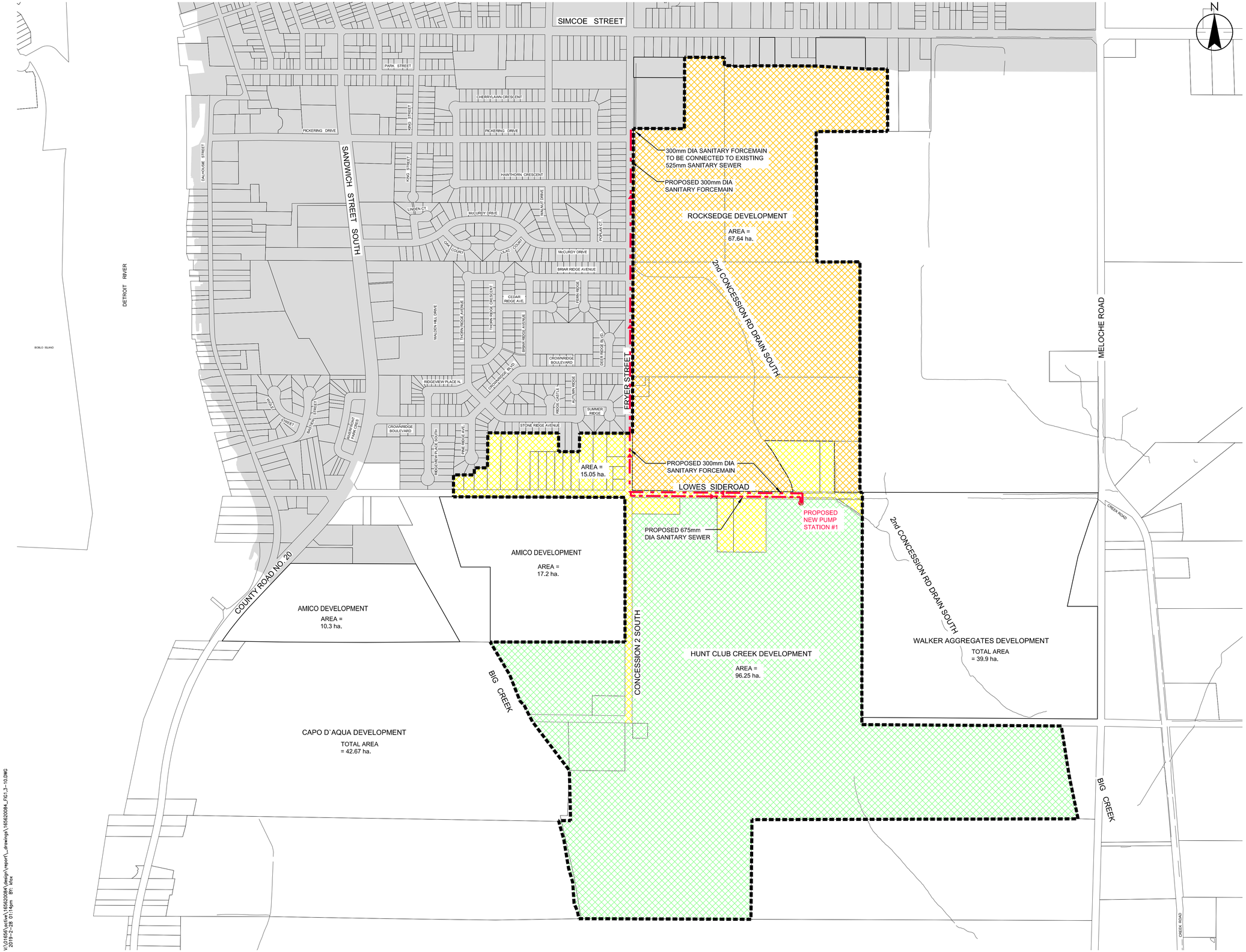
SOUTHEAST QUADRANT
SANITARY AND WATER SERVICING STUDY
Town of Amherstburg, ON Canada

Title
SCENARIO No. 1
(PREFERRED STRATEGY)

Project No. 165620084 — Scale 1:5000

Drawing No. — Sheet — Revision

FIGURE S-6



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Legend

- EXISTING SANITARY SERVICE AREA (560.52 ha)
- ROCKSEDGE DEVELOPMENT (FUTURE POPULATION = 1750)
- HUNT CLUB DEVELOPMENT (FUTURE POPULATION = 3504)
- EXISTING RESIDENTIAL (TOTAL FUTURE POPULATION = 91)
- SCENARIO No.2 SERVICE AREA
- 30.93 / 1359 — DENOTES AREA IN HECTARES / DENOTES NUMBER OF PEOPLE
- PROPOSED NEW PUMP STATION (CAPACITY OF 127.16 L/S)
- PROPOSED 675 mm DIA SANITARY SEWER
- PROPOSED 300 mm DIA SANITARY FORCEMAIN

Notes

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File Name: 165620084_FIG1.3-10 — Dwn. — Chkd. — Dsgn. — 2015.YY.MM.DD

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SOUTHEAST QUADRANT
SANITARY AND WATER SERVICING STUDY
Town of Amherstburg, ON Canada

Title
SCENARIO No. 2

Project No.	Scale	
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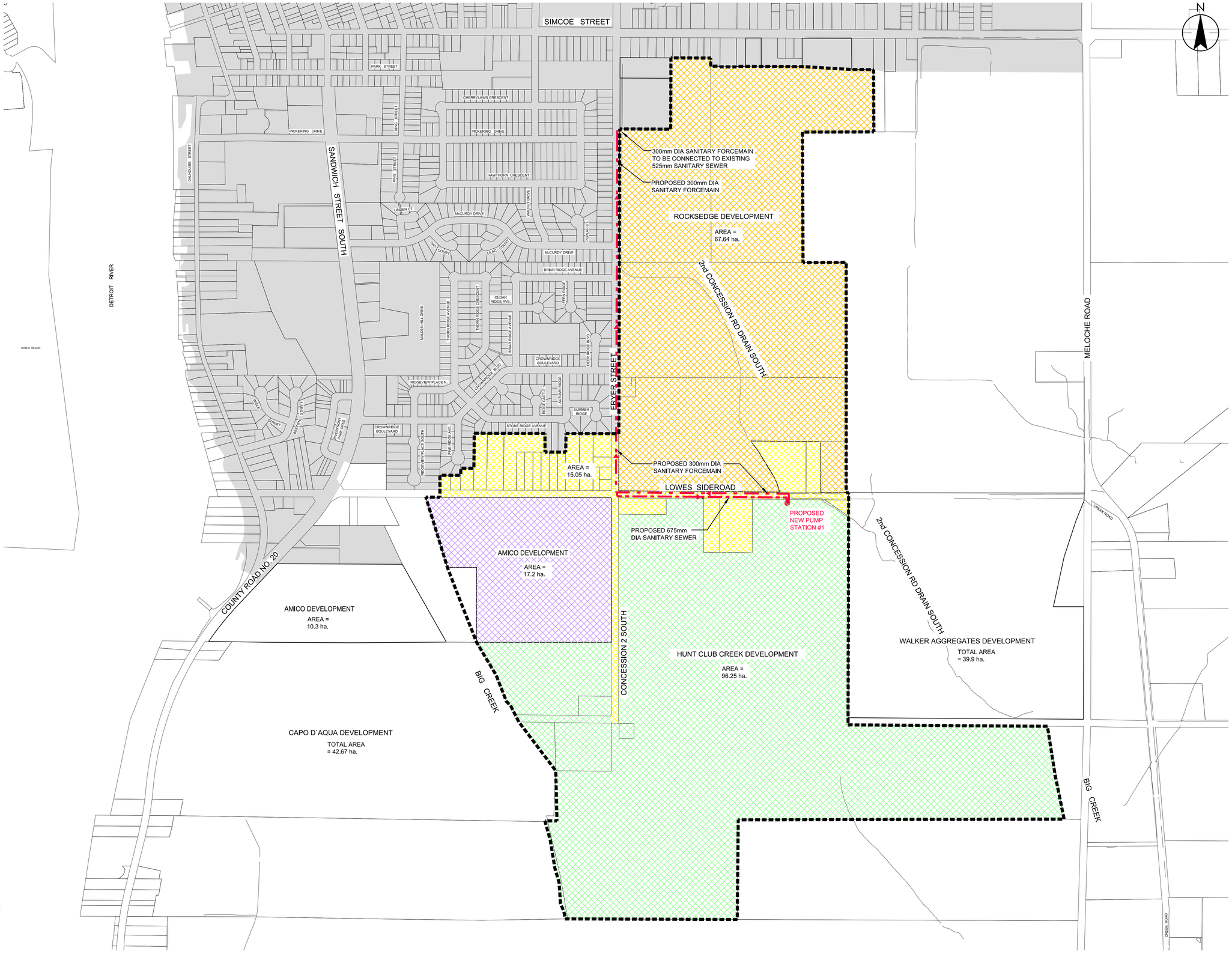
Drawing No.	Sheet	Revision
FIGURE S-7		



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Legend

- EXISTING SANITARY SERVICE AREA (560.52 ha)
- ROCKSEDGE DEVELOPMENT (FUTURE POPULATION = 1750)
- HUNT CLUB DEVELOPMENT (FUTURE POPULATION = 3504)
- AMICO DEVELOPMENT (TOTAL FUTURE POPULATION = 567)
- EXISTING RESIDENTIAL (TOTAL FUTURE POPULATION = 91)
- SCENARIO No.3 SERVICE AREA
- 30.93 / 1359 — DENOTES AREA IN HECTARES / DENOTES NUMBER OF PEOPLE
- PROPOSED NEW PUMP STATION (CAPACITY OF 139.00 L/S)
- PROPOSED 675 mm DIA SANITARY SEWER
- PROPOSED 300 mm DIA SANITARY FORCEMAIN

Notes

Revision	By	Appd.	YY.MM.DD

Issued	By	Appd.	YY.MM.DD

File Name: 165620084_FIG1.3-10 — Dwn. — Chkd. — Dsgn. — 2015. YY.MM.DD

Permit-Seal

PRELIMINARY
FOR DISCUSSION PURPOSES ONLY

Client/Project
TOWN OF AMHERSTBURG

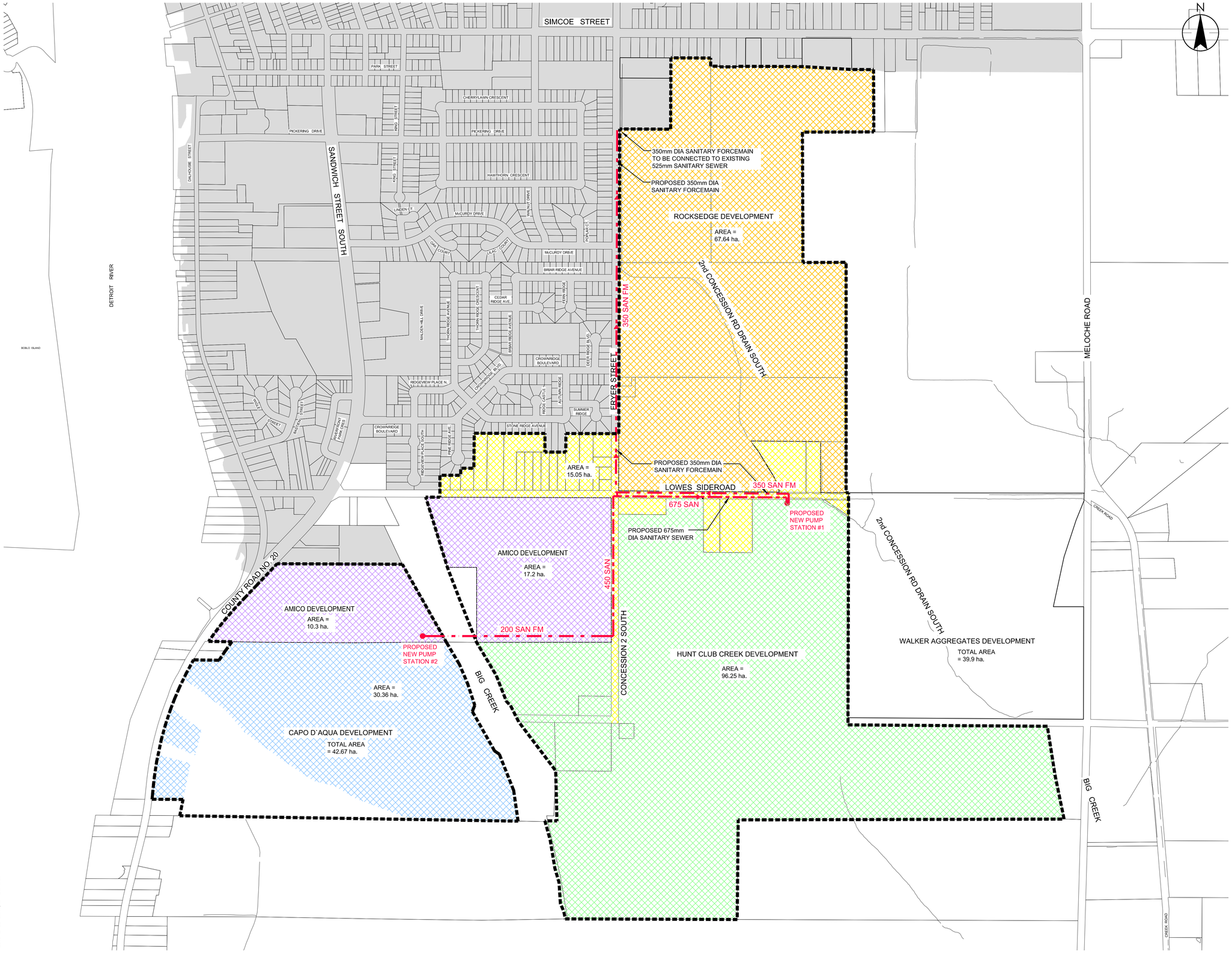
SOUTHEAST QUADRANT
SANITARY AND WATER SERVICING STUDY
Town of Amherstburg, ON Canada

Title
SCENARIO No. 3

Project No. 165620084 — Scale 1:5000

Drawing No. — Sheet — Revision

FIGURE S-8



V:\01656\active\165620084\design\report_drawings\165620084_FIG1.3-10.DWG
2019-2-28 01:17pm By: klox

Stantec

Stantec Consulting Ltd.
140 Ouellette Place Suite 100
Windsor ON Canada
Tel. 519.966.2250
www.stantec.com

Legend

- EXISTING SANITARY SERVICE AREA (560.52 ha)
- ROCKSEDGE DEVELOPMENT (FUTURE POPULATION = 1750)
- HUNT CLUB DEVELOPMENT (FUTURE POPULATION = 3504)
- AMICO DEVELOPMENT (TOTAL FUTURE POPULATION = 1512)
- CAPO D`AQUA DEVELOPMENT (TOTAL FUTURE POPULATION = 396)
- EXISTING RESIDENTIAL (TOTAL FUTURE POPULATION = 91)
- SCENARIO No.4 SERVICE AREA
- 30.93 / 1359 — DENOTES AREA IN HECTARES / DENOTES NUMBER OF PEOPLE
- PROPOSED NEW PUMP STATION (CAPACITY OF 166.51 L/S)
- PROPOSED 675 mm DIA SANITARY SEWER
- PROPOSED 350 mm DIA SANITARY FORCEMAIN

Notes

Revision	By	Appd.	YY.MM.DD

Issued	By	Appd.	YY.MM.DD

File Name: 165620084_FIG1.3-10 — Dwn. — Chkd. — Dsgn. — 2015. YY.MM.DD

Permit-Seal

PRELIMINARY
FOR DISCUSSION PURPOSES ONLY

Client/Project
TOWN OF AMHERSTBURG

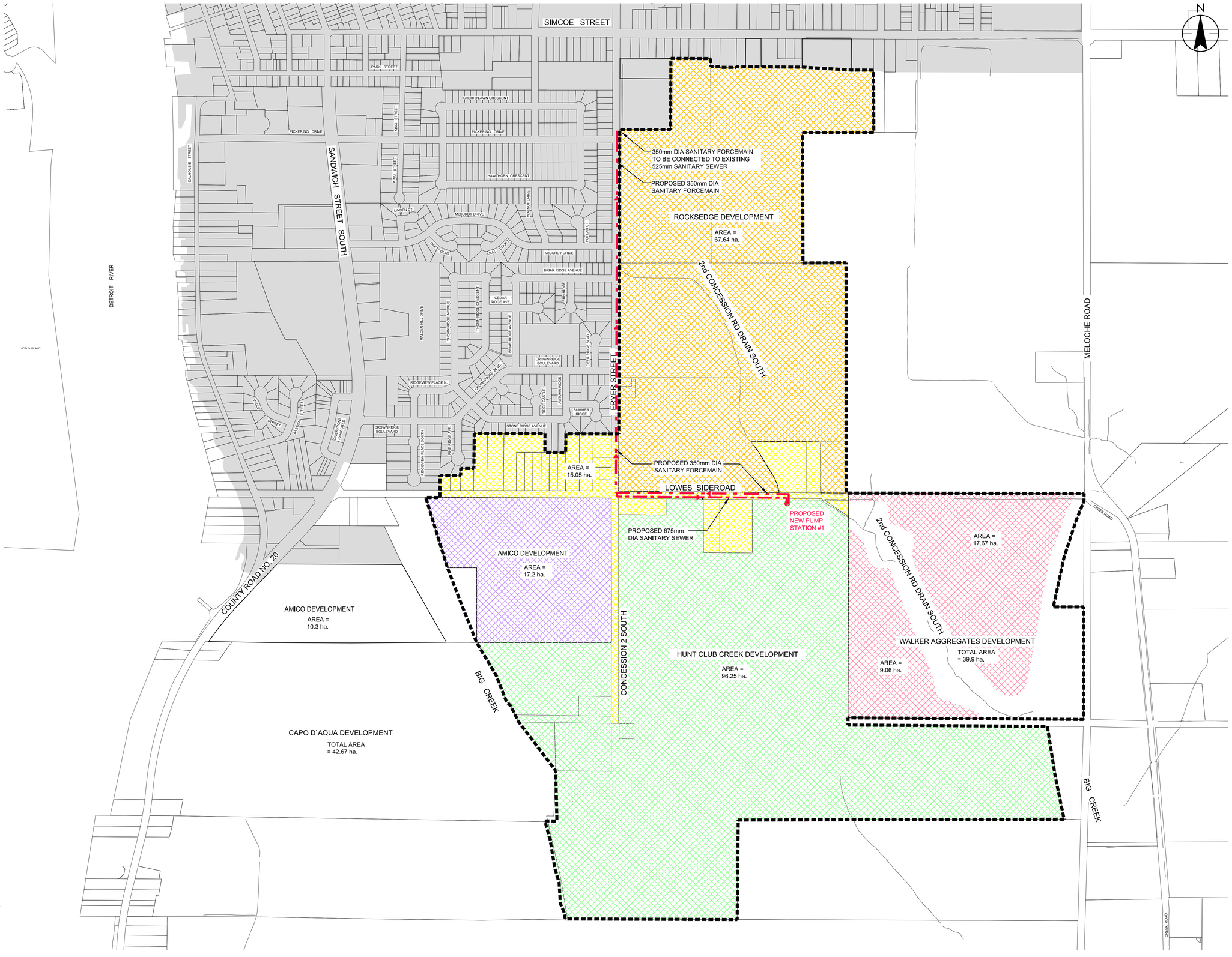
SOUTHEAST QUADRANT
SANITARY AND WATER SERVICING STUDY
Town of Amherstburg, ON Canada

Title
SCENARIO No. 4

Project No. 165620084 — Scale 1:5000

Drawing No. — Sheet — Revision

FIGURE S-9



V:\01656\active\165620084\design\report_drawings\165620084_FIG1.3-10.DWG
2019-2-28 01:17pm BY: Mtan

Stantec

Stantec Consulting Ltd.
140 Ouellette Place Suite 100
Windsor ON Canada
Tel. 519.966.2250
www.stantec.com

Legend

- EXISTING SANITARY SERVICE AREA (560.52 ha)
- ROCKSEDGE DEVELOPMENT (FUTURE POPULATION = 1750)
- HUNT CLUB DEVELOPMENT (FUTURE POPULATION = 3504)
- WALKER AGGREGATES DEVELOPMENT (FUTURE POPULATION = 1225)
- AMICO DEVELOPMENT (TOTAL FUTURE POPULATION = 567)
- EXISTING RESIDENTIAL (TOTAL FUTURE POPULATION = 91)
- SCENARIO No.5 SERVICE AREA
- 30.93 / 1359 — DENOTES AREA IN HECTARES / DENOTES NUMBER OF PEOPLE
- PROPOSED NEW PUMP STATION (CAPACITY OF 161.97 L/S)
- PROPOSED 675 mm DIA SANITARY SEWER
- PROPOSED 350 mm DIA SANITARY FORCEMAIN

Notes

Revision	By	Appd.	YY.MM.DD

Issued	By	Appd.	YY.MM.DD

File Name: 165620084_FIG1.3-10 — Dwn. — Chkd. — Dsgn. — 2015. YY.MM.DD

Permit-Seal

PRELIMINARY
FOR DISCUSSION PURPOSES ONLY

Client/Project
TOWN OF AMHERSTBURG

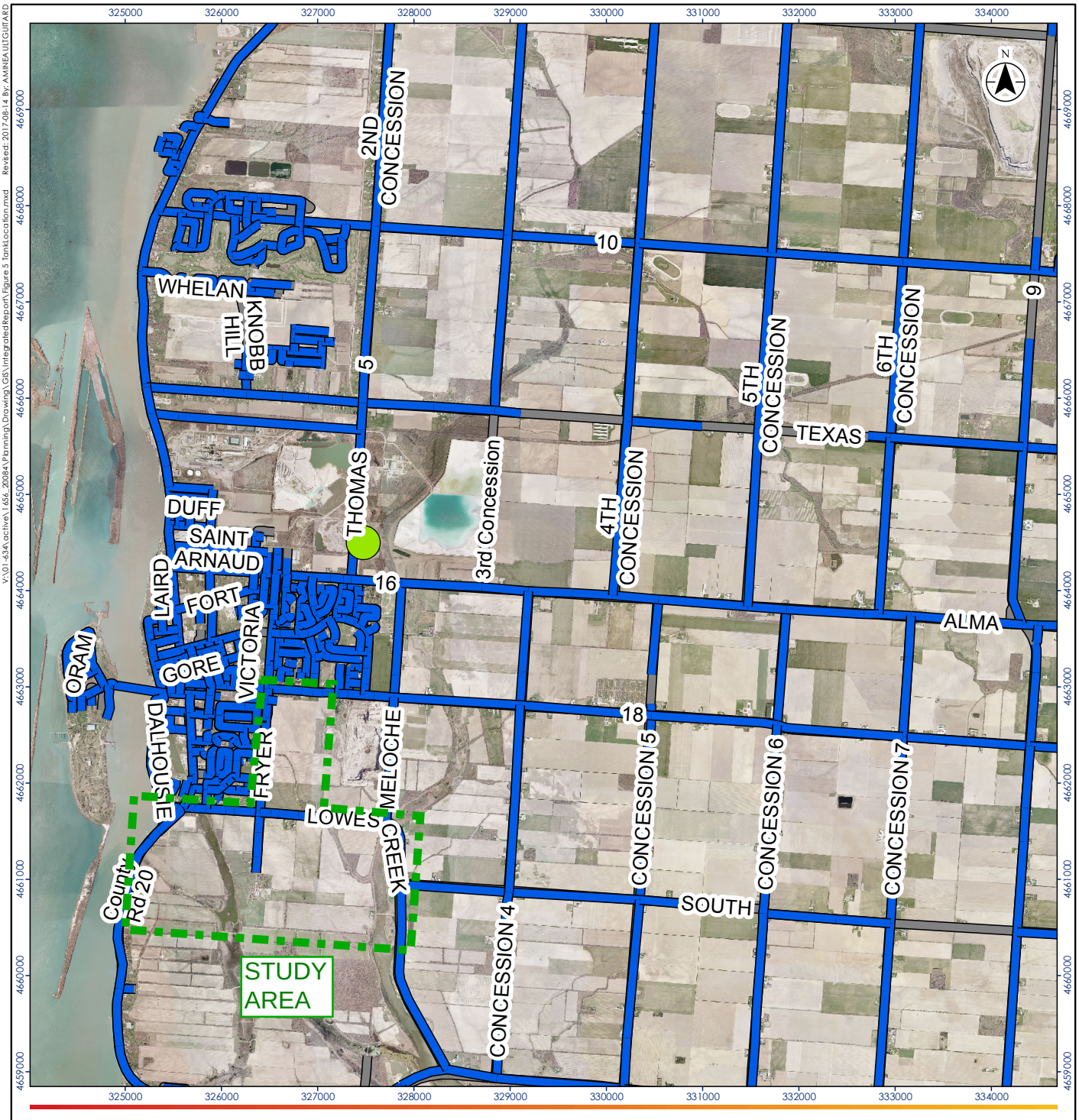
SOUTHEAST QUADRANT
SANITARY AND WATER SERVICING STUDY
Town of Amherstburg, ON Canada

Title
SCENARIO No. 5

Project No. 165620084 — Scale 1:5000

Drawing No. — Sheet — Revision

FIGURE S-10



Legend

- Elevated Tank
- Watermains
- Roads

0 740 1,480 metres

1:60,000 (at original document size of 8.5x11)

Stantec

Project Location
Town of Amherstburg

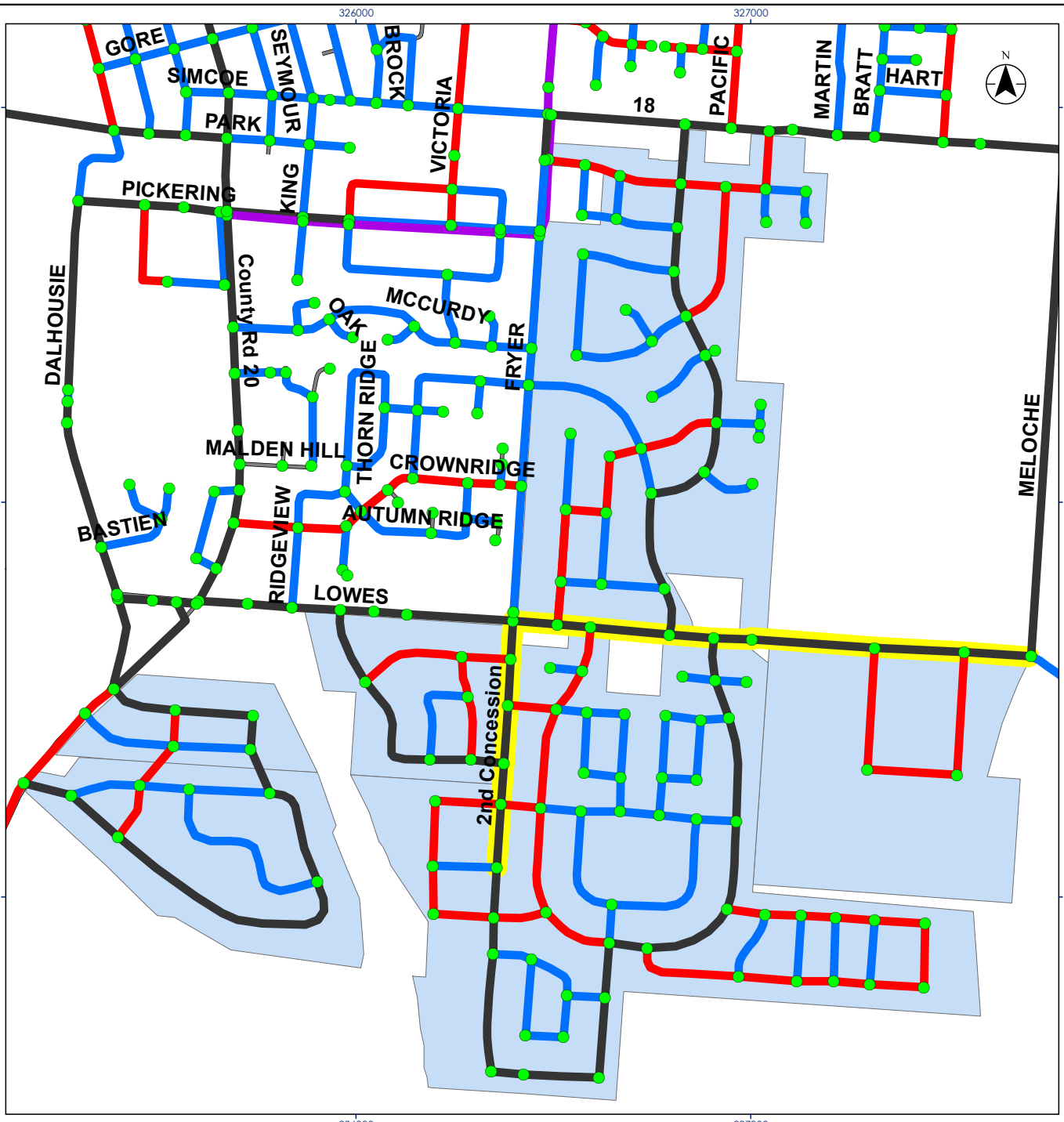
Elevated Storage Tank REVA
Prepared by A. Mineault-Guitard on 2017-07-14
Technical Review by Y. Hoang on 2017-07-14
Independent Review by K. Alemany on 2017-07-14

Client/Project
TOWN OF AMHERSTBURG
SOUTHEAST QUADRANT
SANITARY AND WATER SERVICING STUDY
Town Of Amherstburg, ON Canada

Figure No.
W-1

Title
New Elevated Storage Tank Location

Notes
1. Coordinate System: NAD 1983 UTM zone 17N



Legend

Diameter (mm)

- 150
- 200
- 250
- 300
- 500

- Model Nodes
- New Developments
- Roads
- Proposed Updates

0 200 400 metres

1:15,000 (at original document size of 8.5x11)

Notes
1. Coordinate System: NAD 1983 UTM Zone 17N

Stantec

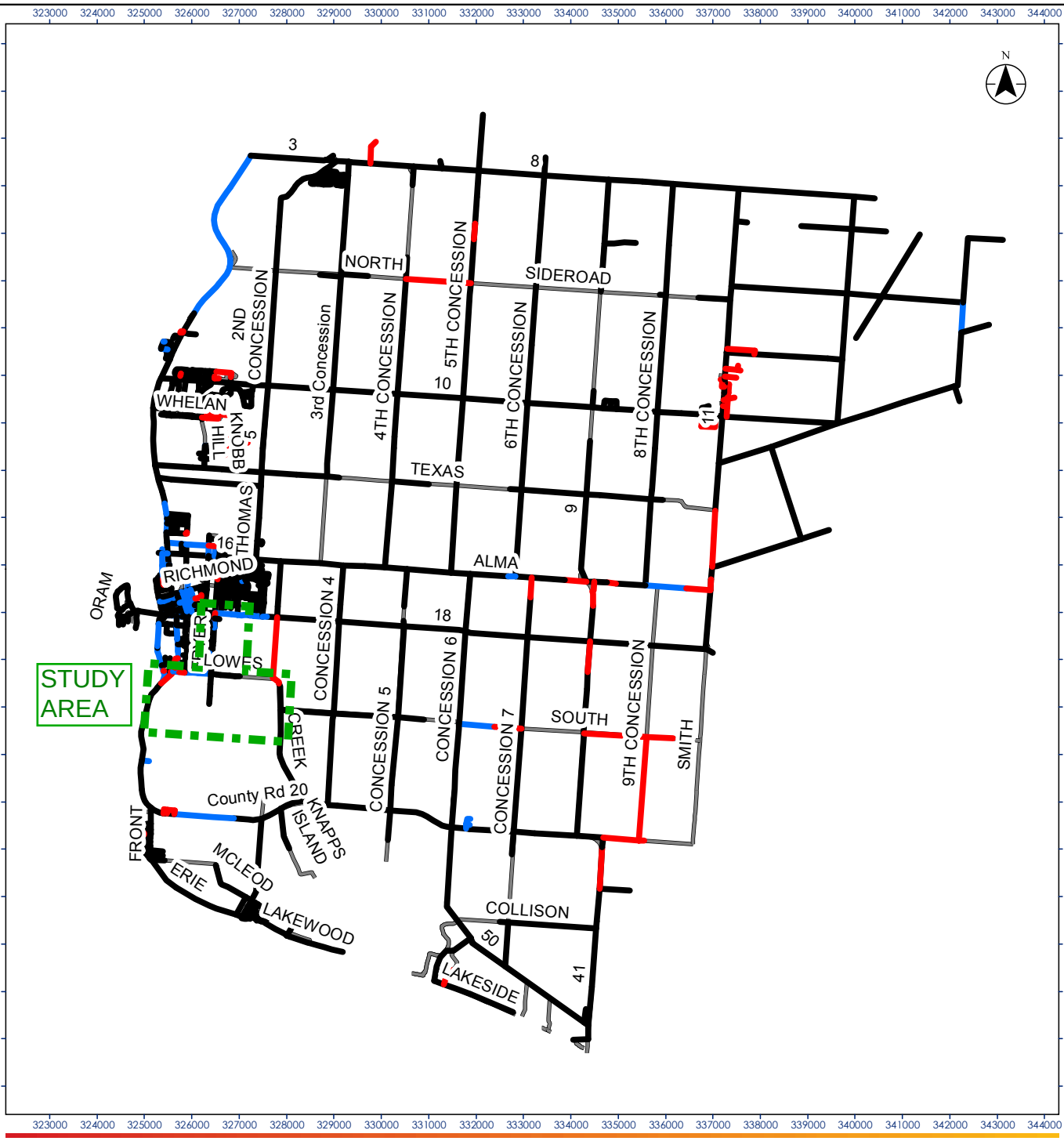
Project Location
Town of Amherstburg

Proposed Pipe Layout REVA
Prepared by A. Mineault-Guitard on 2017-07-14
Technical Review by V. Hoang on 2017-07-14
Independent Review by K. Alemany on 2017-07-14

Client/Project
TOWN OF AMHERSTBURG
SOUTHEAST QUADRANT
SANITARY AND WATER SERVICING STUDY
Town Of Amherstburg, ON Canada

Figure No.
W-2

Title
Proposed Watermain Pipe Layout & Sizing



Legend

- Validated Watermains
- Added Watermains
- Sizing Updates
- Roads

0 1,500 3,000 metres

1:125,000 (at original document size of 8.5x11)

Stantec

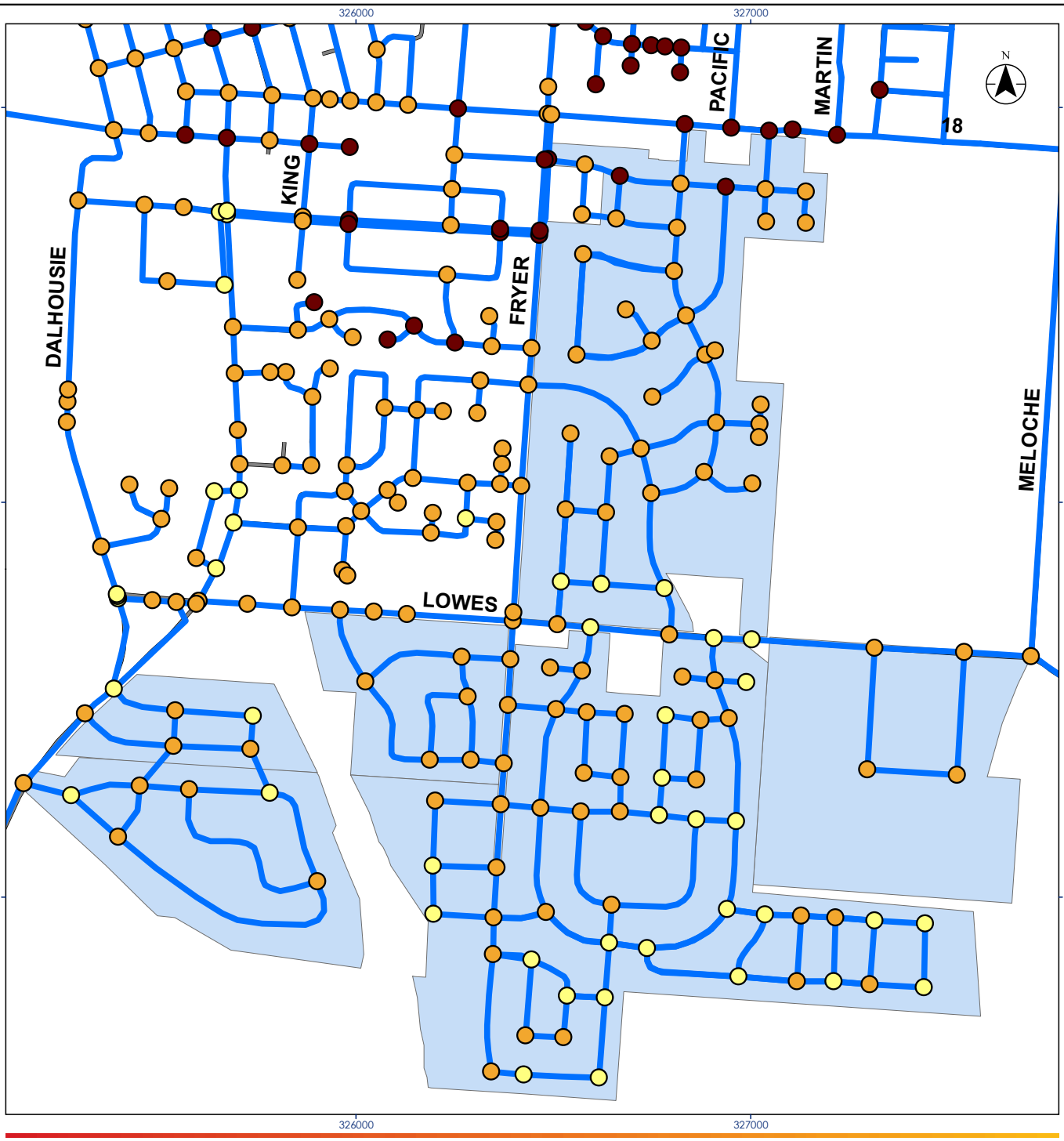
Project Location	Model Updates REVA
Town of Amherstburg	Prepared by A. Mineault-Guitard on 2017-07-14 Technical Review by V. Hoang on 2017-07-14 Independent Review by K. Alemany on 2017-07-14

Client/Project
TOWN OF AMHERSTBURG
SOUTHEAST QUADRANT
SANITARY AND WATER SERVICING STUDY
Town Of Amherstburg, ON Canada

Figure No.
W-3

Title
Location of Model Pipes Updated with the Town's Current GIS Data

Notes
1. Coordinate System: NAD 1983 UTM zone 17N



V:\01-43A-active\1656_2008A\Planning\Drawing\GIS\IntegratedReport\Figure 8 Elevations.mxd Revised: 2017-08-14 By: AMINEAULTGUITARD

Legend

Elevation (m)

- 175 - 177
- 177 - 180
- 180 - 182

Pipes

New Developments

Roads

0 200 400 metres

1:15,000 (at original document size of 8.5x11)

Notes
1. Coordinate System: NAD 1983 UTM Zone 17N

Stantec

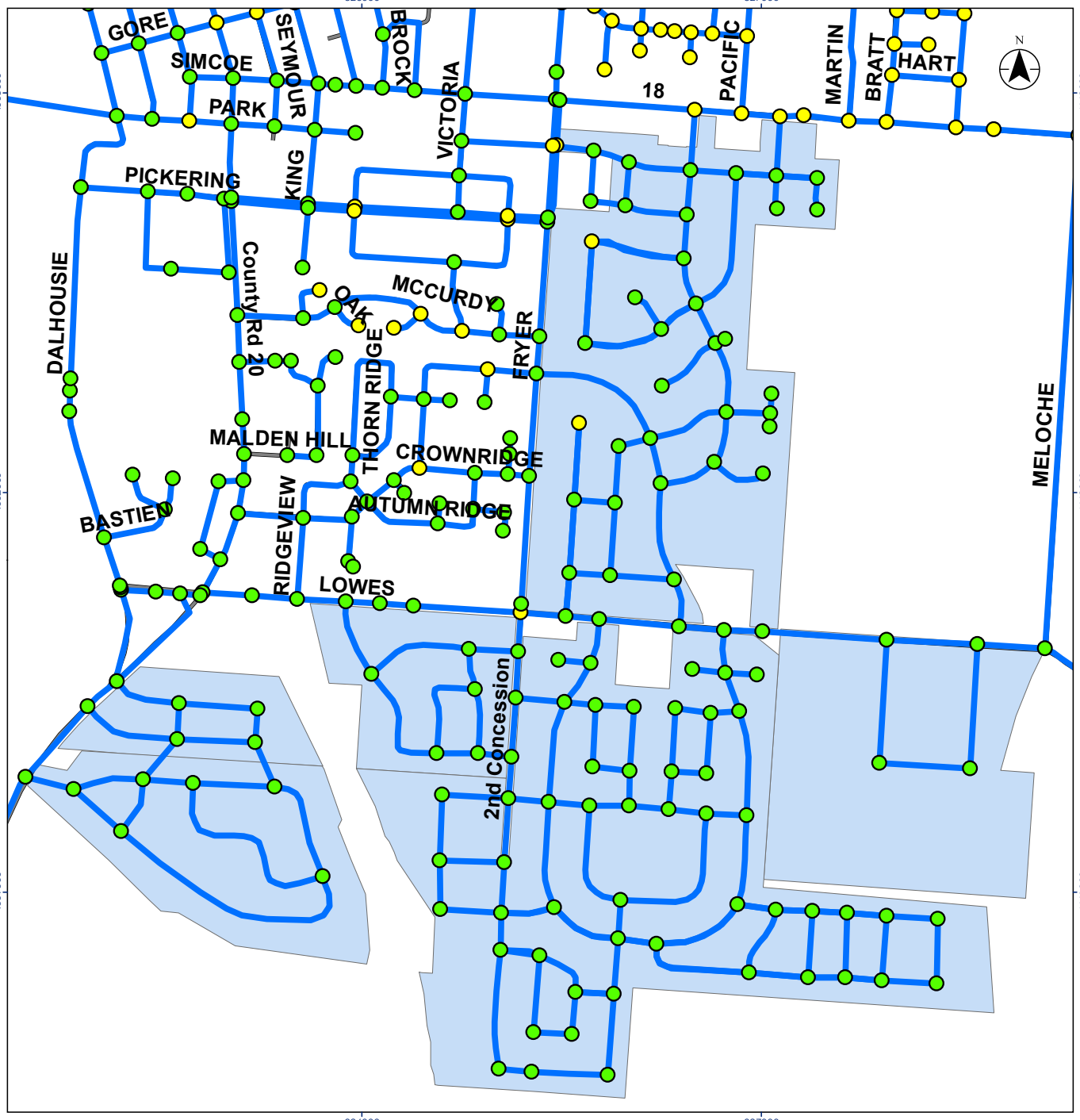
Project Location
Town of Amherstburg

Ground Elevation REVA
Prepared by A. Mineault-Guitard on 2017-08-14
Technical Review by V. Hoang on 2017-07-14
Independent Review by K. Alemany on 2017-07-14

Client/Project
TOWN OF AMHERSTBURG
SOUTHEAST QUADRANT
SANITARY AND WATER SERVICING STUDY
Town Of Amherstburg, ON Canada

Figure No.
W-4

Title
Ground Elevation



Legend

Minimum Pressure (psi)

- < 40
- 40 - 50
- > 50

- Pipes
- New Developments
- Roads

0 200 400 metres

1:15,000 (at original document size of 8.5x11)

Notes
1. Coordinate System: NAD 1983 UTM Zone 17N

Stantec

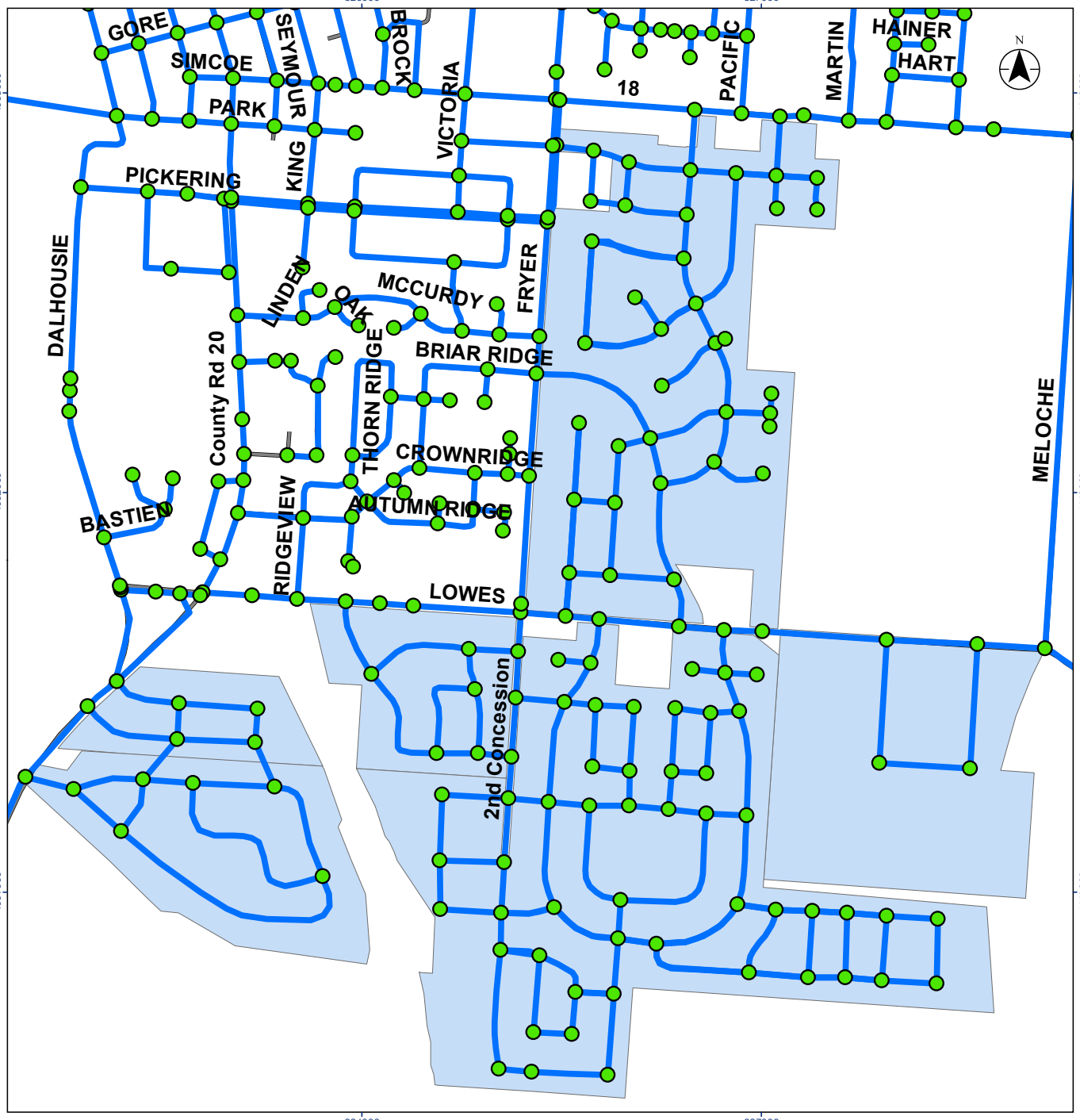
Project Location
Town of Amherstburg

Minimum Pressures REVA
Prepared by A. Mineault-Guitard on 2018-03-15
Technical Review by V. Hoang on 2017-07-14
Independent Review by K. Alemany on 2017-07-14

Client/Project
TOWN OF AMHERSTBURG
SOUTHEAST QUADRANT
SANITARY AND WATER SERVICING STUDY
Town Of Amherstburg, ON Canada

Figure No.
W-5

Title
Minimum Pressures during Peak Hour



Legend

Maximum Pressures (psi)

- < 80
- 80 - 100
- > 100

- Pipes
- New Developments
- Roads

0 200 400 metres

1:15,000 (at original document size of 8.5x11)

Notes
1. Coordinate System: NAD 1983 UTM Zone 17N

Stantec

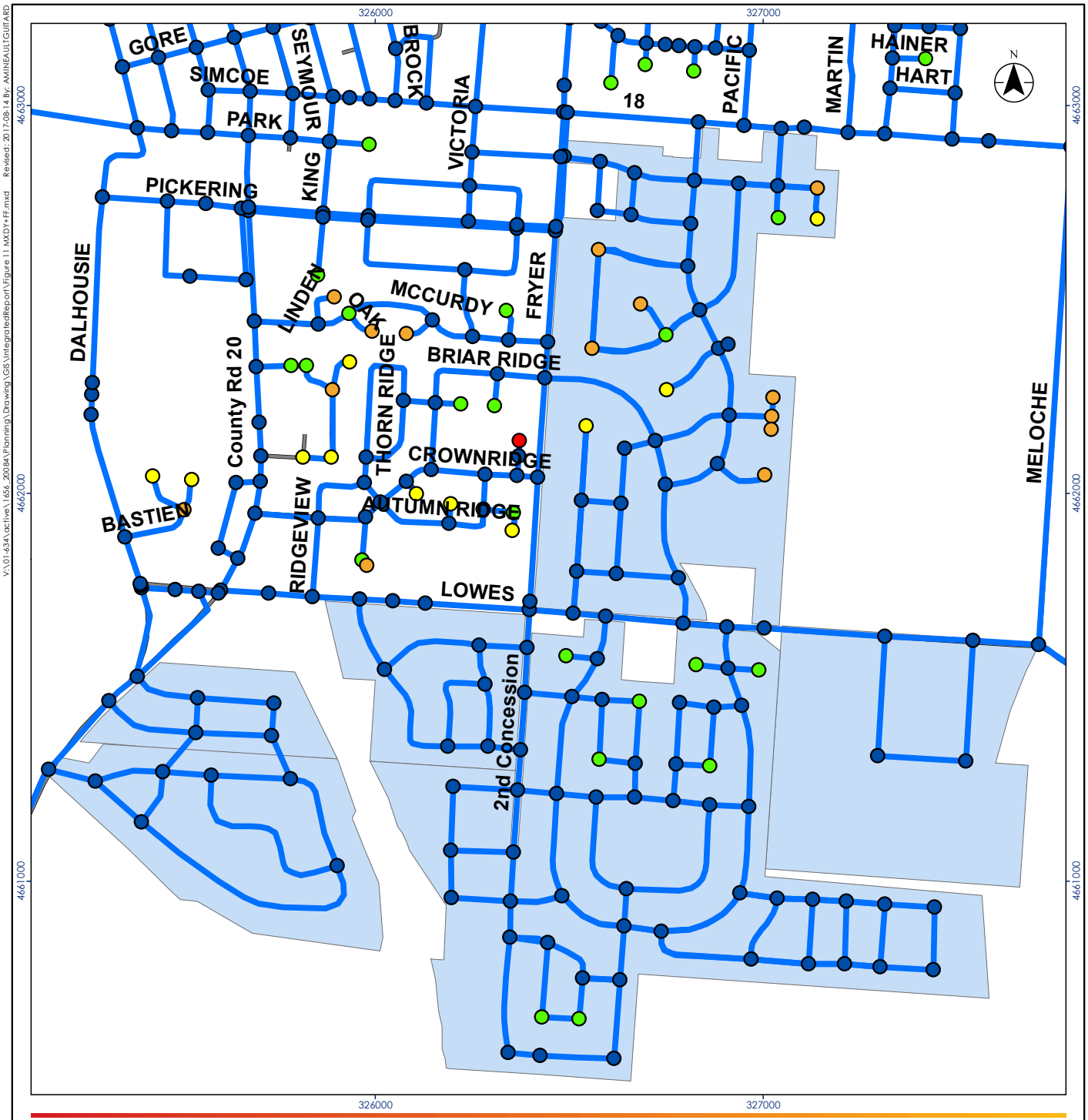
Project Location
Town of Amherstburg

Maximum Pressures REVA
Prepared by A. Mineault-Guitard on 2017-08-14
Technical Review by V. Hoang on 2017-07-14
Independent Review by K. Alemany on 2017-07-14

Client/Project
TOWN OF AMHERSTBURG
SOUTHEAST QUADRANT
SANITARY AND WATER SERVICING STUDY
Town Of Amherstburg, ON Canada

Figure No.
W-6

Title
Maximum Pressures during Average Day



Legend

Available Fire Flow (L/s)

- < 33.3
- 33.3 - 75
- 75 - 100
- 100 - 125
- > 125

- Pipes
- New Developments
- Roads

0 200 400 metres

1:15,000 (at original document size of 8.5x11)

Stantec

Project Location
Town of Amherstburg

Fire Flow REVA
Prepared by A. Mineault-Guitard on 2017-08-14
Technical Review by V. Hoang on 2017-07-14
Independent Review by K. Alemany on 2017-07-14

Client/Project
TOWN OF AMHERSTBURG
SOUTHEAST QUADRANT
SANITARY AND WATER SERVICING STUDY
Town Of Amherstburg, ON Canada

Figure No.
W-7

Title
Available Fire Flow during MXDY within Future Developments

Notes
1. Coordinate System: NAD 1983 UTM Zone 17N

Appendix B TRIBUTARY AREA AND POPULATION

Tributary Area and Population

The average daily domestic flow of 140 L/cap/day for schools was used based on MOECC Design Guidelines for Sewage Works (2008). The schools were converted to equivalent residential lots, as a conservative approach, to estimate the population density.

Block A

- Industrial Area Total **44 hectares (ha)**

- Commercial Area Total **27 ha**

- Stella Maris Elementary School – Northwest end of area

  - School Property equivalent lots - 350 cap x 140 L/cap/day = 49000 L/day / 450 L/cap/day = 109 cap / 3.5 cap = **32 lots**

- Amherstburg Public School – Middle of area

  - School Property equivalent lots - 500 cap x 140 L/cap/day = 70000 L/day / 450 L/cap/day = 156 cap / 3.5 cap = **45 lots**

- St. Bernard Ontario Early Years Centre – Middle of area

  - School Property equivalent lots - 350 cap x 140 L/cap/day = 49000 L/day / 450 L/cap/day = 109 cap / 3.5 cap = **32 lots**

- General Amherst High School

  - School Property equivalent lots - 1200 cap x 140 L/cap/day = 168000 L/day / 450 L/cap/day = 374 cap / 3.5 cap = **107 lots**

- Meadow View Estates Development Future 46 single family lots and 5 semi-detached lots (10 units)

  - Total **56 lots**

- Fort Malden has 4 building = **4 lots**

- Rosewood Crescent Co-Operative Housing Approx. **62 units**

- Residential = **2062 lots**

Block A Total = 2400 lots

Block D

- Existing **6 lots**

- Apartment Complex Approx. **24 units**

Block D Total = 30 lots

Block E

- Existing **63 lots**

- Apartment Complex has **32 units**

Block E Total = 95 lots

Block J

- Existing **55 lots**

- Approx. **8 lots** in vacant property

Block J Total = 63 lots

Block N

- Commercial Area Total **1 ha**

- Existing **15 lots**

- Apartment Complex Approx. **47 units**

Block N Total = 62 lots

Block O

- Institutional Area Total **6.40 ha** (Recreational)

- Existing **32 lots**

- Apartment Complex Approx. **52 units**

Block O Total = 84 lots

Block P

- Existing **8 lots**

- École élémentaire catholique Saint-Jean-Baptiste

    - School Property equivalent lots - 400 cap x 140 L/cap/day = 56000 L/day / 450 L/cap/day = 125 cap / 3.5 cap = **36 lots**

Block P Total = 44 lots

Block Q

- Meadow View Estates Subdivision Future Commercial Site **2.47ha** - Corner of Simcoe St. and Meloche Rd.

- Amherstburg Quarries frontage **4.35 ha**

- Libro Credit Union Center Arena **10.0 ha**

- Meadow View Estates Subdivision Future 39 semi-detached lots (**78 units**)

- Northside of Simcoe has existing **27 lots**

- Southside of Simcoe has existing **27 lots**

- Vacant Property north side of Simcoe St. between Pacific Ave and Martin Cres. Approx. 28 semi-detached lots (**56 units**)

- Apartment Complex northside of Simcoe St. has Approx. **32 units**

Block Q Total = 220 lots

Block R

- Downtown Commercial Area Total **10.36 ha**

- Existing **2 lots**

- Apartment Complex corner of Sandwich St. S and Pickering DR Approx. **45 units**

- Apartment Complex (2) on Pickering Dr. Approx. **152 units** (76+76)

Block R Total = 199 lots

Block S

- Day Care Center Area Total **0.40 ha**

- Existing **222 lots**

- Apartment Complex (3) Approx. **134 units** (54+32+48)

Block S Total = 356 lots

Block T

- Commercial Area Total **3.27 ha**

- Malden Hill Dr. (Trailer Park) **69 lots**

- McCurdy Dr. **39 lots**

Block T Total = 108 lots

Block U

- Commercial Property on Sandwich St S near Pump Station No. 3 **0.92 ha**

- Funeral Home Property north of Crownridge Blvd and east side of Sandwich St. S. **0.95 ha**

- Crownridge Development **293 lots**

- Semi-Detatched Development on west side of Sandwich St. S. **39 lots**

Block U Total = 332 lots

Block V

- Coast Guard Yard **0.4 ha**

- Historical Site **0.7 ha**

- Commercial Area on CR 20 **1.3 ha**

- Existing **120 lots**

- Motel Approx. **26 units**

- Apartment Complex (senior citizens) Approx. **71 units**

- Apartment Complex (4) Approx. **138 units** (44+44+32+18)

- Seasons Retirement Home on CR 20 Approx. **124 units**

Block V Total = 479 lots

Appendix C SANITARY SEWER DESIGN SHEETS

SANITARY SEWER DESIGN SHEET 1 (METRIC) - Existing Service Area

DESIGN CRITERIA
HARMON'S PEAK FACTOR 1+14/(4+(P/1000)^0.5)
PEAK EXTRANEOUS FLOW 0.21 L/Ha/s
AVERAGE DAILY PER CAPITA FLOW 450 L/cap/day

RESIDENTIAL 3.5 people/house
INDUSTRIAL, COMMERCIAL & INSTITUTIONAL (ICI) 35 people/ha VELOCITY RANGE 0.76 m/s to 3
MINIMUM PIPE SIZE 200 mm

Client : Town of Amherstburg **Project No. : 165620084**

LOCATION				INDUSTRIAL/COMMERCIAL/ INSTITUTIONAL (ICI)		EXISTING RESIDENTIAL			FUTURE RESIDENTIAL			TOTAL				PEAK	MAXIMUM FLOW			SEWER DESIGN					PROFILE					
												AREA		DESIGN POPULATION (PERSONS)											UPSTREAM ELEVATION		DOWNSTREAM ELEVATION			
STREET OR EASEMENT	FROM M.H.	TO M.H.	SEWER LENGTH (m)	AREA (HECTARES)	EQUIVALENT POPULATION	AREA (HECTARES)	LOTS	EQUIVALENT POPULATION	AREA (HECTARES)	LOTS	EQUIVALENT POPULATION	INCREMENTAL (HECTARES)	TOTAL (HECTARES)	INCREMENT	TOTAL	FACTOR	INFILTRATION (L/s)	SEWAGE (L/s)	TOTAL SEWAGE AND INFILTRATION (L/s)	SEWER SLOPE (%)	DIAMETER (mm)	MANNING'S "n"	CAPACITY FULL (L/s)	VELOCITY FULL (m/s)	INVERT (m)	GROUND (m)	INVERT (m)	GROUND (m)	AVERAGE DEPTH (m)	AVERAGE COVER (m)
Front Rd (CR No. 20) **Forcemain** from Texas Rd			95.00	0.00	0	0.00	0	0	0.00	0.00	0	0.00	0.00	0	0	0.00	0.000	0.000	**57.00**	0.59%	350	0.013	**112.1**	1.16	180.192	182.00	179.631	182.00	2.09	1.74
Thomas Rd to States Ave **Forcemain**			75.00	10.00	350	0.00	0	0	0.00	0.00	0	10.00	10.00	350	350	4.05	2.100	7.381	**9.48**	0.41%	250	0.013	**38.1**	0.78	181.356	183.00	181.051	183.00	1.80	1.55
BLOCK C - Gore St.				2.91	102	1.84	27	95	0.00	0.00	0	4.75	4.75	196	196	4.15	0.998	4.246	**5.24**	0.31%	300	0.013	**53.8**	0.76						
BLOCK B - Gore St.				0.00	0	0.93	14	49	0.00	0.00	0	0.93	5.68	49	245	4.11	1.193	5.258	**6.45**	0.31%	300	0.013	**53.8**	0.76						
BLOCK A - Dalhouse St.			110.00	71.00	2485	263.11	2400	8400	0.00	0.00	0	334.11	339.79	10885	11130	2.91	71.356	168.599	**306.44**	0.03%	1220	0.013	**705.8**	0.60	171.400	178.00	171.350	178.00	6.63	5.41
BLOCK Q - Simcoe St.			97.64	16.82	589	24.11	220	770	0.00	0.00	0	40.93	40.93	1359	1359	3.71	8.595	26.256	**34.85**	0.17%	375	0.013	**72.3**	0.65	178.197	180.10	178.032	180.70	2.29	1.91
Rocksedge Develoment				0.00	0	0.00	0	0	0.00	0.00	0	0.00	0.00	0	0	4.50	0.000	0.000	**0.00**											
Amico Development				0.00	0	0.00	0	0	0.00	0.00	0	0.00	0.00	0	0	4.50	0.000	0.000	**0.00**											
Capo D'Aqua Development				0.00	0	0.00	0	0	0.00	0.00	0	0.00	0.00	0	0	4.50	0.000	0.000	**0.00**											
Hunt Club Creek Development				0.00	0	0.00	0	0	0.00	0.00	0	0.00	0.00	0	0	4.50	0.000	0.000	**0.00**											
Walker Aggregates Development				0.00	0	0.00	0	0	0.00	0.00	0	0.00	0.00	0	0	4.50	0.000	0.000	**0.00**											
BLOCK P - Fryers St.			113.70	0.00	0	3.99	44	154	0.00	0.00	0	3.99	3.99	154	154	4.19	0.838	3.359	**4.20**	0.14%	525	0.013	**160.9**	0.74	178.080	180.40	177.925	180.70	2.55	2.02
BLOCK O - Simcoe St.			127.91	6.40	224	8.41	84	294	0.00	0.00	0	14.81	59.73	518	2031	3.58	12.543	37.871	**50.41**	0.09%	750	0.013	**334.0**	0.76	176.454	179.50	176.344	179.50	3.10	2.35
BLOCK N - Simcoe St.			84.95	1.00	35	2.89	62	217	0.00	0.00	0	3.89	63.62	252	2283	3.54	13.360	42.092	**55.45**	0.08%	750	0.013	**314.9**	0.71	175.041	179.50	174.970	179.50	4.49	3.74
BLOCK M - Simcoe St.			63.07	2.95	103	3.37	35	123	0.00	0.00	0	6.32	69.94	226	2508	3.51	14.688	45.822	**60.51**	0.08%	750	0.013	**314.9**	0.71	174.850	179.50	174.800	179.50	4.68	3.93
BLOCK L - Simcoe St.			83.08	0.00	0	3.63	44	154	0.00	0.00	0	3.63	73.57	154	2662	3.49	15.450	48.339	**63.79**	0.25%	750	0.013	**556.7**	1.26	174.162	179.50	173.951	179.50	5.44	4.69
BLOCK K - King St.			116.54	0.00	0	3.15	41	144	0.00	0.00	0	3.15	76.72	144	2806	3.47	16.112	50.667	**66.78**	0.09%	750	0.013	**334.0**	0.76	173.851	179.50	173.748	179.50	5.70	4.95
BLOCK J - Park st.			103.72	0.00	0	6.00	63	221	0.00	0.00	0	6.00	82.72	221	3026	3.44	17.372	54.211	**71.58**	0.01%	750	0.013	**111.3**	0.25	173.712	179.50	173.700	179.50	5.79	5.04
BLOCK I - Seymour St.			116.31	0.00	0	1.91	23	81	0.00	0.00	0	1.91	1.91	81	81	4.27	0.401	1.790	**2.19**	0.27%	300	0.013	**50.3**	0.71	174.597	179.50	174.280	179.50	5.06	4.76
BLOCK H - Park St.			100.47	0.16	6	2.26	26	91	0.00	0.00	0	2.42	87.05	97	3204	3.42	18.281	57.030	**75.31**	0.09%	750	0.013	**334.0**	0.76	173.485	178.50	173.395	178.50	5.06	4.31
BLOCK G - Simcoe St.			104.25	0.62	22	0.60	6	21	0.00	0.00	0	1.22	1.22	43	43	4.33	0.257	0.963	**1.22**	0.24%	450	0.013	**139.7**	0.88	174.072	179.25	173.817	179.25	5.31	4.86
BLOCK F - Park st.			113.33	0.00	0	2.30	28	98	0.00	0.00	0	2.30	3.52	98	141	4.20	0.740	3.078	**3.82**	0.30%	450	0.013	**156.2**	0.98	173.760	179.25	173.430	179.25	5.66	5.21
BLOCK E - Park St.			75.67	0.00	0	5.03	95	333	0.00	0.00	0	5.03	95.61	333	3677	3.37	20.077	64.456	**84.53**	0.13%	750	0.013	**401.4**	0.91	172.642	177.50	172.545	177.50	4.91	4.16
BLOCK D - Easement			110.22	0.00	0	1.36	30	105	0.00	0.00	0	1.36	436.76	105	14912	2.78	91.719	215.978	**374.18**	0.10%	1067	0.013	**901.4**	1.01	171.330	177.50	171.215	177.50	6.23	5.16
BLOCK U - Sandwich St. S (Crownridge)			74.58	1.87	65	33.54	332	1162	0.00	0.00	0	35.41	35.41	1227	1227	3.74	7.436	23.915	**31.35**	0.54%	350	0.013	**107.2**	1.11	175.062	177.00	174.659	177.00	2.14	1.79
BLOCK T - Sandwich St. S			171.64	3.27	114	10.13	108	378	0.00	0.00	0	13.40	48.81	492	1720	3.64	10.250	32.569	**42.82**	0.25%	350	0.013	**72.9**	0.76	173.470	179.50	173.040	179.50	6.25	5.90
BLOCK S - Pickering Dr.			69.87	0.40	14	25.74	356	1246	0.00	0.00	0	26.14	26.14	1260	1260	3.73	5.489	24.498	**29.99**	0.23%	375	0.013	**84.1**	0.76	173.200	179.50	173.040	179.50	6.38	6.01
BLOCK R - Pickering Dr.			94.89	10.36	363	6.59	199	697	0.00	0.00	0	16.95	91.90	1059	4039	3.33	19.299	70.042	**89.34**	0.23%	375	0.013	**84.1**	0.76	172.624	177.50	172.410	177.50	4.98	4.61
BLOCK R - Easement			126.93	0.00	0	0.00	0	0	0.00	0.00	0	0.00	528.66	0	18951	2.68	111.018	264.130	**441.63**	0.20%	1067	0.013	**1274.8**	1.43	171.090	177.50	170.840	177.50	6.54	5.47
BLOCK V - Dalhouse St.			130.00	2.40	84	29.46	479	1677	0.00	0.00	0	31.86	31.86	1761	1761	3.63	6.691	33.268	**39.96**	0.15%	300	0.013	**37.5**	0.53	174.022	177.00	173.827	177.50	3.33	3.03
																From Existing System To AWWTP			**481.59**											

SANITARY SEWER DESIGN SHEET 2 (METRIC) - Scenario 1

NOTE: All 5 Future Developments and Existing Residensial Lots to Pump Station on Lowes approx. 500m east of Fryer w/ 26.0ha of Hunt Club Creek drainng towards Concession 2 South and 70.25ha of Hunt Club Creek draining towards Lowes

DESIGN CRITERIA

HARMON'S PEAK FACTOR 1+14/(4+(P/1000)^0.5)

PEAK EXTRANEOUS FLOW 0.21 L/Ha/s

AVERAGE DAILY PER CAPITA FLOW 450 L/cap/day

RESIDENTIAL 3.5 people/house

INDUSTRIAL, COMMERCIAL & INSTITUTIONAL (ICI) 35 people/ha VELOCITY RANGE 0.76 m/s to 3

MINIMUM PIPE SIZE 200 mm

200 - Future sewers to be confirmed during the detailed design stage

Client : Town of Amherstburg **Project No. : 165620084**

LOCATION				INDUSTRIAL/COMMERCIAL/ INSTITUTIONAL (ICI)		EXISTING RESIDENTIAL			FUTURE RESIDENTIAL			TOTAL AREA		TOTAL DESIGN POPULATION (PERSONS)		PEAK FACTOR	MAXIMUM FLOW			SEWER DESIGN					PROFILE					
STREET OR EASEMENT	FROM M.H.	TO M.H.	SEWER LENGTH (m)	AREA (HECTARES)	EQUIVALENT POPULATION	AREA (HECTARES)	LOTS	EQUIVALENT POPULATION	AREA (HECTARES)	LOTS	EQUIVALENT POPULATION	INCREMENTAL (HECTARES)	TOTAL (HECTARES)	INCREMENT	TOTAL		INFILTRATION (L/s)	SEWAGE (L/s)	TOTAL SEWAGE AND INFILTRATION (L/s)	SEWER SLOPE (%)	DIAMETER (mm)	MANNING'S "n"	CAPACITY FULL (L/s)	VELOCITY FULL (m/s)	UPSTREAM INVERT (m)	UPSTREAM GROUND (m)	DOWNSTREAM INVERT (m)	DOWNSTREAM GROUND (m)	AVERAGE DEPTH (m)	AVERAGE COVER (m)
Front Rd (CR No. 20) **Forcemain** from Texas Rd			95.00	0.00	0	0.00	0	0	0.00	0.00	0	0.00	0.00	0	0	0.00	0.000	0.000	**57.00**	0.59%	350	0.013	**112.1**	1.16	180.192	182.00	179.631	182.00	2.09	1.74
Thomas Rd to States Ave **Forcemain**			75.00	10.00	350	0.00	0	0	0.00	0.00	0	10.00	10.00	350	350	4.05	2.100	7.381	**9.48**	0.41%	250	0.013	**38.1**	0.78	181.356	183.00	181.051	183.00	1.80	1.55
BLOCK C - Gore St.				2.91	102	1.84	27	95	0.00	0.00	0	4.75	4.75	196	196	4.15	0.998	4.246	**5.24**	0.31%	300	0.013	**53.8**	0.76						
BLOCK B - Gore St.				0.00	0	0.93	14	49	0.00	0.00	0	0.93	5.68	49	245	4.11	1.193	5.258	**6.45**	0.31%	300	0.013	**53.8**	0.76						
BLOCK A - Dalhouse St.			110.00	71.00	2485	263.11	2400	8400	0.00	0.00	0	334.11	339.79	10885	11130	2.91	71.356	168.599	**306.44**	0.03%	1220	0.013	**705.8**	0.60	171.400	178.00	171.350	178.00	6.63	5.41
BLOCK Q - Simcoe St.			97.64	16.82	589	24.11	220	770	0.00	0.00	0	40.93	40.93	1359	1359	3.71	8.595	26.256	**34.85**	0.17%	375	0.013	**72.3**	0.65	178.197	180.10	178.032	180.70	2.29	1.91
Existing Residential - Fryer St.		Lowes SR	480.00	0.00	0	0.97	3	11	0.00	0.00	0	0.97	0.97	11	11	4.41	0.204	0.241	**0.45**	0.53%	200	0.013	**23.9**	0.76	176.600	178.90	174.056	178.44	3.34	3.14
Capo D'Aqua Development		Fryer St	600.00	0.00	0	0.00	0	0	30.36	113.00	396	30.36	30.36	396	396	4.02	6.376	8.290	**14.67**	0.53%	200	0.013	**23.9**	0.76	174.500	177.00	171.320	177.00	4.09	3.89
Amico Development - Lowes Sideroad		Fryer St	470.00	0.00	0	6.61	16	56	27.50	432.00	1512	34.11	34.11	1568	1568	3.67	7.163	29.935	**37.10**	0.31%	300	0.013	**53.8**	0.76	175.500	178.00	174.043	178.44	3.45	3.15
Rocksedge Develoment		Lowes SR	1200.00	0.00	0	0.00	0	0	67.64	500.00	1750	67.64	67.64	1750	1750	3.63	14.204	33.087	**47.29**	0.31%	300	0.013	**53.8**	0.76	177.500	180.00	173.780	177.85	3.29	2.99
Walker Aggregates Development		New P.S.	600.00	0.00	0	0.00	0	0	17.67	200.00	700	17.67	17.67	700	700	3.89	3.711	14.199	**17.91**	0.39%	250	0.013	**37.1**	0.76	174.500	177.000	172.160	177.55	3.95	3.70
Hunt Club Creek Development - Concession 2 S		Fryer St	1150.00	0.00	0	1.27	0	0	26.00	300.00	1050	27.27	27.27	1050	1050	3.79	5.727	20.706	**26.43**	0.11%	450	0.013	**95.4**	0.60	174.500	177.00	173.212	178.44	3.86	3.41
Lowes Sideroad - East of Fryer	Fryer St	New P.S.	500.00	0.00	0	6.20	7	25	79.31	851.00	2979	85.51	263.53	3003	8477	3.03	55.341	133.583	**188.92**	0.07%	675	0.013	**216.0**	0.60	173.000	178.44	172.670	177.55	5.16	4.49
BLOCK P - Fryers St.			113.70	0.00	0	3.99	44	154	0.00	0.00	0	3.99	267.52	154	8631	3.02	56.179	135.665	**191.84**	0.14%	525	0.013	**160.9**	0.74	178.080	180.40	177.925	180.70	2.55	2.02
BLOCK O - Simcoe St.			127.91	6.40	224	8.41	84	294	0.00	0.00	0	14.81	323.26	518	10508	2.93	67.885	160.532	**228.42**	0.09%	750	0.013	**334.0**	0.76	176.454	179.50	176.344	179.50	3.10	2.35
BLOCK N - Simcoe St.			84.95	1.00	35	2.89	62	217	0.00	0.00	0	3.89	327.15	252	10760	2.92	68.702	163.807	**232.51**	0.08%	750	0.013	**314.9**	0.71	175.041	179.50	174.970	179.50	4.49	3.74
BLOCK M - Simcoe St.			63.07	2.95	103	3.37	35	123	0.00	0.00	0	6.32	333.47	226	10985	2.91	70.029	166.728	**236.76**	0.08%	750	0.013	**314.9**	0.71	174.850	179.50	174.800	179.50	4.68	3.93
BLOCK L - Simcoe St.			83.08	0.00	0	3.63	44	154	0.00	0.00	0	3.63	337.10	154	11139	2.91	70.791	168.715	**239.51**	0.25%	750	0.013	**556.7**	1.26	174.162	179.50	173.951	179.50	5.44	4.69
BLOCK K - King St.			116.54	0.00	0	3.15	41	144	0.00	0.00	0	3.15	340.25	144	11283	2.90	71.453	170.562	**242.02**	0.09%	750	0.013	**334.0**	0.76	173.851	179.50	173.748	179.50	5.70	4.95
BLOCK J - Park st.			103.72	0.00	0	6.00	63	221	0.00	0.00	0	6.00	346.25	221	11503	2.89	72.713	173.392	**246.11**	0.01%	750	0.013	**111.3**	0.25	173.712	179.50	173.700	179.50	5.79	5.04
BLOCK I - Seymour St.			116.31	0.00	0	1.91	23	81	0.00	0.00	0	1.91	1.91	81	81	4.27	0.401	1.790	**2.19**	0.27%	300	0.013	**50.3**	0.71	174.597	179.50	174.280	179.50	5.06	4.76
BLOCK H - Park St.			100.47	0.16	6	2.26	26	91	0.00	0.00	0	2.42	350.58	97	11681	2.89	73.623	175.657	**249.28**	0.09%	750	0.013	**334.0**	0.76	173.485	178.50	173.395	178.50	5.06	4.31
BLOCK G - Simcoe St.			104.25	0.62	22	0.60	6	21	0.00	0.00	0	1.22	1.22	43	43	4.33	0.257	0.963	**1.22**	0.24%	450	0.013	**139.7**	0.88	174.072	179.25	173.817	179.25	5.31	4.86
BLOCK F - Park st.			113.33	0.00	0	2.30	28	98	0.00	0.00	0	2.30	3.52	98	141	4.20	0.740	3.078	**3.82**	0.30%	450	0.013	**156.2**	0.98	173.760	179.25	173.430	179.25	5.66	5.21
BLOCK E - Park St.			75.67	0.00	0	5.03	95	333	0.00	0.00	0	5.03	359.14	333	12154	2.87	75.419	181.680	**257.10**	0.13%	750	0.013	**401.4**	0.91	172.642	177.50	172.545	177.50	4.91	4.16
BLOCK D - Easement			110.22	0.00	0	1.36	30	105	0.00	0.00	0	1.36	700.29	105	23389	2.58	147.060	314.826	**528.37**	0.10%	1067	0.013	**901.4**	1.01	171.330	177.50	171.215	177.50	6.23	5.16
BLOCK U - Sandwich St. S (Crownridge)			74.58	1.87	65	33.54	332	1162	0.00	0.00	0	35.41	35.41	1227	1227	3.74	7.436	23.915	**31.35**	0.54%	350	0.013	**107.2**	1.11	175.062	177.00	174.659	177.00	2.14	1.79
BLOCK T - Sandwich St. S			171.64	3.27	114	10.13	108	378	0.00	0.00	0	13.40	48.81	492	1720	3.64	10.250	32.569	**42.82**	0.25%	350	0.013	**72.9**	0.76	173.470	179.50	173.040	179.50	6.25	5.90
BLOCK S - Pickering Dr.			69.87	0.40	14	25.74	356	1246	0.00	0.00	0	26.14	26.14	1260	1260	3.73	5.489	24.498	**29.99**	0.23%	375	0.013	**84.1**	0.76	173.200	179.50	173.040	179.50	6.38	6.01
BLOCK R - Pickering Dr.			94.89	10.36	363	6.59	199	697	0.00	0.00	0	16.95	91.90	1059	4039	3.33	19.299	70.042	**89.34**	0.23%	375	0.013	**84.1**	0.76	172.624	177.50	172.410	177.50	4.98	4.61
BLOCK R - Easement			126.93	0.00	0	0.00	0	0	0.00	0.00	0	0.00	792.19	0	27428	2.52	166.359	359.368	**592.21**	0.20%	1067	0.013	**1274.8**	1.43	171.090	177.50	170.840	177.50	6.54	5.47
BLOCK V - Dalhouse St.			130.00	2.40	84	29.46	479	1677	0.00	0.00	0	31.86	31.86	1761	1761	3.63	6.691	33.268	**39.96**	0.15%	300	0.013	**37.5**	0.53	174.022	177.00	173.827	177.50	3.33	3.03
																			From Pump Station To AWWTP											
																			632.17										

SANITARY SEWER DESIGN SHEET 3 (METRIC) - Scenario 2

NOTE: Pump Station on Lowes approx. 500m east of Fryer Servicing Rocksedge and Hunt Club Creek Developments, as well as, the 26 Existing Residential Lots within the southeast quadrant

DESIGN CRITERIA

HARMON'S PEAK FACTOR 1+14/(4+(P/1000)^0.5)

PEAK EXTRANEOUS FLOW 0.21 L/Ha/s

AVERAGE DAILY PER CAPITA FLOW 450 L/cap/day

RESIDENTIAL 3.5 people/house

INDUSTRIAL, COMMERCIAL & INSTITUTIONAL (ICI) 35 people/ha

VELOCITY RANGE 0.76 m/s to 3

MINIMUM PIPE SIZE 200 mm

200 - Future sewers to be confirmed during the detailed design stage

Client : Town of Amherstburg

Project No. : 165620084

LOCATION				INDUSTRIAL/COMMERCIAL/ INSTITUTIONAL (ICI)		EXISTING RESIDENTIAL			FUTURE RESIDENTIAL			TOTAL AREA		TOTAL DESIGN POPULATION (PERSONS)		PEAK FACTOR	MAXIMUM FLOW			SEWER DESIGN					PROFILE					
STREET OR EASEMENT	FROM M.H.	TO M.H.	SEWER LENGTH (m)	AREA (HECTARES)	EQUIVALENT POPULATION	AREA (HECTARES)	LOTS	EQUIVALENT POPULATION	AREA (HECTARES)	LOTS	EQUIVALENT POPULATION	INCREMENTAL (HECTARES)	TOTAL (HECTARES)	INCREMENT	TOTAL		INFILTRATION (L/s)	SEWAGE (L/s)	TOTAL SEWAGE AND INFILTRATION (L/s)	SEWER SLOPE (%)	DIAMETER (mm)	MANNING'S "n"	CAPACITY FULL (L/s)	VELOCITY FULL (m/s)	UPSTREAM INVERT (m)	UPSTREAM GROUND (m)	DOWNSTREAM INVERT (m)	DOWNSTREAM GROUND (m)	AVERAGE DEPTH (m)	AVERAGE COVER (m)
Front Rd (CR No. 20) **Forcemain** from Texas Rd			95.00	0.00	0	0.00	0	0	0.00	0.00	0	0.00	0.00	0	0	0.00	0.000	0.000	**57.00**	0.59%	350	0.013	**112.1**	1.16	180.192	182.00	179.631	182.00	2.09	1.74
Thomas Rd to States Ave **Forcemain**			75.00	10.00	350	0.00	0	0	0.00	0.00	0	10.00	10.00	350	350	4.05	2.100	7.381	**9.48**	0.41%	250	0.013	**38.1**	0.78	181.356	183.00	181.051	183.00	1.80	1.55
BLOCK C - Gore St.				2.91	102	1.84	27	95	0.00	0.00	0	4.75	4.75	196	196	4.15	0.998	4.246	**5.24**	0.31%	300	0.013	**53.8**	0.76						
BLOCK B - Gore St.				0.00	0	0.93	14	49	0.00	0.00	0	0.93	5.68	49	245	4.11	1.193	5.258	**6.45**	0.31%	300	0.013	**53.8**	0.76						
BLOCK A - Dalhouse St.			110.00	71.00	2485	263.11	2400	8400	0.00	0.00	0	334.11	339.79	10885	11130	2.91	71.356	168.599	**306.44**	0.03%	1220	0.013	**705.8**	0.60	171.400	178.00	171.350	178.00	6.63	5.41
BLOCK Q - Simcoe St.			97.64	16.82	589	24.11	220	770	0.00	0.00	0	40.93	40.93	1359	1359	3.71	8.595	26.256	**34.85**	0.17%	375	0.013	**72.3**	0.65	178.197	180.10	178.032	180.70	2.29	1.91
Rocksedge Develoment		New P.S.	1200.00	0.00	0	0.00	0	0	67.64	500.00	1750	67.64	67.64	1750	1750	3.63	14.204	33.087	**47.29**	0.31%	300	0.013	**53.8**	0.76	177.500	180.00	173.780	177.85	3.29	2.99
Hunt Club Creek Development		New P.S.	1600.00	0.00	0	0.00	0	0	96.25	1001.00	3504	96.25	96.25	3504	3504	3.38	20.213	61.755	**81.97**	0.11%	450	0.013	**95.4**	0.60	174.500	177.00	172.708	177.55	3.67	3.22
Lowes Sideroad - East of Fryer	Fryer St	New P.S.	500.00	0.00	0	15.05	26	91	0.00	0.00	0	15.05	178.94	91	5345	3.22	37.577	89.578	**127.16**	0.07%	675	0.013	**216.0**	0.60	173.000	178.44	172.670	177.55	5.16	4.49
BLOCK P - Fryers St.			113.70	0.00	0	3.99	44	154	0.00	0.00	0	3.99	182.93	154	5499	3.21	38.415	91.828	**130.24**	0.14%	525	0.013	**160.9**	0.74	178.080	180.40	177.925	180.70	2.55	2.02
BLOCK O - Simcoe St.			127.91	6.40	224	8.41	84	294	0.00	0.00	0	14.81	238.67	518	7375	3.08	50.121	118.489	**168.61**	0.09%	750	0.013	**334.0**	0.76	176.454	179.50	176.344	179.50	3.10	2.35
BLOCK N - Simcoe St.			84.95	1.00	35	2.89	62	217	0.00	0.00	0	3.89	242.56	252	7627	3.07	50.938	121.975	**172.91**	0.08%	750	0.013	**314.9**	0.71	175.041	179.50	174.970	179.50	4.49	3.74
BLOCK M - Simcoe St.			63.07	2.95	103	3.37	35	123	0.00	0.00	0	6.32	248.88	226	7853	3.06	52.265	125.080	**177.34**	0.08%	750	0.013	**314.9**	0.71	174.850	179.50	174.800	179.50	4.68	3.93
BLOCK L - Simcoe St.			83.08	0.00	0	3.63	44	154	0.00	0.00	0	3.63	252.51	154	8007	3.05	53.027	127.189	**180.22**	0.25%	750	0.013	**556.7**	1.26	174.162	179.50	173.951	179.50	5.44	4.69
BLOCK K - King St.			116.54	0.00	0	3.15	41	144	0.00	0.00	0	3.15	255.66	144	8150	3.04	53.689	129.148	**182.84**	0.09%	750	0.013	**334.0**	0.76	173.851	179.50	173.748	179.50	5.70	4.95
BLOCK J - Park st.			103.72	0.00	0	6.00	63	221	0.00	0.00	0	6.00	261.66	221	8371	3.03	54.949	132.146	**187.10**	0.01%	750	0.013	**111.3**	0.25	173.712	179.50	173.700	179.50	5.79	5.04
BLOCK I - Seymour St.			116.31	0.00	0	1.91	23	81	0.00	0.00	0	1.91	1.91	81	81	4.27	0.401	1.790	**2.19**	0.27%	300	0.013	**50.3**	0.71	174.597	179.50	174.280	179.50	5.06	4.76
BLOCK H - Park St.			100.47	0.16	6	2.26	26	91	0.00	0.00	0	2.42	265.99	97	8548	3.02	55.859	134.544	**190.40**	0.09%	750	0.013	**334.0**	0.76	173.485	178.50	173.395	178.50	5.06	4.31
BLOCK G - Simcoe St.			104.25	0.62	22	0.60	6	21	0.00	0.00	0	1.22	1.22	43	43	4.33	0.257	0.963	**1.22**	0.24%	450	0.013	**139.7**	0.88	174.072	179.25	173.817	179.25	5.31	4.86
BLOCK F - Park st.			113.33	0.00	0	2.30	28	98	0.00	0.00	0	2.30	3.52	98	141	4.20	0.740	3.078	**3.82**	0.30%	450	0.013	**156.2**	0.98	173.760	179.25	173.430	179.25	5.66	5.21
BLOCK E - Park St.			75.67	0.00	0	5.03	95	333	0.00	0.00	0	5.03	274.55	333	9021	3.00	57.655	140.910	**198.56**	0.13%	750	0.013	**401.4**	0.91	172.642	177.50	172.545	177.50	4.91	4.16
BLOCK D - Easement			110.22	0.00	0	1.36	30	105	0.00	0.00	0	1.36	615.70	105	20257	2.65	129.297	279.258	**475.04**	0.10%	1067	0.013	**901.4**	1.01	171.330	177.50	171.215	177.50	6.23	5.16
BLOCK U - Sandwich St. S (Crownridge)			74.58	1.87	65	33.54	332	1162	0.00	0.00	0	35.41	35.41	1227	1227	3.74	7.436	23.915	**31.35**	0.54%	350	0.013	**107.2**	1.11	175.062	177.00	174.659	177.00	2.14	1.79
BLOCK T - Sandwich St. S			171.64	3.27	114	10.13	108	378	0.00	0.00	0	13.40	48.81	492	1720	3.64	10.250	32.569	**42.82**	0.25%	350	0.013	**72.9**	0.76	173.470	179.50	173.040	179.50	6.25	5.90
BLOCK S - Pickering Dr.			69.87	0.40	14	25.74	356	1246	0.00	0.00	0	26.14	26.14	1260	1260	3.73	5.489	24.498	**29.99**	0.23%	375	0.013	**84.1**	0.76	173.200	179.50	173.040	179.50	6.38	6.01
BLOCK R - Pickering Dr.			94.89	10.36	363	6.59	199	697	0.00	0.00	0	16.95	91.90	1059	4039	3.33	19.299	70.042	**89.34**	0.23%	375	0.013	**84.1**	0.76	172.624	177.50	172.410	177.50	4.98	4.61
BLOCK R - Easement			126.93	0.00	0	0.00	0	0	0.00	0.00	0	0.00	707.60	0	24296	2.57	148.596	324.943	**540.02**	0.20%	1067	0.013	**1274.8**	1.43	171.090	177.50	170.840	177.50	6.54	5.47
BLOCK V - Dalhouse St.			130.00	2.40	84	29.46	479	1677	0.00	0.00	0	31.86	31.86	1761	1761	3.63	6.691	33.268	**39.96**	0.15%	300	0.013	**37.5**	0.53	174.022	177.00	173.827	177.50	3.33	3.03
																From Pump Station To AWWTP			**579.98**											

SANITARY SEWER DESIGN SHEET 4 (METRIC) - Scenario 3

NOTE: Pump Station on Lowes approx. 500m east of Fryer Servicing Rocksedge, Hunt Club Creek and Amico (17.2 ha) Developments , as well as, the 26 Existing Residential Lots within the southeast quadrant

DESIGN CRITERIA

HARMON'S PEAK FACTOR 1+14/(4+(P/1000)^0.5)

PEAK EXTRANEOUS FLOW 0.21 L/Ha/s

AVERAGE DAILY PER CAPITA FLOW 450 L/cap/day

RESIDENTIAL 3.5 people/house

INDUSTRIAL, COMMERCIAL & INSTITUTIONAL (ICI) 35 people/ha VELOCITY RANGE 0.76 m/s to 3

MINIMUM PIPE SIZE 200 mm

200 - Future sewers to be confirmed during the detailed design stage

Client : Town of Amherstburg **Project No. : 165620084**

LOCATION																													
STREET OR EASEMENT	FROM M.H.	TO M.H.	SEWER LENGTH (m)	INDUSTRIAL/COMMERCIAL/ INSTITUTIONAL (ICI) AREA (HECTARES)	INDUSTRIAL/COMMERCIAL/ INSTITUTIONAL (ICI) EQUIVALENT POPULATION	EXISTING RESIDENTIAL AREA (HECTARES)	EXISTING RESIDENTIAL LOTS	EXISTING RESIDENTIAL EQUIVALENT POPULATION	FUTURE RESIDENTIAL AREA (HECTARES)	FUTURE RESIDENTIAL LOTS	FUTURE RESIDENTIAL EQUIVALENT POPULATION	TOTAL AREA INCREMENTAL (HECTARES)	TOTAL AREA TOTAL (HECTARES)	DESIGN POPULATION (PERSONS) INCREMENT	DESIGN POPULATION (PERSONS) TOTAL	PEAK FACTOR	MAXIMUM FLOW INFILTRATION (L/s)	MAXIMUM FLOW SEWAGE (L/s)	MAXIMUM FLOW TOTAL SEWAGE AND INFILTRATION (L/s)	SEWER DESIGN SEWER SLOPE (%)	SEWER DESIGN DIAMETER (mm)	SEWER DESIGN MANNING'S "n"	SEWER DESIGN CAPACITY FULL (L/s)	SEWER DESIGN VELOCITY FULL (m/s)	PROFILE UPSTREAM ELEVATION INVERT (m)	PROFILE UPSTREAM ELEVATION GROUND (m)	PROFILE DOWNSTREAM ELEVATION INVERT (m)	PROFILE DOWNSTREAM ELEVATION GROUND (m)	AVERAGE DEPTH (m)	AVERAGE COVER (m)
Front Rd (CR No. 20) **Forcemain** from Texas Rd			95.00	0.00	0	0.00	0	0	0.00	0.00	0	0.00	0.00	0	0	0.00	0.000	0.000	**57.00**	0.59%	350	0.013	**112.1**	1.16	180.192	182.00	179.631	182.00	2.09	1.74
Thomas Rd to States Ave **Forcemain**			75.00	10.00	350	0.00	0	0	0.00	0.00	0	10.00	10.00	350	350	4.05	2.100	7.381	**9.48**	0.41%	250	0.013	**38.1**	0.78	181.356	183.00	181.051	183.00	1.80	1.55
BLOCK C - Gore St.				2.91	102	1.84	27	95	0.00	0.00	0	4.75	4.75	196	196	4.15	0.998	4.246	**5.24**	0.31%	300	0.013	**53.8**	0.76						
BLOCK B - Gore St.				0.00	0	0.93	14	49	0.00	0.00	0	0.93	5.68	49	245	4.11	1.193	5.258	**6.45**	0.31%	300	0.013	**53.8**	0.76						
BLOCK A - Dalhouse St.			110.00	71.00	2485	263.11	2400	8400	0.00	0.00	0	334.11	339.79	10885	11130	2.91	71.356	168.599	**306.44**	0.03%	1220	0.013	**705.8**	0.60	171.400	178.00	171.350	178.00	6.63	5.41
BLOCK Q - Simcoe St.			97.64	16.82	589	24.11	220	770	0.00	0.00	0	40.93	40.93	1359	1359	3.71	8.595	26.256	**34.85**	0.17%	375	0.013	**72.3**	0.65	178.197	180.10	178.032	180.70	2.29	1.91
Rocksedge Develoment		Lowes SR	1200.00	0.00	0	0.00	0	0	67.64	500.00	1750	67.64	67.64	1750	1750	3.63	14.204	33.087	**47.29**	0.31%	300	0.013	**53.8**	0.76	177.500	180.00	173.780	177.85	3.29	2.99
Hunt Club Creek Development		Lowes SR	1600.00	0.00	0	0.00	0	0	96.25	1001.00	3504	96.25	96.25	3504	3504	3.38	20.213	61.755	**81.97**	0.11%	450	0.013	**95.4**	0.60	174.500	177.00	172.708	177.55	3.67	3.22
Amico Development - Lowes Sideroad		Fryer St	500.00	0.00	0	0.00	0	0	17.20	162.00	567	17.20	17.20	567	567	3.95	3.612	11.652	**15.26**	0.25%	250	0.013	**29.7**	0.61	174.500	177.00	173.250	178.44	3.85	3.60
Lowes Sideroad - East of Fryer	Fryer St	New P.S.	500.00	0.00	0	15.05	26	91	0.00	0.00	0	15.05	196.14	91	5912	3.18	41.189	97.812	**139.00**	0.07%	675	0.013	**216.0**	0.60	173.000	178.44	172.670	177.55	5.16	4.49
BLOCK P - Fryers St.			113.70	0.00	0	3.99	44	154	0.00	0.00	0	3.99	200.13	154	6066	3.17	42.027	100.025	**142.05**	0.14%	525	0.013	**160.9**	0.74	178.080	180.40	177.925	180.70	2.55	2.02
BLOCK O - Simcoe St.			127.91	6.40	224	8.41	84	294	0.00	0.00	0	14.81	255.87	518	7942	3.05	53.733	126.303	**180.04**	0.09%	750	0.013	**334.0**	0.76	176.454	179.50	176.344	179.50	3.10	2.35
BLOCK N - Simcoe St.			84.95	1.00	35	2.89	62	217	0.00	0.00	0	3.89	259.76	252	8194	3.04	54.550	129.744	**184.29**	0.08%	750	0.013	**314.9**	0.71	175.041	179.50	174.970	179.50	4.49	3.74
BLOCK M - Simcoe St.			63.07	2.95	103	3.37	35	123	0.00	0.00	0	6.32	266.08	226	8420	3.03	55.877	132.811	**188.69**	0.08%	750	0.013	**314.9**	0.71	174.850	179.50	174.800	179.50	4.68	3.93
BLOCK L - Simcoe St.			83.08	0.00	0	3.63	44	154	0.00	0.00	0	3.63	269.71	154	8574	3.02	56.639	134.894	**191.53**	0.25%	750	0.013	**556.7**	1.26	174.162	179.50	173.951	179.50	5.44	4.69
BLOCK K - King St.			116.54	0.00	0	3.15	41	144	0.00	0.00	0	3.15	272.86	144	8717	3.01	57.301	136.830	**194.13**	0.09%	750	0.013	**334.0**	0.76	173.851	179.50	173.748	179.50	5.70	4.95
BLOCK J - Park st.			103.72	0.00	0	6.00	63	221	0.00	0.00	0	6.00	278.86	221	8938	3.00	58.561	139.793	**198.35**	0.01%	750	0.013	**111.3**	0.25	173.712	179.50	173.700	179.50	5.79	5.04
BLOCK I - Seymour St.			116.31	0.00	0	1.91	23	81	0.00	0.00	0	1.91	1.91	81	81	4.27	0.401	1.790	**2.19**	0.27%	300	0.013	**50.3**	0.71	174.597	179.50	174.280	179.50	5.06	4.76
BLOCK H - Park St.			100.47	0.16	6	2.26	26	91	0.00	0.00	0	2.42	283.19	97	9115	2.99	59.471	142.164	**201.63**	0.09%	750	0.013	**334.0**	0.76	173.485	178.50	173.395	178.50	5.06	4.31
BLOCK G - Simcoe St.			104.25	0.62	22	0.60	6	21	0.00	0.00	0	1.22	1.22	43	43	4.33	0.257	0.963	**1.22**	0.24%	450	0.013	**139.7**	0.88	174.072	179.25	173.817	179.25	5.31	4.86
BLOCK F - Park st.			113.33	0.00	0	2.30	28	98	0.00	0.00	0	2.30	3.52	98	141	4.20	0.740	3.078	**3.82**	0.30%	450	0.013	**156.2**	0.98	173.760	179.25	173.430	179.25	5.66	5.21
BLOCK E - Park St.			75.67	0.00	0	5.03	95	333	0.00	0.00	0	5.03	291.75	333	9588	2.97	61.267	148.458	**209.73**	0.13%	750	0.013	**401.4**	0.91	172.642	177.50	172.545	177.50	4.91	4.16
BLOCK D - Easement			110.22	0.00	0	1.36	30	105	0.00	0.00	0	1.36	632.90	105	20824	2.63	132.909	285.770	**485.16**	0.10%	1067	0.013	**901.4**	1.01	171.330	177.50	171.215	177.50	6.23	5.16
BLOCK U - Sandwich St. S (Crownridge)			74.58	1.87	65	33.54	332	1162	0.00	0.00	0	35.41	35.41	1227	1227	3.74	7.436	23.915	**31.35**	0.54%	350	0.013	**107.2**	1.11	175.062	177.00	174.659	177.00	2.14	1.79
BLOCK T - Sandwich St. S			171.64	3.27	114	10.13	108	378	0.00	0.00	0	13.40	48.81	492	1720	3.64	10.250	32.569	**42.82**	0.25%	350	0.013	**72.9**	0.76	173.470	179.50	173.040	179.50	6.25	5.90
BLOCK S - Pickering Dr.			69.87	0.40	14	25.74	356	1246	0.00	0.00	0	26.14	26.14	1260	1260	3.73	5.489	24.498	**29.99**	0.23%	375	0.013	**84.1**	0.76	173.200	179.50	173.040	179.50	6.38	6.01
BLOCK R - Pickering Dr.			94.89	10.36	363	6.59	199	697	0.00	0.00	0	16.95	91.90	1059	4039	3.33	19.299	70.042	**89.34**	0.23%	375	0.013	**84.1**	0.76	172.624	177.50	172.410	177.50	4.98	4.61
BLOCK R - Easement			126.93	0.00	0	0.00	0	0	0.00	0.00	0	0.00	724.80	0	24863	2.56	152.208	331.235	**549.92**	0.20%	1067	0.013	**1274.8**	1.43	171.090	177.50	170.840	177.50	6.54	5.47
BLOCK V - Dalhouse St.			130.00	2.40	84	29.46	479	1677	0.00	0.00	0	31.86	31.86	1761	1761	3.63	6.691	33.268	**39.96**	0.15%	300	0.013	**37.5**	0.53	174.022	177.00	173.827	177.50	3.33	3.03
																			From Pump Station To AWWTP	**589.88**										

SANITARY SEWER DESIGN SHEET 5 (METRIC) - Scenario 4

NOTE: Pump Station on Lowes approx. 500m east of Fryer Servicing Rocksedge, Hunt Club Creek, Capo D'Aqua and Amico (Full) Developments , as well as, the 26 Existing Residential Lots within the southeast quadrant

DESIGN CRITERIA

HARMON'S PEAK FACTOR 1+14/(4+(P/1000)^0.5)

PEAK EXTRANEOUS FLOW 0.21 L/Ha/s

AVERAGE DAILY PER CAPITA FLOW 450 L/cap/day

RESIDENTIAL 3.5 people/house

INDUSTRIAL, COMMERCIAL & INSTITUTIONAL (ICI) 35 people/ha VELOCITY RANGE 0.76 m/s to 3

MINIMUM PIPE SIZE 200 mm

200 - Future sewers to be confirmed during the detailed design stage

Client : Town of Amherstburg **Project No. : 165620084**

LOCATION				INDUSTRIAL/COMMERCIAL/ INSTITUTIONAL (ICI)		EXISTING RESIDENTIAL			FUTURE RESIDENTIAL			TOTAL AREA		TOTAL DESIGN POPULATION (PERSONS)		PEAK FACTOR	MAXIMUM FLOW			SEWER DESIGN					PROFILE					
STREET OR EASEMENT	FROM M.H.	TO M.H.	SEWER LENGTH (m)	AREA (HECTARES)	EQUIVALENT POPULATION	AREA (HECTARES)	LOTS	EQUIVALENT POPULATION	AREA (HECTARES)	LOTS	EQUIVALENT POPULATION	INCREMENTAL (HECTARES)	TOTAL (HECTARES)	INCREMENT	TOTAL		INFILTRATION (L/s)	SEWAGE (L/s)	TOTAL SEWAGE AND INFILTRATION (L/s)	SEWER SLOPE (%)	DIAMETER (mm)	MANNING'S "n"	CAPACITY FULL (L/s)	VELOCITY FULL (m/s)	UPSTREAM ELEVATION INVERT (m)	UPSTREAM ELEVATION GROUND (m)	DOWNSTREAM ELEVATION INVERT (m)	DOWNSTREAM ELEVATION GROUND (m)	AVERAGE DEPTH (m)	AVERAGE COVER (m)
Front Rd (CR No. 20) **Forcemain** from Texas Rd			95.00	0.00	0	0.00	0	0	0.00	0.00	0	0.00	0.00	0	0	0.00	0.000	0.000	**57.00**	0.59%	350	0.013	**112.1**	1.16	180.192	182.00	179.631	182.00	2.09	1.74
Thomas Rd to States Ave **Forcemain**			75.00	10.00	350	0.00	0	0	0.00	0.00	0	10.00	10.00	350	350	4.05	2.100	7.381	**9.48**	0.41%	250	0.013	**38.1**	0.78	181.356	183.00	181.051	183.00	1.80	1.55
BLOCK C - Gore St.				2.91	102	1.84	27	95	0.00	0.00	0	4.75	4.75	196	196	4.15	0.998	4.246	**5.24**	0.31%	300	0.013	**53.8**	0.76						
BLOCK B - Gore St.				0.00	0	0.93	14	49	0.00	0.00	0	0.93	5.68	49	245	4.11	1.193	5.258	**6.45**	0.31%	300	0.013	**53.8**	0.76						
BLOCK A - Dalhouse St.			110.00	71.00	2485	263.11	2400	8400	0.00	0.00	0	334.11	339.79	10885	11130	2.91	71.356	168.599	**306.44**	0.03%	1220	0.013	**705.8**	0.60	171.400	178.00	171.350	178.00	6.63	5.41
BLOCK Q - Simcoe St.			97.64	16.82	589	24.11	220	770	0.00	0.00	0	40.93	40.93	1359	1359	3.71	8.595	26.256	**34.85**	0.17%	375	0.013	**72.3**	0.65	178.197	180.10	178.032	180.70	2.29	1.91
Rocksedge Develoment		Lowes SR	1200.00	0.00	0	0.00	0	0	67.64	500.00	1750	67.64	67.64	1750	1750	3.63	14.204	33.087	**47.29**	0.31%	300	0.013	**53.8**	0.76	177.500	180.00	173.780	177.85	3.29	2.99
Hunt Club Creek Development		Lowes SR	1600.00	0.00	0	0.00	0	0	96.25	1001.00	3504	96.25	96.25	3504	3504	3.38	20.213	61.755	**81.97**	0.11%	450	0.013	**95.4**	0.60	174.500	177.00	172.708	177.55	3.67	3.22
Capo D'Aqua Development		Fryer St	600.00	0.00	0	0.00	0	0	30.36	113.00	396	30.36	30.36	396	396	4.02	6.376	8.290	**14.67**	0.53%	200	0.013	**23.9**	0.76	174.500	177.00	171.320	177.00	4.09	3.89
Amico Development - Lowes Sideroad		Fryer St	500.00	0.00	0	0.00	0	0	27.50	432.00	1512	27.50	27.50	1512	1512	3.68	5.775	28.957	**34.73**	0.19%	300	0.013	**42.2**	0.60	174.500	177.00	173.550	178.44	3.69	3.39
Lowes Sideroad - East of Fryer	Fryer St	New P.S.	500.00	0.00	0	15.05	26	91	0.00	0.00	0	15.05	236.80	91	7252	3.09	49.728	116.778	**166.51**	0.07%	675	0.013	**216.0**	0.60	173.000	178.44	172.670	177.55	5.16	4.49
BLOCK P - Fryers St.			113.70	0.00	0	3.99	44	154	0.00	0.00	0	3.99	240.79	154	7406	3.08	50.566	118.916	**169.48**	0.14%	525	0.013	**160.9**	0.74	178.080	180.40	177.925	180.70	2.55	2.02
BLOCK O - Simcoe St.			127.91	6.40	224	8.41	84	294	0.00	0.00	0	14.81	296.53	518	9283	2.99	62.271	144.401	**206.67**	0.09%	750	0.013	**334.0**	0.76	176.454	179.50	176.344	179.50	3.10	2.35
BLOCK N - Simcoe St.			84.95	1.00	35	2.89	62	217	0.00	0.00	0	3.89	300.42	252	9535	2.98	63.088	147.749	**210.84**	0.08%	750	0.013	**314.9**	0.71	175.041	179.50	174.970	179.50	4.49	3.74
BLOCK M - Simcoe St.			63.07	2.95	103	3.37	35	123	0.00	0.00	0	6.32	306.74	226	9760	2.97	64.416	150.735	**215.15**	0.08%	750	0.013	**314.9**	0.71	174.850	179.50	174.800	179.50	4.68	3.93
BLOCK L - Simcoe St.			83.08	0.00	0	3.63	44	154	0.00	0.00	0	3.63	310.37	154	9914	2.96	65.178	152.765	**217.94**	0.25%	750	0.013	**556.7**	1.26	174.162	179.50	173.951	179.50	5.44	4.69
BLOCK K - King St.			116.54	0.00	0	3.15	41	144	0.00	0.00	0	3.15	313.52	144	10058	2.95	65.840	154.651	**220.49**	0.09%	750	0.013	**334.0**	0.76	173.851	179.50	173.748	179.50	5.70	4.95
BLOCK J - Park st.			103.72	0.00	0	6.00	63	221	0.00	0.00	0	6.00	319.52	221	10278	2.94	67.100	157.540	**224.64**	0.01%	750	0.013	**111.3**	0.25	173.712	179.50	173.700	179.50	5.79	5.04
BLOCK I - Seymour St.			116.31	0.00	0	1.91	23	81	0.00	0.00	0	1.91	1.91	81	81	4.27	0.401	1.790	**2.19**	0.27%	300	0.013	**50.3**	0.71	174.597	179.50	174.280	179.50	5.06	4.76
BLOCK H - Park St.			100.47	0.16	6	2.26	26	91	0.00	0.00	0	2.42	323.85	97	10456	2.94	68.009	159.852	**227.86**	0.09%	750	0.013	**334.0**	0.76	173.485	178.50	173.395	178.50	5.06	4.31
BLOCK G - Simcoe St.			104.25	0.62	22	0.60	6	21	0.00	0.00	0	1.22	1.22	43	43	4.33	0.257	0.963	**1.22**	0.24%	450	0.013	**139.7**	0.88	174.072	179.25	173.817	179.25	5.31	4.86
BLOCK F - Park st.			113.33	0.00	0	2.30	28	98	0.00	0.00	0	2.30	3.52	98	141	4.20	0.740	3.078	**3.82**	0.30%	450	0.013	**156.2**	0.98	173.760	179.25	173.430	179.25	5.66	5.21
BLOCK E - Park St.			75.67	0.00	0	5.03	95	333	0.00	0.00	0	5.03	332.41	333	10929	2.92	69.805	165.996	**235.80**	0.13%	750	0.013	**401.4**	0.91	172.642	177.50	172.545	177.50	4.91	4.16
BLOCK D - Easement			110.22	0.00	0	1.36	30	105	0.00	0.00	0	1.36	673.56	105	22164	2.61	141.447	301.033	**508.96**	0.10%	1067	0.013	**901.4**	1.01	171.330	177.50	171.215	177.50	6.23	5.16
BLOCK U - Sandwich St. S (Crownridge)			74.58	1.87	65	33.54	332	1162	0.00	0.00	0	35.41	35.41	1227	1227	3.74	7.436	23.915	**31.35**	0.54%	350	0.013	**107.2**	1.11	175.062	177.00	174.659	177.00	2.14	1.79
BLOCK T - Sandwich St. S			171.64	3.27	114	10.13	108	378	0.00	0.00	0	13.40	48.81	492	1720	3.64	10.250	32.569	**42.82**	0.25%	350	0.013	**72.9**	0.76	173.470	179.50	173.040	179.50	6.25	5.90
BLOCK S - Pickering Dr.			69.87	0.40	14	25.74	356	1246	0.00	0.00	0	26.14	26.14	1260	1260	3.73	5.489	24.498	**29.99**	0.23%	375	0.013	**84.1**	0.76	173.200	179.50	173.040	179.50	6.38	6.01
BLOCK R - Pickering Dr.			94.89	10.36	363	6.59	199	697	0.00	0.00	0	16.95	91.90	1059	4039	3.33	19.299	70.042	**89.34**	0.23%	375	0.013	**84.1**	0.76	172.624	177.50	172.410	177.50	4.98	4.61
BLOCK R - Easement			126.93	0.00	0	0.00	0	0	0.00	0.00	0	0.00	765.46	0	26203	2.54	160.746	346.001	**573.23**	0.20%	1067	0.013	**1274.8**	1.43	171.090	177.50	170.840	177.50	6.54	5.47
BLOCK V - Dalhouse St.			130.00	2.40	84	29.46	479	1677	0.00	0.00	0	31.86	31.86	1761	1761	3.63	6.691	33.268	**39.96**	0.15%	300	0.013	**37.5**	0.53	174.022	177.00	173.827	177.50	3.33	3.03
																From Pump Station To AWWTP			**613.19**											

SANITARY SEWER DESIGN SHEET 6 (METRIC) - Scenario 5

NOTE: Pump Station on Lowes approx. 500m east of Fryer Servicing Rocksedge, Hunt Club Creek, Amico (17.2 ha) and Walker Aggregates (26.73 ha) Developments, as well as, the 26 Existing Residential Lots within the southeast quadrant

DESIGN CRITERIA

HARMON'S PEAK FACTOR 1+14/(4+(P/1000)^0.5)

PEAK EXTRANEOUS FLOW 0.21 L/Ha/s

AVERAGE DAILY PER CAPITA FLOW 450 L/cap/day

RESIDENTIAL 3.5 people/house

INDUSTRIAL, COMMERCIAL & INSTITUTIONAL (ICI) 35 people/ha VELOCITY RANGE 0.76 m/s to 3

MINIMUM PIPE SIZE 200 mm

200 - Future sewers to be confirmed during the detailed design stage

Client : Town of Amherstburg **Project No. : 165620084**

LOCATION				INDUSTRIAL/COMMERCIAL/ INSTITUTIONAL (ICI)		EXISTING RESIDENTIAL			FUTURE RESIDENTIAL			TOTAL AREA		TOTAL DESIGN POPULATION (PERSONS)		PEAK FACTOR	MAXIMUM FLOW			SEWER DESIGN					PROFILE					
STREET OR EASEMENT	FROM M.H.	TO M.H.	SEWER LENGTH (m)	AREA (HECTARES)	EQUIVALENT POPULATION	AREA (HECTARES)	LOTS	EQUIVALENT POPULATION	AREA (HECTARES)	LOTS	EQUIVALENT POPULATION	INCREMENTAL (HECTARES)	TOTAL (HECTARES)	INCREMENT	TOTAL		INFILTRATION (L/s)	SEWAGE (L/s)	TOTAL SEWAGE AND INFILTRATION (L/s)	SEWER SLOPE (%)	DIAMETER (mm)	MANNING'S "n"	CAPACITY FULL (L/s)	VELOCITY FULL (m/s)	UPSTREAM ELEVATION INVERT (m)	UPSTREAM ELEVATION GROUND (m)	DOWNSTREAM ELEVATION INVERT (m)	DOWNSTREAM ELEVATION GROUND (m)	AVERAGE DEPTH (m)	AVERAGE COVER (m)
Front Rd (CR No. 20) **Forcemain** from Texas Rd			95.00	0.00	0	0.00	0	0	0.00	0.00	0	0.00	0.00	0	0	0.00	0.000	0.000	**57.00**	0.59%	350	0.013	**112.1**	1.16	180.192	182.00	179.631	182.00	2.09	1.74
Thomas Rd to States Ave **Forcemain**			75.00	10.00	350	0.00	0	0	0.00	0.00	0	10.00	10.00	350	350	4.05	2.100	7.381	**9.48**	0.41%	250	0.013	**38.1**	0.78	181.356	183.00	181.051	183.00	1.80	1.55
BLOCK C - Gore St.				2.91	102	1.84	27	95	0.00	0.00	0	4.75	4.75	196	196	4.15	0.998	4.246	**5.24**	0.31%	300	0.013	**53.8**	0.76						
BLOCK B - Gore St.				0.00	0	0.93	14	49	0.00	0.00	0	0.93	5.68	49	245	4.11	1.193	5.258	**6.45**	0.31%	300	0.013	**53.8**	0.76						
BLOCK A - Dalhouse St.			110.00	71.00	2485	263.11	2400	8400	0.00	0.00	0	334.11	339.79	10885	11130	2.91	71.356	168.599	**306.44**	0.03%	1220	0.013	**705.8**	0.60	171.400	178.00	171.350	178.00	6.63	5.41
BLOCK Q - Simcoe St.			97.64	16.82	589	24.11	220	770	0.00	0.00	0	40.93	40.93	1359	1359	3.71	8.595	26.256	**34.85**	0.17%	375	0.013	**72.3**	0.65	178.197	180.10	178.032	180.70	2.29	1.91
Walker Aggregates Development		New P.S.	600.00	0.00	0	0.00	0	0	26.73	350.00	1225	26.73	26.73	1225	1225	3.74	5.613	23.871	**29.48**	0.39%	250	0.013	**37.1**	0.76	174.500	177.00	172.160	177.55	3.95	3.70
Rocksedge Develoment		Lowes SR	1200.00	0.00	0	0.00	0	0	67.64	500.00	1750	67.64	67.64	1750	1750	3.63	14.204	33.087	**47.29**	0.31%	300	0.013	**53.8**	0.76	177.500	180.00	173.780	177.85	3.29	2.99
Hunt Club Creek Development		Lowes SR	1600.00	0.00	0	0.00	0	0	96.25	1001.00	3504	96.25	96.25	3504	3504	3.38	20.213	61.755	**81.97**	0.11%	450	0.013	**95.4**	0.60	174.500	177.00	172.708	177.55	3.67	3.22
Amico Development - Lowes Sideroad		Fryer St	500.00	0.00	0	0.00	0	0	17.20	162.00	567	17.20	17.20	567	567	3.95	3.612	11.652	**15.26**	0.25%	250	0.013	**29.4**	0.60	174.500	177.00	173.275	178.44	3.83	3.58
Lowes Sideroad - East of Fryer	Fryer St	New P.S.	500.00	0.00	0	15.05	26	91	0.00	0.00	0	15.05	222.87	91	7137	3.10	46.803	115.169	**161.97**	0.07%	675	0.013	**216.0**	0.60	173.000	178.44	172.670	177.55	5.16	4.49
BLOCK P - Fryers St.			113.70	0.00	0	3.99	44	154	0.00	0.00	0	3.99	226.86	154	7291	3.09	47.641	117.313	**164.95**	0.14%	525	0.013	**160.9**	0.74	178.080	180.40	177.925	180.70	2.55	2.02
BLOCK O - Simcoe St.			127.91	6.40	224	8.41	84	294	0.00	0.00	0	14.81	282.60	518	9167	2.99	59.346	142.861	**202.21**	0.09%	750	0.013	**334.0**	0.76	176.454	179.50	176.344	179.50	3.10	2.35
BLOCK N - Simcoe St.			84.95	1.00	35	2.89	62	217	0.00	0.00	0	3.89	286.49	252	9419	2.98	60.163	146.216	**206.38**	0.08%	750	0.013	**314.9**	0.71	175.041	179.50	174.970	179.50	4.49	3.74
BLOCK M - Simcoe St.			63.07	2.95	103	3.37	35	123	0.00	0.00	0	6.32	292.81	226	9645	2.97	61.490	149.209	**210.70**	0.08%	750	0.013	**314.9**	0.71	174.850	179.50	174.800	179.50	4.68	3.93
BLOCK L - Simcoe St.			83.08	0.00	0	3.63	44	154	0.00	0.00	0	3.63	296.44	154	9799	2.96	62.253	151.243	**213.50**	0.25%	750	0.013	**556.7**	1.26	174.162	179.50	173.951	179.50	5.44	4.69
BLOCK K - King St.			116.54	0.00	0	3.15	41	144	0.00	0.00	0	3.15	299.59	144	9942	2.96	62.915	153.133	**216.05**	0.09%	750	0.013	**334.0**	0.76	173.851	179.50	173.748	179.50	5.70	4.95
BLOCK J - Park st.			103.72	0.00	0	6.00	63	221	0.00	0.00	0	6.00	305.59	221	10163	2.95	64.175	156.028	**220.20**	0.01%	750	0.013	**111.3**	0.25	173.712	179.50	173.700	179.50	5.79	5.04
BLOCK I - Seymour St.			116.31	0.00	0	1.91	23	81	0.00	0.00	0	1.91	1.91	81	81	4.27	0.401	1.790	**2.19**	0.27%	300	0.013	**50.3**	0.71	174.597	179.50	174.280	179.50	5.06	4.76
BLOCK H - Park St.			100.47	0.16	6	2.26	26	91	0.00	0.00	0	2.42	309.92	97	10340	2.94	65.084	158.345	**223.43**	0.09%	750	0.013	**334.0**	0.76	173.485	178.50	173.395	178.50	5.06	4.31
BLOCK G - Simcoe St.			104.25	0.62	22	0.60	6	21	0.00	0.00	0	1.22	1.22	43	43	4.33	0.257	0.963	**1.22**	0.24%	450	0.013	**139.7**	0.88	174.072	179.25	173.817	179.25	5.31	4.86
BLOCK F - Park st.			113.33	0.00	0	2.30	28	98	0.00	0.00	0	2.30	3.52	98	141	4.20	0.740	3.078	**3.82**	0.30%	450	0.013	**156.2**	0.98	173.760	179.25	173.430	179.25	5.66	5.21
BLOCK E - Park St.			75.67	0.00	0	5.03	95	333	0.00	0.00	0	5.03	318.48	333	10813	2.92	66.880	164.501	**231.38**	0.13%	750	0.013	**401.4**	0.91	172.642	177.50	172.545	177.50	4.91	4.16
BLOCK D - Easement			110.22	0.00	0	1.36	30	105	0.00	0.00	0	1.36	659.63	105	22049	2.61	138.522	299.725	**504.73**	0.10%	1067	0.013	**901.4**	1.01	171.330	177.50	171.215	177.50	6.23	5.16
BLOCK U - Sandwich St. S (Crownridge)			74.58	1.87	65	33.54	332	1162	0.00	0.00	0	35.41	35.41	1227	1227	3.74	7.436	23.915	**31.35**	0.54%	350	0.013	**107.2**	1.11	175.062	177.00	174.659	177.00	2.14	1.79
BLOCK T - Sandwich St. S			171.64	3.27	114	10.13	108	378	0.00	0.00	0	13.40	48.81	492	1720	3.64	10.250	32.569	**42.82**	0.25%	350	0.013	**72.9**	0.76	173.470	179.50	173.040	179.50	6.25	5.90
BLOCK S - Pickering Dr.			69.87	0.40	14	25.74	356	1246	0.00	0.00	0	26.14	26.14	1260	1260	3.73	5.489	24.498	**29.99**	0.23%	375	0.013	**84.1**	0.76	173.200	179.50	173.040	179.50	6.38	6.01
BLOCK R - Pickering Dr.			94.89	10.36	363	6.59	199	697	0.00	0.00	0	16.95	91.90	1059	4039	3.33	19.299	70.042	**89.34**	0.23%	375	0.013	**84.1**	0.76	172.624	177.50	172.410	177.50	4.98	4.61
BLOCK R - Easement			126.93	0.00	0	0.00	0	0	0.00	0.00	0	0.00	751.53	0	26088	2.54	157.821	344.734	**569.04**	0.20%	1067	0.013	**1274.8**	1.43	171.090	177.50	170.840	177.50	6.54	5.47
BLOCK V - Dalhouse St.			130.00	2.40	84	29.46	479	1677	0.00	0.00	0	31.86	31.86	1761	1761	3.63	6.691	33.268	**39.96**	0.15%	300	0.013	**37.5**	0.53	174.022	177.00	173.827	177.50	3.33	3.03
																		From Pump Station To AWWTP	**608.99**										