

1. System Infrastructure Assessment and Evaluation

In the Water and Wastewater Master Plan, the water and wastewater servicing concepts were evaluated and confirmed to be feasible to provide sufficient services to meet the urban boundary expansion. For each stage (e.g., Stages 1 to 4), the proof of concepts completed in the Water and Wastewater Master Plan led to the water and wastewater infrastructure assessment for identifying the implementation strategy.

1.1 Water and Wastewater Infrastructure Assessment Basis

Basis for Overall Recommended Maser Community Plan Water and Wastewater Servicing Strategy

- Strategy for urban boundary expansion must not impact the growth within existing urban boundary developments.
- Assumes Smithville Pumping Station upgrades in place by 2030 (as per Region's DC study).
- Also, in sync with Region's Water and Wastewater Servicing Master Plan strategy.
- Requires Region's Smithville forcemain twinning between Smithville and Grimsby systems and Grimsby water treatment plant and wastewater treatment plant capacity upgrades. Assume these works would be implemented between 2030 and 2040.
- Requires Smithville elevated tank replacement and London Road water pump station capacity upgrade.

Utilizing the preliminary water servicing concept presented in the Water and Wastewater Master Plan, various infrastructure strategies / alignment options were reviewed. The strategies were developed based on the following considerations.

- a) Region's DC Projects (W-M-006 & W-M-018);
- b) Future road improvement works;
- c) Creek and railway crossing;
- d) Urban boundary expansion location;
- e) Opportunity to improve existing infrastructures; and
- f) Construction complexity.

Figure 1-1 and **Figure 1-2** present the water and wastewater infrastructure options, respectively. The following sub-sections provided detailed water and wastewater infrastructure options assessment for each staging of the urban boundary expansion concept.

Figure 1-1: Water Servicing Strategy Options

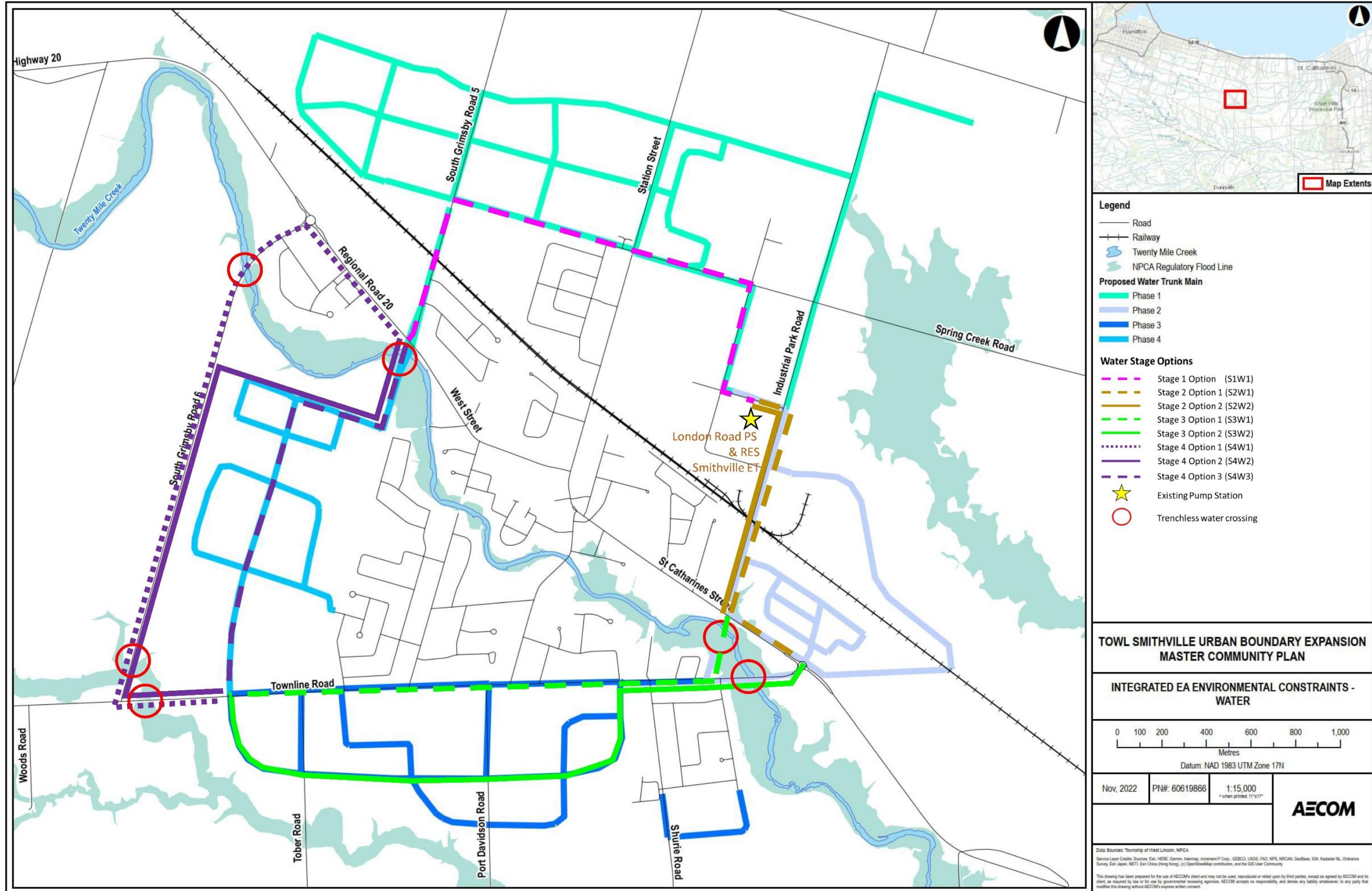
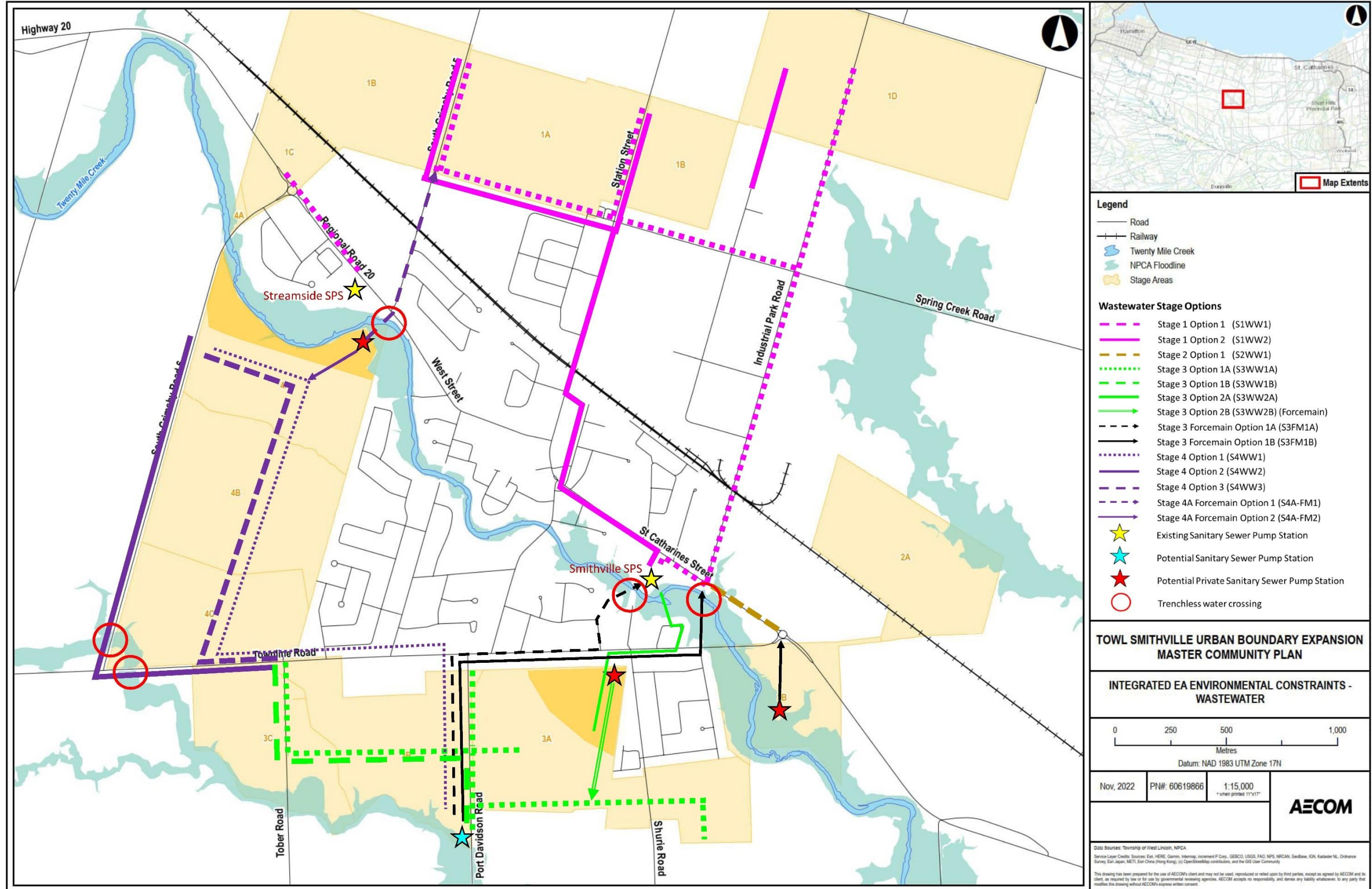


Figure 1-2: Wastewater Servicing Strategy Options



1.2 Water and Wastewater Infrastructure Assessment for Stage 1

The assessment results indicated that S1W1 and S1WW1 would be considered a most preferable strategies to meet the water and wastewater service, respectively, for the urban boundary expansion for Stage 1 as well as the expected growth for the Spring Creek Heights Secondary Plan area. The following summarizes the rationale for selecting these preferred solutions and **Table 1-1** presents the detailed assessment results.

1.2.1 Preferred Solutions and Rationale for Stage 1 Water Service

As only one option was evaluated for the watermain expansion for Stage 1, S1W1 is the preferred solution.

1.2.2 Preferred Solutions and Rationale for Stage 1 Wastewater Service

Two alternatives were evaluated to address wastewater servicing for the Stage 1 urban boundary expansion area.

S1WW1

- a) New sewer gravity main on Spring Creek Road from South Grimsby Road 5 and easterly to Industrial Park Road
- b) Gravity sewer continues southernly down Industrial Park Road
- c) Industrial Park to Regional Road 20
- d) Westerly on Regional Road 20 to Smithville Pumping Station

S1WW2

- a) New sewer gravity main on Spring Creek Road from South Grimsby Road 5 and easternly towards Station Street
- b) Station Street south to Regional Road 20
- c) Westerly on Regional Road 20 to Smithville Pumping Station

Rationale for preferred solution for Stage 1 Wastewater Service

S1WW1 is the preferred solution, and the rationale is summarized as follows:

- Appendix A:** Can be easily co-ordinated with near term development
- Appendix B:** Alignment can be co-ordinated with preferred watermain length (S1W1)
- Appendix C:** Reduced construction complexity and avoids significant utility conflicts and community disruption within the existing Smithville urban area
- Appendix D:** Alignment can also provide service to the Spring Creek Heights Secondary Plan development area

In addition to the above noted rationale for selecting S1WW1 as the preferred solution, Industrial Park Road has a number of existing services within its Right-of-way as well as the future Regional Forcemain. The detailed design for the S1WW1 must consider these services prior to the implementation of the infrastructure.

Table 1-1: Stage 1 Water and Wastewater Strategy Assessment Results

Category	Criteria	Stage 1 Water: S1W1	Stage 1 Wastewater: S1WW1	Stage 1 Wastewater: S1WW2
Details	-	<ul style="list-style-type: none"> Watermain extends northerly on South Grimsby Road 5 from Regional Road 20 to Spring Creek Road Easternly along Spring Creek Road to Thompson Road Southernly on Thompson Road and easternly to London Road pumping station No crossing of Twenty Mile Creek Crossing of rail tracks on South Grimsby Road 5 <p style="text-align: center;">Preferred Solution</p>	<ul style="list-style-type: none"> New sewer gravity main on Spring Creek Road from South Grimsby Road 5 and easterly to Industrial Park Road Gravity sewer continues southernly down Industrial Park Road Industrial Park to Regional Road 20 Westerly on Regional Road 20 to Smithville Pumping Station No crossing of Twenty Mile Creek required Crossing of rail tracks on Industrial Park Road <p style="text-align: center;">Preferred Solution</p>	<ul style="list-style-type: none"> New sewer gravity main on Spring Creek Road from South Grimsby Road 5 and easternly towards Station Street Station Street south to Regional Road 20 Westerly on Regional Road 20 to Smithville Pumping Station No crossing of Twenty Mile Creek required Crossing of rail tracks on Station Street
Technical Environment	<ul style="list-style-type: none"> Potential degree of construction complexities, including number and type of water crossings, anticipated rock removal, access, working area and duration to build. 	<ul style="list-style-type: none"> One crossing of rail tracks No crossings of Twenty Mile Creek Anticipate in rock Access from South Grimsby Road 5 and Spring Creek Road Relative construction duration has not been determined due to single option for water 	<ul style="list-style-type: none"> One crossing of rail tracks No crossings of Twenty Mile Creek Anticipate in rock Access from Industrial Park Road, South Grimsby Road 5, and Spring Creek Road Shorter construction duration 	<ul style="list-style-type: none"> One crossing of rail tracks No crossings of Twenty Mile Creek Anticipate in rock Access from South Grimsby Road 5 and Spring Creek Road Longer construction duration due to work in urbanized area along Station Street / Brock Street
Technical Environment	<ul style="list-style-type: none"> Potential effects on roadway and utility infrastructure. 	<ul style="list-style-type: none"> Lower impacts to paved surfaces Potential for railway conflicts on South Grimsby Road 5 Potential for utility conflicts on Thompson Road and London Road 	<ul style="list-style-type: none"> Lower impacts to paved surfaces Potential for railway conflicts on South Grimsby Road 5 	<ul style="list-style-type: none"> Greater impacts to paved surfaces on Station Street Potential for railway conflicts on Station Street
Technical Environment	<ul style="list-style-type: none"> Provides good site access for maintenance vehicles, future operation and maintenance and servicing. 	<ul style="list-style-type: none"> Access from existing road allowances and existing utility corridor / easement / multi use path 	<ul style="list-style-type: none"> Access from existing road allowances and existing utility corridor/easement/multi use path Provides better access from existing and future road Right-of-way 	<ul style="list-style-type: none"> Access from existing road allowances and existing utility corridor/ easement / multi-use path Provides more difficult access from existing Right-of-way (Station Street)
Technical Environment	<ul style="list-style-type: none"> Operation efficiency. 	<ul style="list-style-type: none"> Not applicable 	<ul style="list-style-type: none"> Not applicable 	<ul style="list-style-type: none"> Not applicable
Technical Environment	<ul style="list-style-type: none"> Potential opportunity for current infrastructure to be decommissioned in favour of gravity solutions 	<ul style="list-style-type: none"> Not applicable 	<ul style="list-style-type: none"> Not applicable 	<ul style="list-style-type: none"> Not applicable
Technical Environment	<ul style="list-style-type: none"> Potential effects on traffic. 	<ul style="list-style-type: none"> Lower impacts to the travelling public 	<ul style="list-style-type: none"> Lower impacts to the travelling public 	<ul style="list-style-type: none"> Greater impacts to the travelling public
Technical Environment	<ul style="list-style-type: none"> Dependency on the completion of other Stages 	<ul style="list-style-type: none"> Independent of all other Staging Strategies 	<ul style="list-style-type: none"> Independent of all other Staging Strategies 	<ul style="list-style-type: none"> Independent of all other Staging Strategies
Technical Environment	<ul style="list-style-type: none"> Degree of permitting and approvals complexity 	<ul style="list-style-type: none"> Canadian Pacific Railway permitting anticipated due to railway crossing Species at Risk permitting anticipated due to Species at Risk habitat in area (Spring Creek Road extension) 	<ul style="list-style-type: none"> Canadian Pacific Railway permitting anticipated due to railway crossing Species at Risk permitting anticipated due to Species at Risk habitat in area (Spring Creek Road extension) 	<ul style="list-style-type: none"> Canadian Pacific Railway permitting anticipated due to railway crossing Species at Risk permitting anticipated due to Species at Risk habitat in area (Spring Creek Road extension)

Category	Criteria	Stage 1 Water: S1W1	Stage 1 Wastewater: S1WW1	Stage 1 Wastewater: S1WW2
Land Use	<ul style="list-style-type: none"> Potential to conform to approved local (e.g., OP and Maser Community Plan), provincial (e.g., PPS) plans and policies. Identify existing official plans and schedule B1, B3 and B4 Natural Heritage 	<ul style="list-style-type: none"> Conforms Utilities permitted in future Right-of-way Pipe does not cross natural heritage system 	<ul style="list-style-type: none"> Conforms Pipe does not cross natural heritage system 	<ul style="list-style-type: none"> Conforms Pipe does not cross natural heritage system
Land Use	<ul style="list-style-type: none"> Potential effects on current land uses, including development plans. 	<ul style="list-style-type: none"> None anticipated 	<ul style="list-style-type: none"> None anticipated 	<ul style="list-style-type: none"> None anticipated
Natural Environment	<ul style="list-style-type: none"> Potential effects on terrestrial/ aquatic habitat and species. 	<ul style="list-style-type: none"> No anticipated effects on terrestrial / aquatic habitat and species 	<ul style="list-style-type: none"> No anticipated effects on terrestrial / aquatic habitat and species 	<ul style="list-style-type: none"> No anticipated effects on terrestrial / aquatic habitat and species
Natural Environment	<ul style="list-style-type: none"> Potential effects on species at risk (Species at Risk) and Species at Risk habitat. 	<ul style="list-style-type: none"> Potential to encounter Species at Risk within Spring Creek Road extension area. Species may include Bobolink and Eastern Meadowlark. 	<ul style="list-style-type: none"> Potential to encounter Species at Risk within Spring Creek Road extension area. Species may include Bobolink and Eastern Meadowlark. 	<ul style="list-style-type: none"> Potential to encounter Species at Risk within Spring Creek Road extension area. Species may include Bobolink and Eastern Meadowlark.
Natural Environment	<ul style="list-style-type: none"> Potential to encounter soil and water contamination and waste disposal. 	<ul style="list-style-type: none"> None identified 	<ul style="list-style-type: none"> None identified 	<ul style="list-style-type: none"> None identified
Natural Environment	<ul style="list-style-type: none"> Anticipated environmental permitting and approval considerations. 	<ul style="list-style-type: none"> Species at Risk permitting anticipated due to Species at Risk habitat in area (Spring Creek Road extension) 	<ul style="list-style-type: none"> Species at Risk permitting anticipated due to Species at Risk habitat in area (Spring Creek Road extension) 	<ul style="list-style-type: none"> Species at Risk permitting anticipated due to Species at Risk habitat in area (Spring Creek Road extension)
Natural Environment	<ul style="list-style-type: none"> Potential effects on surface water and groundwater due to construction (i.e., dewatering of trenches during installation of watermain and/or sanitary forcemain/sewer, control of erosion and sedimentation). 	<ul style="list-style-type: none"> The installation of watermain can lead to the interception of the shallow water table altering shallow groundwater flow paths Installation of infrastructure below the water table leads to the potential need for dewatering during construction and post construction and a decrease in groundwater levels 	<ul style="list-style-type: none"> The installation of sewer infrastructure can lead to the interception of the shallow water table altering shallow groundwater flow paths Installation of infrastructure below the water table leads to the potential need for dewatering during construction and post construction and a decrease in groundwater levels 	<ul style="list-style-type: none"> The installation of sewer infrastructure can lead to the interception of the shallow water table altering shallow groundwater flow paths Installation of infrastructure below the water table leads to the potential need for dewatering during construction and post construction and a decrease in groundwater levels
Natural Environment	<ul style="list-style-type: none"> Source water protection considerations. 	<ul style="list-style-type: none"> Drainage features within the study area are primarily headwater drainage (HDF) features, with some defined and regulated watercourses 	<ul style="list-style-type: none"> Drainage features within the study area are primarily headwater drainage (HDF) features, with some defined and regulated watercourses 	<ul style="list-style-type: none"> Drainage features within the study area are primarily headwater drainage (HDF) features, with some defined and regulated watercourses
Socio-Economic Environment	<ul style="list-style-type: none"> Potential nuisance impacts (e.g., disruption to access, air, dust, noise, and vibration) from construction and operations. 	<ul style="list-style-type: none"> Potential disruption to fronting properties 	<ul style="list-style-type: none"> Lower potential disruption to fronting properties 	<ul style="list-style-type: none"> Greater potential disruption to fronting properties
Socio-Economic Environment	<ul style="list-style-type: none"> Potential property requirements (temporary and permanent). 	<ul style="list-style-type: none"> None anticipated 	<ul style="list-style-type: none"> None anticipated 	<ul style="list-style-type: none"> None anticipated
Climate Change	<ul style="list-style-type: none"> Potential carbon footprint (e.g., energy usage, use of construction materials, construction methods and operations). 	<ul style="list-style-type: none"> Relative carbon footprint not determined due to single option for water 	<ul style="list-style-type: none"> Lower carbon footprint based on shorter construction duration 	<ul style="list-style-type: none"> Higher carbon footprint based on longer construction duration
Cultural Environment	<ul style="list-style-type: none"> Potential effects on archaeological resources. 	<ul style="list-style-type: none"> Works outside road right of way contains areas of moderate to high archaeological potential. 	<ul style="list-style-type: none"> Works outside road right of way contains areas of moderate to high archaeological potential. 	<ul style="list-style-type: none"> Works outside road right of way contains areas of moderate to high archaeological potential
Cultural Environment	<ul style="list-style-type: none"> Potential for disruption of built heritage resources and cultural heritage landscapes. 	<ul style="list-style-type: none"> No potential or designated heritage resources within area. 	<ul style="list-style-type: none"> No potential or designated heritage resources within area. 	<ul style="list-style-type: none"> No potential or designated heritage resources within area.
Cost	<ul style="list-style-type: none"> Cost of construction (including property acquisition). 	<ul style="list-style-type: none"> Relative cost of construction not determined due to single option for water 	<ul style="list-style-type: none"> Lower cost of construction than S1WW2 due to shorter construction duration 	<ul style="list-style-type: none"> Higher cost of construction than S1WW1 due to shorter construction duration
Cost	<ul style="list-style-type: none"> Cost of operation / maintenance. 	<ul style="list-style-type: none"> Relative cost of operation not determined due to single option for water 	<ul style="list-style-type: none"> Lower than S1WW2 	<ul style="list-style-type: none"> Higher than S1WW1

1.3 Water and Wastewater Infrastructure Assessment for Stage 2

The assessment results indicated that S2W2 and S2WW1 would be considered a most preferable strategies to meet the water and wastewater service, respectively, for the Stage 2 urban boundary expansion as well as the expected growth for the East Smithville Secondary Plan area. The following summarizes the rationale for selecting these preferred solutions and **Table 1-2** presents the detailed assessment results.

1.3.1 Preferred Solutions and Rationale for Stage 2 Water Service

Two alternatives were evaluated to address water servicing for the Stage 2 urban boundary expansion area.

S2W1

- a) Watermain extends southernly from London Road Pumping Station down Industrial Park Road
- b) Industrial Park Road easternly towards Regional Road 20 and Townline Road roundabout

S2W2

- a) Watermain extends southernly from London Road Pumping Station towards Industrial Park Road and Regional Road 20 (St. Catharines Street) intersection

Rationale for Preferred Solution for Stage 2 Water Service

S2W2 is the preferred solution, and the rationale is summarized as follows:

1. Reduced construction complexity and avoids significant community disruption within the existing Smithville urban area
2. No potential of cultural heritage sites in area

1.3.2 Preferred Solutions and Rationale for Stage 2 Wastewater Service

As only one option was evaluated for the wastewater servicing for Stage 2, S2WW1 is the preferred solution. To service Stage area 2B a private pumping system will be required. Alternatively, the area can be serviced by utilising a low pressure system whereby individual buildings pump their wastewater to a pressurized sewer main which will be owned and maintained by the Township; individual building pumps will be considered a private system with individual building owner responsibility.

Table 1-2: Stage 2 Water and Wastewater Strategy Assessment Results

Category	Criteria	Stage 2 Water: S2W1	Stage 2 Water: S2W2	Stage 2 Wastewater: S2WW1
Details	-	<ul style="list-style-type: none"> Watermain extends southerly from London Road Pumping Station down Industrial Park Road Industrial Park Road easterly towards Regional Road 20 and Townline Road roundabout No crossing of Twenty Mile Creek Crossing of rail tracks on Industrial Park Road 	<ul style="list-style-type: none"> Watermain extends southerly from London Road Pumping Station towards Industrial Park Road and Regional Road 20 (St. Catharines Street) intersection No crossing of Twenty Mile Creek Crossing of rail tracks on Industrial Park Road <p style="text-align: center;">Preferred Solution</p>	<ul style="list-style-type: none"> New sewer gravity main from Smithville sanitary pumping station on east side from Regional Road 20 (St. Catharines Street) towards Townline Road No crossing of Twenty Mile Creek required No crossing of rail tracks <p style="text-align: center;">Preferred Solution</p>
Technical Environment	<ul style="list-style-type: none"> Potential degree of construction complexities, including number and type of water crossings, anticipated rock removal, access, working area and duration to build. 	<ul style="list-style-type: none"> One crossing of rail tracks No crossings of Twenty Mile Creek Anticipate in rock Access from Industrial Park Road Longer construction duration related to longer watermain length Potential temporary easement required which could delay construction commencement 	<ul style="list-style-type: none"> One crossing of rail tracks No crossings of Twenty Mile Creek Anticipate in rock Access from Industrial Park Road Shorter construction duration related to shorter watermain length Potential temporary easement required which could delay construction commencement 	<ul style="list-style-type: none"> No crossings of rail tracks No crossings of Twenty Mile Creek Anticipate in rock Access from Regional Road 20 (St. Catharines Street) Relative construction duration has not been determined due to single option for wastewater
Technical Environment	<ul style="list-style-type: none"> Potential effects on roadway and utility infrastructure. 	<ul style="list-style-type: none"> Greater impacts to recently paved surfaces on Regional Road 20 (St. Catharines Street) and Townline Road roundabout Potential for utility conflicts on Townline Road and Regional Road 20 (St. Catharines Street) Potential for railway conflicts on Industrial Park Road 	<ul style="list-style-type: none"> Lower impacts to paved surfaces Potential for railway conflicts on Industrial Park Road Potential for utility conflicts on London Road 	<ul style="list-style-type: none"> Greater impacts to recently paved surfaces on Regional Road 20 (St. Catharines Street) and Townline Road roundabout Potential for utility conflicts on Townline Road and Regional Road 20 (St. Catharines Street)
Technical Environment	<ul style="list-style-type: none"> Provides good site access for maintenance vehicles, future operation and maintenance and servicing. 	<ul style="list-style-type: none"> Access from existing road allowances 	<ul style="list-style-type: none"> Access from existing road allowances 	<ul style="list-style-type: none"> Access from existing road allowances
Technical Environment	<ul style="list-style-type: none"> Operation efficiency. 	<ul style="list-style-type: none"> Higher energy use related to long watermain and number of bends 	<ul style="list-style-type: none"> Lower energy use related to short watermain and no bends 	<ul style="list-style-type: none"> Relative operation efficiency not determined due to single option for wastewater
Technical Environment	<ul style="list-style-type: none"> Potential opportunity for current infrastructure to be decommissioned in favour of gravity solutions 	<ul style="list-style-type: none"> Not applicable 	<ul style="list-style-type: none"> Not applicable 	<ul style="list-style-type: none"> Not applicable
Technical Environment	<ul style="list-style-type: none"> Potential effects on traffic. 	<ul style="list-style-type: none"> Greater impacts to traveling public 	<ul style="list-style-type: none"> Lower impacts to traveling public 	<ul style="list-style-type: none"> Relative traffic effects not determined due to single option for wastewater
Technical Environment	<ul style="list-style-type: none"> Dependency on the completion of other Stages 	<ul style="list-style-type: none"> Independent of all other Staging Strategies 	<ul style="list-style-type: none"> Independent of all other Staging Strategies 	<ul style="list-style-type: none"> Independent of all other Staging Strategies
Technical Environment	<ul style="list-style-type: none"> Degree of permitting and approvals complexity 	<ul style="list-style-type: none"> Canadian Pacific Railway permitting anticipated due to railway crossing Species at Risk permitting anticipated due to Species at Risk habitat in area (Industrial Park Road agricultural fields) 	<ul style="list-style-type: none"> Canadian Pacific Railway permitting anticipated due to railway crossing Species at Risk permitting anticipated due to Species at Risk habitat in area (Industrial Park Road agricultural fields) 	<ul style="list-style-type: none"> Species at Risk permitting anticipated due to Species at Risk habitat in area (Regional Road 20 agricultural fields)

Category	Criteria	Stage 2 Water: S2W1	Stage 2 Water: S2W2	Stage 2 Wastewater: S2WW1
Land Use	<ul style="list-style-type: none"> Potential to conform to approved local (e.g., OP and Maser Community Plan), provincial (e.g., PPS) plans and policies. Identify existing official plans and schedule B1, B3 and B4 Natural Heritage 	<ul style="list-style-type: none"> Conforms Utilities permitted in future Right-of-way Pipe does not cross natural heritage system Work in regulated area to comply with Niagara Peninsula Conservation Authority policy document – November 2022 	<ul style="list-style-type: none"> Conforms Utilities permitted in future Right-of-way Pipe does not cross natural heritage system Work in regulated area to comply with Niagara Peninsula Conservation Authority policy document – November 2022 	<ul style="list-style-type: none"> Conforms Pipe does not cross natural heritage system Work in regulated area to comply with Niagara Peninsula Conservation Authority policy document – November 2022
Land Use	<ul style="list-style-type: none"> Potential effects on current land uses, including development plans. 	<ul style="list-style-type: none"> Potential to impact industrial area along Industrial Park Road Potential to impact Tim Hortons landscaping and parking 	<ul style="list-style-type: none"> Potential to impact industrial area along Industrial Park Road Potential to impact Tim Hortons landscaping and parking 	<ul style="list-style-type: none"> Potential to impact residential and industrial area along Regional Road 20 (St. Catharines Street)
Natural Environment	<ul style="list-style-type: none"> Potential effects on terrestrial/aquatic habitat and species. 	<ul style="list-style-type: none"> Provincially Significant wetland consisting of swamp community south of Regional Road 20. Twenty Mile Creek includes wetland amphibian breeding habitat and turtle wintering. Habitat for several species of Conservation concern and deer wintering. 	<ul style="list-style-type: none"> Provincially Significant wetland consisting of swamp community south of Regional Road 20 (St. Catharines Street). Twenty Mile Creek includes wetland amphibian breeding habitat and turtle wintering. Habitat for several species of Conservation concern and deer wintering. 	<ul style="list-style-type: none"> Provincially Significant wetland consisting of swamp community south of Regional Road 20. Twenty Mile Creek includes wetland amphibian breeding habitat and turtle wintering. Habitat for several species of Conservation concern and deer wintering.
Natural Environment	<ul style="list-style-type: none"> Potential effects on species at risk (Species at Risk) and Species at Risk habitat. 	<ul style="list-style-type: none"> Potential to encounter Species at Risk in agricultural fields east of Industrial Park Road. Species may include Bobolink and Eastern Meadowlark. 	<ul style="list-style-type: none"> Potential to encounter Species at Risk in agricultural fields east of Industrial Park Road. Species may include Bobolink and Eastern Meadowlark. 	<ul style="list-style-type: none"> Potential to encounter Species at Risk in agricultural fields north of Regional Road 20 (St. Catharines Street). Species may include Bobolink and Eastern Meadowlark.
Natural Environment	<ul style="list-style-type: none"> Potential to encounter soil and water contamination and waste disposal. 	<ul style="list-style-type: none"> None identified 	<ul style="list-style-type: none"> None identified 	<ul style="list-style-type: none"> None identified
Natural Environment	<ul style="list-style-type: none"> Anticipated environmental permitting and approval considerations. 	<ul style="list-style-type: none"> Requires Niagara Peninsula Conservation Authority work permit Potential Species at Risk related to sending and receiving pits outside travel portion of Right-of-way 	<ul style="list-style-type: none"> Requires Niagara Peninsula Conservation Authority work permit Potential Species at Risk related to sending and receiving pits outside travel portion of Right-of-way 	<ul style="list-style-type: none"> Requires Niagara Peninsula Conservation Authority work permit Potential Species at Risk related to sending and receiving pits outside travel portion of ROW
Natural Environment	<ul style="list-style-type: none"> Potential effects on surface water and groundwater due to construction (i.e., dewatering of trenches during installation of watermain and/or sanitary forcemain/sewer, control of erosion and sedimentation). 	<ul style="list-style-type: none"> The installation of water infrastructure can lead to the interception of the shallow water table altering shallow groundwater flow paths Installation of infrastructure below the water table leads to the potential need for dewatering during construction and post construction and a decrease in groundwater levels 	<ul style="list-style-type: none"> The installation of water infrastructure can lead to the interception of the shallow water table altering shallow groundwater flow paths Installation of infrastructure below the water table leads to the potential need for dewatering during construction and post construction and a decrease in groundwater levels 	<ul style="list-style-type: none"> The installation of sewer infrastructure can lead to the interception of the shallow water table altering shallow groundwater flow paths Installation of infrastructure below the water table leads to the potential need for dewatering during construction and post construction and a decrease in groundwater levels
Natural Environment	<ul style="list-style-type: none"> Source water protection considerations. 	<ul style="list-style-type: none"> Drainage features within the study area are primarily headwater drainage (HDF) features, with some defined and regulated watercourses Twenty Mile Creek is the most significant watercourse and valley system within Smithville, with confined corridors and floodplains 	<ul style="list-style-type: none"> Drainage features within the study area are primarily headwater drainage (HDF) features, with some defined and regulated watercourses Twenty Mile Creek is the most significant watercourse and valley system within Smithville, with confined corridors and floodplains 	<ul style="list-style-type: none"> Drainage features within the study area are primarily headwater drainage (HDF) features, with some defined and regulated watercourses Twenty Mile Creek is the most significant watercourse and valley system within Smithville, with confined corridors and floodplains

Category	Criteria	Stage 2 Water: S2W1	Stage 2 Water: S2W2	Stage 2 Wastewater: S2WW1
Socio-Economic Environment	<ul style="list-style-type: none"> Potential nuisance impacts (e.g., disruption to access, air, dust, noise, and vibration) from construction and operations. 	<ul style="list-style-type: none"> Greater potential disruption to fronting properties 	<ul style="list-style-type: none"> Lower potential disruption to fronting properties 	<ul style="list-style-type: none"> Potential disruption to fronting properties
Socio-Economic Environment	<ul style="list-style-type: none"> Potential property requirements (temporary and permanent). 	<ul style="list-style-type: none"> Potential temporary easements on northern section Industrial Park Road for railway crossing Potential temporary easements on northwest corner of Industrial Park Road and Regional Road 20 (St. Catharines Street) 	<ul style="list-style-type: none"> Potential temporary easements on northern section Industrial Park Road for railway crossing Potential temporary easements on northwest corner of Industrial Park Road and Regional Road 20 (St. Catharines Street) 	<ul style="list-style-type: none"> Potential temporary easements on northwest corner of Industrial Park Road and Regional Road 20 (St. Catharines Street) Twenty Mile Creek for sewer crossing
Climate Change	<ul style="list-style-type: none"> Potential carbon footprint (e.g., energy usage, use of construction materials, construction methods and operations). 	<ul style="list-style-type: none"> Higher carbon footprint related to longer length of watermain and construction duration. 	<ul style="list-style-type: none"> Lower carbon footprint related to shorter length of watermain and construction duration. 	<ul style="list-style-type: none"> Relative carbon footprint not determined due to single option for wastewater
Cultural Environment	<ul style="list-style-type: none"> Potential effects on archaeological resources. 	<ul style="list-style-type: none"> Works outside road right of way contains areas of moderate to high archaeological potential. 	<ul style="list-style-type: none"> Works outside road right of way contains areas of moderate to high archaeological potential. 	<ul style="list-style-type: none"> Works outside road right of way contains areas of moderate to high archaeological potential.
Cultural Environment	<ul style="list-style-type: none"> Potential for disruption of built heritage resources and cultural heritage landscapes. 	<ul style="list-style-type: none"> Potential heritage resources within area. 	<ul style="list-style-type: none"> No potential or designated heritage resources within area. 	<ul style="list-style-type: none"> Potential heritage resources within area.
Cost	<ul style="list-style-type: none"> Cost of construction (including property acquisition). 	<ul style="list-style-type: none"> Higher cost relative to longer construction duration 	<ul style="list-style-type: none"> Lower cost relative to shorter construction duration 	<ul style="list-style-type: none"> Relative cost of construction not determined due to single option for wastewater
Cost	<ul style="list-style-type: none"> Cost of operation / maintenance. 	<ul style="list-style-type: none"> Higher than S2W2 	<ul style="list-style-type: none"> Lower than S2W1 	<ul style="list-style-type: none"> Relative cost of operation not determined due to single option for wastewater

1.4 Water and Wastewater Infrastructure Assessment for Stage 3

The assessment results indicated that S3W1 would be considered a most preferable strategies to meet the required water service for the Stage 2 urban boundary expansion. For meeting the required wastewater service, a combination of three wastewater infrastructure strategies were identified as the most preferable solutions; S3WW1A, S3WW2A and S3FM1B. The following summarizes the rationale for selecting these preferred solutions and **Table 1-3** and **Table 1-4** present the detailed assessment results for water and wastewater servicing strategy, respectively.

1.4.1 Preferred Solutions and Rationale for Stage 3 Water Service

Two alternatives were evaluated to address water servicing for the Stage 3 urban boundary expansion area.

S3W1

- a) New watermain extends easterly along Townline Road to existing North South easement east of Anderson Crescent
- b) Northernly from easement to Industrial Park Road / Regional Road 20 and connection future Stage 2 watermain

S3W2

- a) New watermain extends southernly from Townline Road and Stage 4 North South local collector road
- b) Southernly / easterly / northernly following internal Stage 3 local collector road to Townline Road
- c) Easternly along Townline Road to Townline Road and Regional Road 20 roundabout and connection to future Stage 2 watermain

Rationale for Preferred Solution for Stage 3 Water Service

S3W1 is the preferred solution, and the rationale is summarized as follows:

1. Reduced construction complexity and avoids significant community disruption specifically for the roundabout located at Townline Road and Regional Road 20
2. Lower capital and operation maintenance costs

3. Alignment follows road allowances and does not need to be co-ordinated with Stage 3 developments
4. Allows for decommissioning of existing watermain within current easement between Townline Road and Regional Road 20
5. Can be co-ordinated with future upgrades to Townline Road
6. Stage 3A could connect to the existing watermain on Townline Road until the Region's Ring System is implemented. Therefore Stage 3A can be implemented in the near term.

The preferred solution for Stage 3 water service includes a crossing of Twenty Mile Creek and **Figure 1-3** presents the location of the crossing for this solution as well as the property access requirements.

1.4.2 Preferred Solutions and Rationale for Stage 3 Wastewater Service

A total of six alternatives were evaluated to address wastewater servicing for the Stage 3 urban boundary expansion area.

1.4.2.1 Gravity Sewer System Options for Stage 3

S3WW1A

- a) New Gravity Sewer follows Stage 3 North South and easterly local collector road starting at Townline Road
- b) Connection to new Smithville Pumping Station at Port Davidson Road / Creek
- c) Also includes flow from new gravity sewers within Stage 3 east of Port Davidson Road
- d) Does not service Stage 4

S3WW1B

- a) New Gravity Sewer follows Stage 3 North South and easterly local collector road starting at Townline Road
- b) Connection to new Smithville Pumping Station at Port Davidson Road / Creek
- c) Also includes flow from new gravity sewers within Stage 3 east of Port Davidson Road
- d) Deeper gravity sewer at the westside of the new Smithville Pumping Station to allow for Stage 4 Wastewater to be completed

Rationale for Preferred Solution for Stage 3 Gravity Sewer System

S3WW1A is the preferred solution, and the rationale is summarized as follows:

1. Reduced construction complexity as gravity sewer exists closer to surface
2. Lower capital and operation maintenance costs

1.4.2.2 Wastewater Servicing Options for Stage 3A

S3WW2A

- a) New gravity sewer northerly from Stage 3A area to Townline Road
- b) Replace existing gravity sewer with larger size along Townline Road to Anderson Crescent and northerly on Anderson Crescent via existing easement to southside of Twenty Mile Creek

S3WW2B

- a) New Smithville Pumping Station for Stage 3A service area and forcemain southerly to Stage 3 development area connecting to east west gravity sewer that sends flow to new Smithville Pumping Station at Port Davidson Road and Creek

Rationale for Preferred Solution for Stage 3A Wastewater Service

S3WW2A is the preferred solution, and the rationale is summarized as follows:

1. Reduced construction complexity and avoids significant community disruption within the existing urban area
2. Lower capital and operation maintenance costs relating to new gravity sewer and no pumping system is required
3. Alignment follows road allowances and does not need to be co-ordinated with Stage 3 developments
4. Can be co-ordinated with future upgrades to Townline Road

1.4.2.3 Forcemain Options for Stage 3

S3FM1A

- a) New forcemain extending Northerly on port Davidson Road from Smithville Pumping Station towards Townline road

- b) Easternly along Townline Road to Rock Street. Northernly up Rock Street towards Twenty Mile Creek crossing Rock Street Park
- c) Trenchless crossing of Twenty Mile Creek
- d) Connects to pumping station at Regional Road 20 and Industrial Park Road

S3FM1B

- a) New forcemain extending Northernly on port Davidson Road from Smithville Pumping Station towards Townline Road
- b) Easternly along Townline Road to watermain easement. Northernly through easement towards Twenty Mile Creek
- c) Trenchless crossing of Twenty Mile Creek
- d) Connects to future gravity sewer at Regional Road 20 and Industrial Park Road
- e) New Smithville Pumping Station is a private pumping station

Rationale for preferred solution for Stage 3 Forcemain System

S3FM1B is the preferred solution, and the rationale is summarized as follows:

1. Reduced construction complexity and avoids significant community disruption within the existing urban area as it avoids Rock Park
2. Avoids potential soil and groundwater contamination associated with former landfill
3. Can be co-ordinated with the preferred Stage 3 water projects and Twenty Mile Creek crossing
4. Utilises existing north south easement between Townline Road and Regional Road 20

The preferred solution for Stage 3 forcemain system includes a crossing of Twenty Mile Creek and **Figure 1-3** presents the location of the crossing for this solution as well as the property access requirements.

Table 1-3: Stage 3 Water Servicing Strategy Assessment Results

Category	Criteria	Stage 3 Water: S3W1	Stage 3 Water: S3W2
Details	-	<ul style="list-style-type: none"> ■ New watermain extends easterly along Townline Road to existing North South easement east of Anderson Crescent ■ Northernly from easement to Industrial Park Road / Regional Road 20 and connection future Stage 2 watermain ■ Trenchless crossing of Twenty Mile Creek south of Industrial Park Road and Regional Road 20 <p style="text-align: center;">Preferred Solution</p>	<ul style="list-style-type: none"> ■ New watermain extends southernly from Townline Road and Stage 4 North South local collector road ■ Southernly / easterly / northernly following internal stage 3 local collector road to Townline Road ■ Easternly along Townline Road to Townline Road and Regional Road 20 roundabout and connection to future Stage 2 watermain ■ Trenchless crossing of Twenty Mile Creek along Townline Road
Technical Environment	<ul style="list-style-type: none"> ■ Potential degree of construction complexities, including number and type of water crossings, anticipated rock removal, access, working area and duration to build. 	<ul style="list-style-type: none"> ■ One crossing of Twenty Mile Creek ■ Anticipate in rock ■ Access from Townline Road and from existing watermain easement (South side of Twenty Mile Creek) ■ Shorter construction duration due to shorter watermain length and without requirement to co-ordinate construction with Stage 3 development ■ Potential easement required for Twenty Mile Creek crossing 	<ul style="list-style-type: none"> ■ One crossing of Twenty Mile Creek ■ Anticipate in rock ■ Access from Townline Road and from existing watermain easement (South side of Twenty Mile Creek) ■ Longer construction duration due to longer watermain length and requirement to co-ordinate construction with Stage 3 development ■ Potential easement required for Twenty Mile Creek crossing
Technical Environment	<ul style="list-style-type: none"> ■ Potential effects on roadway and utility infrastructure. 	<ul style="list-style-type: none"> ■ Lower impacts to paved surfaces and utilities (i.e., shorter length) 	<ul style="list-style-type: none"> ■ Greater impacts to paved surfaces and utilities (i.e., roundabout located at Regional Road 20 and Townline Road)
Technical Environment	<ul style="list-style-type: none"> ■ Provides good site access for maintenance vehicles, future operation and maintenance and servicing. 	<ul style="list-style-type: none"> ■ Access from existing utility corridor/easement / roads 	<ul style="list-style-type: none"> ■ Access from existing roads
Technical Environment	<ul style="list-style-type: none"> ■ Operation efficiency. 	<ul style="list-style-type: none"> ■ Lower operation and maintenance effort required related to shorter watermain distance 	<ul style="list-style-type: none"> ■ Higher operation and maintenance effort related to longer watermain distance
Technical Environment	<ul style="list-style-type: none"> ■ Potential opportunity for current infrastructure to be decommissioned in favour of gravity solutions 	<ul style="list-style-type: none"> ■ Allows for decommissioning of existing 150 mm watermain in current easement between Townline Road and Regional Road 20 	<ul style="list-style-type: none"> ■ Does not allow for decommissioning
Technical Environment	<ul style="list-style-type: none"> ■ Potential effects on traffic. 	<ul style="list-style-type: none"> ■ Lower impacts to traveling public (avoids roundabout at Townline Road and Regional Road 20) 	<ul style="list-style-type: none"> ■ Greater impacts to traveling public on Townline Road and Regional Road 20 (roundabout)
Technical Environment	<ul style="list-style-type: none"> ■ Dependency on the completion of other Stages 	<ul style="list-style-type: none"> ■ Water strategy requires Stage 2 water infrastructure to be in place prior to developing Stage 3 	<ul style="list-style-type: none"> ■ Water strategy requires Stage 2 water infrastructure to be in place prior to developing Stage 3
Technical Environment	<ul style="list-style-type: none"> ■ Degree of permitting and approvals complexity 	<ul style="list-style-type: none"> ■ Species at risk habitat in area of water crossings ■ NCPA permits for trenchless crossing ■ Avoids co-ordination with block plan development process 	<ul style="list-style-type: none"> ■ Species at risk habitat in area of water crossings ■ NCPA permits for trenchless crossing ■ Watermain to be captured with block plan development process
Land Use	<ul style="list-style-type: none"> ■ Potential to conform to approved local (e.g., OP and Maser Community Plan), provincial (e.g., PPS) plans and policies. ■ Identify existing official plans and schedule B1, B3 and B4 Natural Heritage 	<ul style="list-style-type: none"> ■ Conforms ■ Utilities permitted in future ROW ■ Pipe crosses natural heritage system (current official plan Schedule E-12 and proposed OPA schedule 63) between Regional Road 20 (St. Catharines Street) and Townline Road ■ Work in regulated area to comply with Niagara Peninsula Conservation Authority policy document – November 2022 	<ul style="list-style-type: none"> ■ Conforms ■ Utilities permitted in future ROW ■ Pipe crosses natural heritage system (current official plan Schedule E-12 and proposed OPA schedule 63) between Regional Road 20 (St. Catharines Street) and Townline Road ■ Work in regulated area to comply with Niagara Peninsula Conservation Authority policy document – November 2022
Land Use	<ul style="list-style-type: none"> ■ Potential effects on current land uses, including development plans. 	<ul style="list-style-type: none"> ■ Potential to disrupt parking lot at northwest corner of Industrial Park Road and Regional Road 20 (Temporary easement for watercrossing) 	<ul style="list-style-type: none"> ■ Potential to disrupt agricultural land use (Southside Twenty Mile Creek) (Temporary easement for watercrossing)

Category	Criteria	Stage 3 Water: S3W1	Stage 3 Water: S3W2
Natural Environment	<ul style="list-style-type: none"> Potential effects on terrestrial/aquatic habitat and species. 	<ul style="list-style-type: none"> Trenchless crossing minimizes impacts Minor vegetation removal in existing easement between Townline Road and Regional Road 20 Provincially Significant wetland consisting of swamp community south of Industrial Park Road. Twenty Mile Creek includes wetland amphibian breeding habitat and turtle wintering. Habitat for several species of Conservation concern and deer wintering. 	<ul style="list-style-type: none"> Trenchless crossing minimizes impacts Potential vegetation removal on Townline Road for Twenty Mile Creek crossing Provincially Significant wetland consisting of swamp community between Regional Road 20 (St. Catharines) and Townline Road. Twenty Mile Creek includes wetland amphibian breeding habitat and turtle wintering. Habitat for several species of Conservation concern and deer wintering.
Natural Environment	<ul style="list-style-type: none"> Potential effects on species at risk (Species at Risk) and Species at Risk habitat. 	<ul style="list-style-type: none"> Potential to encounter Species at Risk in existing easement between Townline Road and R 20 Grass Pickerel and Snapping Turtle habitat in creek. 	<ul style="list-style-type: none"> Potential to encounter Species at Risk in agricultural fields south of Townline Road. Species may include Bobolink and Eastern Meadowlark.
Natural Environment	<ul style="list-style-type: none"> Potential to encounter soil and water contamination and waste disposal. 	<ul style="list-style-type: none"> None identified 	<ul style="list-style-type: none"> None identified
Natural Environment	<ul style="list-style-type: none"> Anticipated environmental permitting and approval considerations. 	<ul style="list-style-type: none"> Requires Niagara Peninsula Conservation Authority work permit Anticipated Permit to Take Water Potential Species at Risk related to sending and receiving pits outside travel portion of ROW 	<ul style="list-style-type: none"> Requires Niagara Peninsula Conservation Authority work permit Anticipated Permit to Take Water Potential Species at Risk related to sending and receiving pits outside travel portion of ROW
Natural Environment	<ul style="list-style-type: none"> Potential effects on surface water and groundwater due to construction (i.e., dewatering of trenches during installation of watermain and/or sanitary forcemain/sewer, control of erosion and sedimentation). 	<ul style="list-style-type: none"> The installation of water infrastructure can lead to the interception of the shallow water table altering shallow groundwater flow paths Installation of infrastructure below the water table leads to the potential need for dewatering during construction and post construction and a decrease in groundwater levels 	<ul style="list-style-type: none"> The installation of water infrastructure can lead to the interception of the shallow water table altering shallow groundwater flow paths Installation of infrastructure below the water table leads to the potential need for dewatering during construction and post construction and a decrease in groundwater levels
Natural Environment	<ul style="list-style-type: none"> Source water protection considerations. 	<ul style="list-style-type: none"> Drainage features within the study area are primarily headwater drainage (HDF) features, with some defined and regulated watercourses Twenty Mile Creek is the most significant watercourse and valley system within Smithville, with confined corridors and floodplains 	<ul style="list-style-type: none"> Drainage features within the study area are primarily headwater drainage (HDF) features, with some defined and regulated watercourses Twenty Mile Creek is the most significant watercourse and valley system within Smithville, with confined corridors and floodplains
Socio-Economic Environment	<ul style="list-style-type: none"> Potential nuisance impacts (e.g., disruption to access, air, dust, noise, and vibration) from construction and operations. 	<ul style="list-style-type: none"> Greater potential to impact fronting properties and access to businesses (Regional Road 20 and Industrial Park Road area) 	<ul style="list-style-type: none"> Lower potential to impact fronting properties and businesses
Socio-Economic Environment	<ul style="list-style-type: none"> Potential property requirements (temporary and permanent). 	<ul style="list-style-type: none"> Potential temporary easements on northwest corner of Industrial Park Road and Regional Road 20 (St. Catharines Street) Potential permanent easement between St. Catharines Street and Townline Road for watermain crossing 	<ul style="list-style-type: none"> Potential permanent easements on Townline Road at Twenty Mile Creek for watermain crossing
Climate Change	<ul style="list-style-type: none"> Potential carbon footprint (e.g., energy usage, use of construction materials, construction methods and operations). 	<ul style="list-style-type: none"> Lower carbon footprint related to shorter length of watermain and construction duration. 	<ul style="list-style-type: none"> Higher carbon footprint related to longer length of watermain and construction duration.
Cultural Environment	<ul style="list-style-type: none"> Potential effects on archaeological resources. 	<ul style="list-style-type: none"> Works outside road right of way contains areas of moderate to high archaeological potential. 	<ul style="list-style-type: none"> Works outside road right of way contains areas of moderate to high archaeological potential.
Cultural Environment	<ul style="list-style-type: none"> Potential for disruption of built heritage resources and cultural heritage landscapes. 	<ul style="list-style-type: none"> Potential heritage resources within area. 	<ul style="list-style-type: none"> Potential heritage resources within area.
Cost	<ul style="list-style-type: none"> Cost of construction (including property acquisition). 	<ul style="list-style-type: none"> Lower than S3W2 due to shorter length and less road restoration required 	<ul style="list-style-type: none"> Higher than S3W1 due to longer length and greater road restoration required (roundabout at Regional Road 20 and Townline Road)
Cost	<ul style="list-style-type: none"> Cost of operation / maintenance. 	<ul style="list-style-type: none"> Lower than S3W2 due to shorter length Allows for decommissioning of existing watermain with a higher efficiency system 	<ul style="list-style-type: none"> Higher than S3W1 due to shorter length

Table 1-4: Stage 3 Wastewater Servicing Strategy Assessment Results

Category	Criteria	Stage 3: S3WW1A	Stage 3: S3WW1B	Stage 3 S3FM1A	Stage 3 S3FM1B	Stage 3: S3WW2A	Stage 3: S3WW2B
Details	-	<ul style="list-style-type: none"> ■ New Gravity Sewer follows Stage 3 North South and easterly local collector road starting at Townline Road ■ Connection to new Smithville Pumping Station at Port Davidson Road / North Creek ■ Also includes flow from new gravity sewers within Stage 3 east of Port Davidson Road ■ Trenchless crossing of Twenty Mile Creek required ■ Does not service Stage 4 <p>Preferred Solution</p>	<ul style="list-style-type: none"> ■ New Gravity Sewer follows Stage 3 North South and easterly local collector road starting at Townline Road ■ Connection to new Smithville Pumping Station at Port Davidson Road / North Creek ■ Also includes flow from new gravity sewers within Stage 3 east of Port Davidson Road ■ Deeper gravity sewer to allow for Stage 4 Wastewater to be completed 	<ul style="list-style-type: none"> ■ New forcemain extending Northernly on port Davidson Road from Smithville Pumping Station towards Townline road ■ Easternly along Townline Road to Rock Street. Northernly up Rock Street towards Twenty Mile Creek crossing Rock Street Park ■ Trenchless crossing of Twenty Mile Creek ■ Connects to pumping station at Regional Road 20 and Industrial Park Road 	<ul style="list-style-type: none"> ■ New forcemain extending Northernly on port Davidson Road from Smithville Pumping Station towards Townline road ■ Easternly along Townline Road to watermain easement. Northernly through easement towards Twenty Mile Creek ■ Trenchless crossing of Twenty Mile Creek ■ Connects to future gravity sewer at Regional Road 20 and Industrial Park Road <p>Preferred Solution</p>	<ul style="list-style-type: none"> ■ New gravity sewer northernly from Stage 3A area to Townline Road ■ Easternly along Townline Road to Anderson Crescent ■ Northernly on Anderson Crescent via existing easement to southside of Twenty Mile Creek <p>Preferred Solution</p>	<ul style="list-style-type: none"> ■ New Smithville Pumping Station for Stage 3A service area and forcemain southerly to Stage 3 development area connecting to east west gravity sewer that sends flow to new Smithville Pumping Station at Port Davidson Road and North Creek ■ New Smithville Pumping Station is a private pumping station
Technical Environment	<ul style="list-style-type: none"> ■ Potential degree of construction complexities, including number and type of water crossings, anticipated rock removal, access, working area and duration to build. 	<ul style="list-style-type: none"> ■ No crossings of Twenty Mile Creek ■ Anticipate in rock ■ Access from Townline Road ■ Shorter construction duration relative to 1B due to sewer being closer to the surface 	<ul style="list-style-type: none"> ■ No crossings of Twenty Mile Creek ■ Greater amount of in rock due to deeper gravity sewer ■ Access from Townline Road ■ Longer construction duration relative to 1A due to deeper sewer 	<ul style="list-style-type: none"> ■ One crossing of Twenty Mile Creek to connect with new Smithville Pumping Station and forcemain ■ Anticipate in rock ■ Access from Townline Road ■ Comparable construction duration relative to FM1B due to park restoration required ■ Potential conflict with storm outlet (Northside of Twenty Mile Creek) ■ Potential temporary easement required in area of Smithville Pumping Station connection 	<ul style="list-style-type: none"> ■ One crossing of Twenty Mile Creek to connect with new Smithville Pumping Station and forcemain ■ Anticipate in rock ■ Access from Townline Road ■ Comparable construction duration relative to FM1A due to longer forcemain length ■ Potential conflict with storm outlet (Northside of Twenty Mile Creek) ■ Potential temporary easement required at northwest intersection of Regional Road 20 and Industrial Park Road 	<ul style="list-style-type: none"> ■ No crossings of Twenty Mile Creek ■ Anticipate in rock ■ Access from Townline Road ■ Existing easement between houses on north side of Anderson Crescent has limited spacing ■ Comparable construction duration relative to 2B due to same sewer main length 	<ul style="list-style-type: none"> ■ No crossings of Twenty Mile Creek ■ Anticipate in rock ■ Access from Townline Road ■ Comparable construction duration relative to 2A due to same sewer main length
Technical Environment	<ul style="list-style-type: none"> ■ Potential effects on roadway and utility infrastructure. 	<ul style="list-style-type: none"> ■ H impacts to paved surfaces 	<ul style="list-style-type: none"> ■ Lower impacts to paved surfaces 	<ul style="list-style-type: none"> ■ Lower impacts to paved surfaces ■ Potential conflict with storm outlet (Northside of Twenty Mile Creek) 	<ul style="list-style-type: none"> ■ Lower impacts to paved surfaces ■ Potential conflict with storm outlet (Northside of Twenty Mile Creek) 	<ul style="list-style-type: none"> ■ Greater impacts to paved surfaces (Anderson Crescent) 	<ul style="list-style-type: none"> ■ Low impacts to paved surfaces (Avoids Anderson Crescent)

Category	Criteria	Stage 3: S3WW1A	Stage 3: S3WW1B	Stage 3 S3FM1A	Stage 3 S3FM1B	Stage 3: S3WW2A	Stage 3: S3WW2B
Technical Environment	<ul style="list-style-type: none"> Provides good site access for maintenance vehicles, future operation and maintenance and servicing. 	<ul style="list-style-type: none"> Access from existing roads 	<ul style="list-style-type: none"> Access from existing roads 	<ul style="list-style-type: none"> Access from existing roads and Rock Park 	<ul style="list-style-type: none"> Access from existing utility corridor / roads 	<ul style="list-style-type: none"> Access from existing roads 	<ul style="list-style-type: none"> Access from existing roads
Technical Environment	<ul style="list-style-type: none"> Operation efficiency. 	<ul style="list-style-type: none"> Lower operation and maintenance effort use compared to 1B 	<ul style="list-style-type: none"> Higher operation and maintenance effort compared to 1A related to deeper sewer 	<ul style="list-style-type: none"> Comparable operation and maintenance effort relative to FM1B due to same length 	<ul style="list-style-type: none"> Comparable operation and maintenance effort relative to FM1A due to same length 	<ul style="list-style-type: none"> Higher operation and maintenance effort relative to W3WW2B due to Smithville Pumping Station 	<ul style="list-style-type: none"> Lower operation and maintenance effort relative to W3WW2A due to avoidance of Smithville Pumping Station Requires operations and maintenance by private entity
Technical Environment	<ul style="list-style-type: none"> Potential opportunity for current infrastructure to be decommissioned in favour of gravity solutions Potential effects on traffic 	<ul style="list-style-type: none"> Not Applicable 	<ul style="list-style-type: none"> Not Applicable 	<ul style="list-style-type: none"> Not Applicable 	<ul style="list-style-type: none"> Consolidates water and wastewater in existing utility corridor (existing easement between Townline Road and Regional Road 20) 	<ul style="list-style-type: none"> Not applicable 	<ul style="list-style-type: none"> Not Applicable
Technical Environment	<ul style="list-style-type: none"> Potential effects on traffic. 	<ul style="list-style-type: none"> Lower impacts to traveling public Townline Road 	<ul style="list-style-type: none"> Lower impacts to traveling public Townline Road 	<ul style="list-style-type: none"> Lower impacts to traveling public Townline Road 	<ul style="list-style-type: none"> Lower impacts to traveling public Townline Road 	<ul style="list-style-type: none"> Greater impacts to traveling public on Anderson Crescent and Townline Road 	<ul style="list-style-type: none"> Lower impacts to traveling public Townline Road
Technical Environment	<ul style="list-style-type: none"> Dependency on the completion of other Stages 	<ul style="list-style-type: none"> Wastewater strategy could be implemented independently to Stages 1 and 2 with a new sanitary pump station / forcemain in place. 	<ul style="list-style-type: none"> Wastewater strategy could be implemented independently to Stages 1 and 2 with a new sanitary pump station / forcemain in place. 	<ul style="list-style-type: none"> Implementation would allow S3WW1 or S3WW2 to be implemented independently of Stages 1 and 2 	<ul style="list-style-type: none"> Requires gravity sewer from Stage 1 (S1WW1) Implementation would allow S3WW1 or S3WW2 to be implemented independently of Stages 1 and 2 	<ul style="list-style-type: none"> Stage 3 northeast area can be implemented in near term with replacement of existing sewer line (Anderson Crescent sanitary sewer easement deficiency and maintenance of capacity). 	<ul style="list-style-type: none"> Stage 3 northeast area can be implemented with a new Stage 3 gravity sewer, pump station and forcemain in place
Technical Environment	<ul style="list-style-type: none"> Degree of permitting and approvals complexity 	<ul style="list-style-type: none"> Species at Risk permitting anticipated due to Species at Risk habitat in area (Townline Road agricultural fields) Sewer to be captured with block plan development process 	<ul style="list-style-type: none"> Species at Risk permitting anticipated due to Species at Risk habitat in area (Townline Road agricultural fields) Sewer to be captured with block plan development process 	<ul style="list-style-type: none"> Species at risk habitat in area of water crossings NCPA permits for trenchless crossing Forcemain to be captured with block plan development process 	<ul style="list-style-type: none"> Species at risk habitat in area of water crossings NCPA permits for trenchless crossing Forcemain to be captured with block plan development process 	<ul style="list-style-type: none"> Species at Risk permitting anticipated due to Species at Risk habitat in area (Townline Road agricultural fields) Sewer to be captured with block plan development process 	<ul style="list-style-type: none"> Species at Risk permitting anticipated due to Species at Risk habitat in area (Townline Road agricultural fields) Forcemain to be captured with block plan development process

Category	Criteria	Stage 3: S3WW1A	Stage 3: S3WW1B	Stage 3 S3FM1A	Stage 3 S3FM1B	Stage 3: S3WW2A	Stage 3: S3WW2B
Land Use	<ul style="list-style-type: none"> Potential to conform to approved local (e.g., OP and Maser Community Plan), provincial (e.g., PPS) plans and policies. Identify existing official plans and schedule B1, B3 and B4 Natural Heritage 	<ul style="list-style-type: none"> Conforms Pipe does not cross natural heritage system Work in regulated area to comply with Niagara Peninsula Conservation Authority policy document – November 2022 	<ul style="list-style-type: none"> Conforms Pipe does not cross natural heritage system Work in regulated area to comply with NPCA policy document – November 2022 	<ul style="list-style-type: none"> Conforms Pipe crosses natural heritage system (current official plan Schedule E-12 and proposed OPA schedule 63) between Regional Road 20 (St. Catharines Street) and Townline Road Work in regulated area to comply with NPCA policy document – November 2022 	<ul style="list-style-type: none"> Conforms Pipe crosses natural heritage system (current official plan Schedule E-12 and proposed OPA schedule 63) between Regional Road 20 (St. Catharines Street) and Townline Road Work in regulated area to comply with NPCA policy document – November 2022 	<ul style="list-style-type: none"> Conforms Pipe does not cross natural heritage system Work in regulated area to comply with NPCA policy document – November 2022 	<ul style="list-style-type: none"> Conforms Pipe does not cross natural heritage system Work in regulated area to comply with NPCA policy document – November 2022
Land Use	<ul style="list-style-type: none"> Potential effects on current land uses, including development plans. 	<ul style="list-style-type: none"> Sewer line is located within future development lands 	<ul style="list-style-type: none"> Sewer line is located within future development lands 	<ul style="list-style-type: none"> Forcemain is located within future development lands 	<ul style="list-style-type: none"> Forcemain is located within future development lands 	<ul style="list-style-type: none"> Sewer line is located within future development lands 	<ul style="list-style-type: none"> Sewer line is located within future development lands
Natural Environment	<ul style="list-style-type: none"> Potential effects on terrestrial/aquatic habitat and species. 	<ul style="list-style-type: none"> No anticipated effects on terrestrial / aquatic habitat and species 	<ul style="list-style-type: none"> No anticipated effects on terrestrial / aquatic habitat and species 	<ul style="list-style-type: none"> Trenchless crossing minimizes impacts Minor vegetation removal in existing easement between Townline Road and Regional Road 20 Provincially Significant wetland consisting of swamp community south of Industrial Park Road. Twenty Mile Creek includes wetland amphibian breeding habitat and turtle wintering. Habitat for several species of Conservation concern and deer wintering. 	<ul style="list-style-type: none"> Trenchless crossing minimizes impacts Minor vegetation removal in existing easement between Townline Road and Regional Road 20 Provincially Significant wetland consisting of swamp community south of Industrial Park Road. Twenty Mile Creek includes wetland amphibian breeding habitat and turtle wintering. Habitat for several species of Conservation concern and deer wintering. 	<ul style="list-style-type: none"> Minor vegetation removal between Townline Road and Regional Road 20 Provincially Significant wetland consisting of swamp community south of Industrial Park Road. Twenty Mile Creek includes wetland amphibian breeding habitat and turtle wintering. Habitat for several species of Conservation concern and deer wintering. 	<ul style="list-style-type: none"> Minor vegetation removal between Townline Road and Regional Road 20 Provincially Significant wetland consisting of swamp community south of Industrial Park Road. Twenty Mile Creek includes wetland amphibian breeding habitat and turtle wintering. Habitat for several species of Conservation concern and deer wintering.
Natural Environment	<ul style="list-style-type: none"> Potential effects on species at risk (Species at Risk) and Species at Risk habitat. 	<ul style="list-style-type: none"> Potential to encounter Species at Risk in agricultural fields south of Townline Road. Species may include Bobolink and Eastern Meadowlark. 	<ul style="list-style-type: none"> Potential to encounter Species at Risk in agricultural fields south of Townline Road. Species may include Bobolink and Eastern Meadowlark. 	<ul style="list-style-type: none"> Potential to encounter Species at Risk in agricultural fields south of Townline Road. Species may include Bobolink and Eastern Meadowlark. 	<ul style="list-style-type: none"> Potential to encounter Species at Risk in agricultural fields south of Townline Road. Species may include Bobolink and Eastern Meadowlark. 	<ul style="list-style-type: none"> Potential to encounter Species at Risk in agricultural fields south of Townline Road. Species may include Bobolink and Eastern Meadowlark. 	<ul style="list-style-type: none"> Potential to encounter Species at Risk in agricultural fields south of Townline Road. Species may include Bobolink and Eastern Meadowlark.
Natural Environment	<ul style="list-style-type: none"> Potential to encounter soil and water contamination and waste disposal. 	<ul style="list-style-type: none"> None identified 	<ul style="list-style-type: none"> None identified 	<ul style="list-style-type: none"> Potential to encounter soil and groundwater contamination due to work within / adjacent to former landfill in the area 	<ul style="list-style-type: none"> None identified 	<ul style="list-style-type: none"> None identified 	<ul style="list-style-type: none"> None identified

Category	Criteria	Stage 3: S3WW1A	Stage 3: S3WW1B	Stage 3 S3FM1A	Stage 3 S3FM1B	Stage 3: S3WW2A	Stage 3: S3WW2B
Natural Environment	<ul style="list-style-type: none"> Anticipated environmental permitting and approval considerations. 	<ul style="list-style-type: none"> Requires Niagara Peninsula Conservation Authority work permit Potential Species at Risk related to sending and receiving pits outside travel portion of ROW 	<ul style="list-style-type: none"> Requires Niagara Peninsula Conservation Authority work permit Potential Species at Risk related to sending and receiving pits outside travel portion of ROW 	<ul style="list-style-type: none"> Requires Niagara Peninsula Conservation Authority work permit Anticipated Permit to Take Water Potential Species at Risk related to sending and receiving pits outside travel portion of ROW 	<ul style="list-style-type: none"> Requires Niagara Peninsula Conservation Authority work permit Anticipated Permit to Take Water Potential Species at Risk related to sending and receiving pits outside travel portion of ROW 	<ul style="list-style-type: none"> Requires Niagara Peninsula Conservation Authority work permit Potential Species at Risk related to sending and receiving pits outside travel portion of ROW 	<ul style="list-style-type: none"> Requires Niagara Peninsula Conservation Authority work permit Potential Species at Risk related to sending and receiving pits outside travel portion of ROW
Natural Environment	<ul style="list-style-type: none"> Potential effects on surface water and groundwater due to construction (i.e., dewatering of trenches during installation of watermain and/or sanitary forcemain/sewer, control of erosion and sedimentation). 	<ul style="list-style-type: none"> The installation of sewer infrastructure can lead to the interception of the shallow water table altering shallow groundwater flow paths Installation of infrastructure below the water table leads to the potential need for dewatering during construction and post construction and a decrease in groundwater levels 	<ul style="list-style-type: none"> The installation of sewer infrastructure can lead to the interception of the shallow water table altering shallow groundwater flow paths Installation of infrastructure below the water table leads to the potential need for dewatering during construction and post construction and a decrease in groundwater levels 	<ul style="list-style-type: none"> The installation of sewer infrastructure can lead to the interception of the shallow water table altering shallow groundwater flow paths Installation of infrastructure below the water table leads to the potential need for dewatering during construction and post construction and a decrease in groundwater levels 	<ul style="list-style-type: none"> The installation of sewer infrastructure can lead to the interception of the shallow water table altering shallow groundwater flow paths Installation of infrastructure below the water table leads to the potential need for dewatering during construction and post construction and a decrease in groundwater levels 	<ul style="list-style-type: none"> The installation of sewer infrastructure can lead to the interception of the shallow water table altering shallow groundwater flow paths Installation of infrastructure below the water table leads to the potential need for dewatering during construction and post construction and a decrease in groundwater levels 	<ul style="list-style-type: none"> The installation of sewer infrastructure can lead to the interception of the shallow water table altering shallow groundwater flow paths Installation of infrastructure below the water table leads to the potential need for dewatering during construction and post construction and a decrease in groundwater levels
Natural Environment	<ul style="list-style-type: none"> Source water protection considerations. 	<ul style="list-style-type: none"> Drainage features within the study area are primarily headwater drainage (HDF) features, with some defined and regulated watercourses Twenty Mile Creek is the most significant watercourse and valley system within Smithville, with confined corridors and floodplains 	<ul style="list-style-type: none"> Drainage features within the study area are primarily headwater drainage (HDF) features, with some defined and regulated watercourses Twenty Mile Creek is the most significant watercourse and valley system within Smithville, with confined corridors and floodplains 	<ul style="list-style-type: none"> Drainage features within the study area are primarily headwater drainage (HDF) features, with some defined and regulated watercourses Twenty Mile Creek is the most significant watercourse and valley system within Smithville, with confined corridors and floodplains 	<ul style="list-style-type: none"> Drainage features within the study area are primarily headwater drainage (HDF) features, with some defined and regulated watercourses Twenty Mile Creek is the most significant watercourse and valley system within Smithville, with confined corridors and floodplains 	<ul style="list-style-type: none"> Drainage features within the study area are primarily headwater drainage (HDF) features, with some defined and regulated watercourses Twenty Mile Creek is the most significant watercourse and valley system within Smithville, with confined corridors and floodplains 	<ul style="list-style-type: none"> Drainage features within the study area are primarily headwater drainage (HDF) features, with some defined and regulated watercourses Twenty Mile Creek is the most significant watercourse and valley system within Smithville, with confined corridors and floodplains
Socio-Economic Environment	<ul style="list-style-type: none"> Potential nuisance impacts (e.g., disruption to access, air, dust, noise, and vibration) from construction and operations. 	<ul style="list-style-type: none"> Lower potential disruption to fronting properties due to avoidance of work within existing ROW 	<ul style="list-style-type: none"> Lower potential disruption to fronting properties due to avoidance of work within existing ROW 	<ul style="list-style-type: none"> Greater potential disruption to fronting properties than FM2 due to passage through Rock Park 	<ul style="list-style-type: none"> Lower potential disruption to fronting properties than FM1 	<ul style="list-style-type: none"> Greater potential disruption to fronting properties along Anderson Crescent and Townline Road 	<ul style="list-style-type: none"> Lesser potential disruption to fronting properties along Towline Road
Socio-Economic Environment	<ul style="list-style-type: none"> Potential property requirements (temporary and permanent). 	<ul style="list-style-type: none"> None anticipated 	<ul style="list-style-type: none"> None anticipated 	<ul style="list-style-type: none"> Potential temporary easements on Townline Road at Twenty Mile Creek for forcemain crossing 	<ul style="list-style-type: none"> Potential temporary easements on Townline Road at Twenty Mile Creek for forcemain crossing 	<ul style="list-style-type: none"> Existing easement between houses is insufficient for new gravity sewer installation (May require new easement) 	<ul style="list-style-type: none"> None anticipated

Category	Criteria	Stage 3: S3WW1A	Stage 3: S3WW1B	Stage 3 S3FM1A	Stage 3 S3FM1B	Stage 3: S3WW2A	Stage 3: S3WW2B
Climate Change	<ul style="list-style-type: none"> Potential carbon footprint (e.g., energy usage, use of construction materials, construction methods and operations). 	<ul style="list-style-type: none"> Lower carbon footprint relative to S3WW1B 	<ul style="list-style-type: none"> Higher carbon footprint relative to S3WW1A 	<ul style="list-style-type: none"> Comparable carbon footprint relative to S3FM2 	<ul style="list-style-type: none"> Comparable carbon footprint relative to S3FM1 	<ul style="list-style-type: none"> Higher carbon footprint relative to S3WW2B due to construction of gravity sewer 	<ul style="list-style-type: none"> Lower carbon footprint relative to S3WW2A
Cultural Environment	<ul style="list-style-type: none"> Potential effects on archaeological resources. 	<ul style="list-style-type: none"> Works outside road right of way contains areas of moderate to high archaeological potential. 	<ul style="list-style-type: none"> Works outside road right of way contains areas of moderate to high archaeological potential. 	<ul style="list-style-type: none"> Works outside road right of way contains areas of moderate to high archaeological potential. 	<ul style="list-style-type: none"> Works outside road right of way contains areas of moderate to high archaeological potential. 	<ul style="list-style-type: none"> Works outside road right of way contains areas of moderate to high archaeological potential. 	<ul style="list-style-type: none"> Works outside road right of way contains areas of moderate to high archaeological potential.
Cultural Enviro+onment	<ul style="list-style-type: none"> Potential for disruption of built heritage resources and cultural heritage landscapes. 	<ul style="list-style-type: none"> Potential heritage resources within area. 	<ul style="list-style-type: none"> Potential heritage resources within area. 	<ul style="list-style-type: none"> Potential heritage resources within area. 	<ul style="list-style-type: none"> Potential heritage resources within area. 	<ul style="list-style-type: none"> No potential or designated heritage resources within the area 	<ul style="list-style-type: none"> No potential or designated heritage resources within the area
Cost	<ul style="list-style-type: none"> Cost of construction (including property acquisition). 	<ul style="list-style-type: none"> Lower cost of construction relative to S3WW1B due to sewer depth 	<ul style="list-style-type: none"> Higher cost of construction relative to S3WW1B due to deeper sewer 	<ul style="list-style-type: none"> Relatively comparable cost relative to S3FM1B 	<ul style="list-style-type: none"> Relatively comparable cost relative to S3FM1A 	<ul style="list-style-type: none"> Higher cost of construction relative to S3WW2B due to new gravity sewer 	<ul style="list-style-type: none"> Lower cost of construction relative to S3WW2A due to reduce infrastructure requirements
Cost	<ul style="list-style-type: none"> Cost of operation / maintenance. 	<ul style="list-style-type: none"> Lower cost relative to 1B due to sewer depth 	<ul style="list-style-type: none"> Higher cost relative to 1A due to deeper sewer 	<ul style="list-style-type: none"> Comparable cost relative to S3FM2 due to similar length forcemains and construction requirements 	<ul style="list-style-type: none"> Comparable cost relative to S3FM1 due to similar length forcemains and construction requirements 	<ul style="list-style-type: none"> Lower maintenance cost relative to 2B as new gravity sewer will likely not have maintenance costs for a few years 	<ul style="list-style-type: none"> Higher maintenance cost relative to 2A due to routine maintenance needed on existing gravity sewer

1.5 Water and Wastewater Infrastructure Assessment for Stage 4

The assessment results indicated that S4W3 would be considered a most preferable strategies to meet the water for the Stage 4 urban boundary expansion. For meeting the required wastewater service for Stage 4, two infrastructure options were determined to be the most preferable strategy; S4WW1 and S4A-FM2. The following summarizes the rationale for selecting these preferred solutions. **Table 1-5** present the detailed assessment results for Stage 4 water and wastewater strategy, respectively.

1.5.1 Preferred Solutions and Rationale for Stage 4 Water Service

Three alternatives were evaluated to address the need to expand the watermain length to Stage 4 of the Township of Lincoln Urban Expansion Project.

S4W1

- a) Watermain follows Regional Road 20 from South Grimsby Road 5 to South Grimsby Road 6
- b) Southernly on South Grimsby Road 6
- c) Trenchless crossing of Twenty Mile Creek on South Grimsby Road 6
- d) Watermain continues on South Grimsby Road 6 to Townline Road
- e) Two trenchless crossings of North Creek

S4W2

- a) Watermain extends southernly from Regional Road 20 and South Grimsby Road 5 intersection along future development lands to South Grimsby Road 6
- b) Trenchless crossing of Twenty Mile Creek on South Grimsby Road 5
- c) Within planned utility / active transportation corridor and planned Stage 4 local collector road
- d) Westerly on collector road to connect on South Grimsby Road 6
- e) Southernly on South Grimsby Road 6 to Townline Road
- f) Two trenchless crossings of North Creek

S4W3

- a) Watermain extends southernly from Regional Road 20 along future development lands to Townline Road
- b) Trenchless crossing of Twenty Mile Creek on South Grimsby Road 5
- c) Within planned utility / active transportation corridor and planned Stage 4 local collector road
- d) Southernly on local north south collector road to Townline Road

Rationale for Preferred Solution for Stage 4 Water Servicing

S4W3 is the preferred solution, and the rationale is summarized as follows:

1. Reduced construction complexity including fewest trenchless water crossings, avoids significant utility conflicts and community disruption within the existing Smithville urban area
2. Lowest carbon footprint associated with the construction and maintenance of system
3. Lowest cost in construction, operation and maintenance

The preferred solution for Stage 4 water servicing includes a crossing of Twenty Mile Creek and **Figure 1-4** presents the location of the crossing for this solution as well as the property access requirements (temporary easement at Northwest corner of South Grimsby Road 5 and Region Road 20).

Table 1-5: Stage 4 Water Infrastructure Strategy Assessment Results

Category	Criteria	Stage 1 Water: S1W1	Stage 1 Wastewater: S1WW1	Stage 1 Wastewater: S1WW2
Details	-	<ul style="list-style-type: none"> Watermain follows Regional Road 20 from South Grimsby Road 5 to South Grimsby Road 6 Southernly on South Grimsby Road 6 Trenchless crossing of Twenty Mile Creek on South Grimsby Road 6 Watermain continues on South Grimsby Road 6 to Townline Road Two trenchless crossings of North Creek 	<ul style="list-style-type: none"> Watermain extends southernly from Regional Road 20 and South Grimsby Road 5 intersection along future development lands to South Grimsby Road 6 Trenchless crossing of Twenty Mile Creek on South Grimsby Road 5 Within planned utility / active transportation corridor and planned Stage 4 local collector road Westerly on collector road to connect on South Grimsby Road 6 Southernly on South Grimsby Road 6 to Townline Road Two trenchless crossings of North Creek 	<ul style="list-style-type: none"> Watermain extends southernly from Regional Road 20 along future development lands to Townline Road Trenchless crossing of Twenty Mile Creek on South Grimsby Road 5 Within planned utility / active transportation corridor and planned Stage 4 local collector road Southernly on local north south collector road to Townline Road <p style="text-align: center;">Preferred Solution</p>
Technical Environment	<ul style="list-style-type: none"> Potential degree of construction complexities, including number and type of water crossings, anticipated rock removal, access, working area and duration to build. 	<ul style="list-style-type: none"> One crossing of Twenty Mile Creek Two crossings of North Creek at the northeast corner of Townline Road and South Grimsby Road 6 Anticipate in rock Access from South Grimsby Road 6 and Regional Road 20 (West Street) Longer construction duration associated with longer watermain length 	<ul style="list-style-type: none"> One crossing of Twenty Mile Creek Two crossings of North Creek at the northeast corner of Townline Road and South Grimsby Road 6 Anticipate in rock Access from South Grimsby Road 6 and Future Development lands (South side of Twenty Mile Creek) Shorter construction duration associated with shorter watermain length 	<ul style="list-style-type: none"> One crossing of Twenty Mile Creek Anticipate in rock Access from South GR5 (North side of Twenty Mile Creek) Access from Future Development Lands (South side of Twenty Mile Creek) Shortest construction duration associated with shortest watermain length
Technical Environment	<ul style="list-style-type: none"> Potential effects on roadway and utility infrastructure. 	<ul style="list-style-type: none"> Greater potential to impact recently paved surfaces on Regional Road 20 (West Street) and South Grimsby Road 6 roundabout 	<ul style="list-style-type: none"> Lower impacts to paved surfaces 	<ul style="list-style-type: none"> Lowest impacts to paved surfaces
Technical Environment	<ul style="list-style-type: none"> Provides good site access for maintenance vehicles, future operation and maintenance and servicing. 	<ul style="list-style-type: none"> Access from existing roads (South Grimsby Road 6 and West Street) 	<ul style="list-style-type: none"> Access from future development lands, local collector road, utility corridor (South of Twenty Mile Creek), and existing roads (South Grimsby Road 6) 	<ul style="list-style-type: none"> Access from future development lands, local collector road, and utility corridor (South of Twenty Mile Creek)
Technical Environment	<ul style="list-style-type: none"> Operation efficiency. 	<ul style="list-style-type: none"> Highest operation and maintenance effort related to longest watermain 	<ul style="list-style-type: none"> Higher operation and maintenance effort related to longer watermain 	<ul style="list-style-type: none"> Lower operation and maintenance effort related to shorter watermain
Technical Environment	<ul style="list-style-type: none"> Potential opportunity for current infrastructure to be decommissioned in favour of gravity solutions Potential effects on traffic 	<ul style="list-style-type: none"> Not applicable 	<ul style="list-style-type: none"> Not applicable 	<ul style="list-style-type: none"> Not applicable
Technical Environment	<ul style="list-style-type: none"> Potential effects on traffic. 	<ul style="list-style-type: none"> Greater impacts to traveling public due to road restoration required (Roundabout at Regional Road 20 and South Grimsby Road 6) 	<ul style="list-style-type: none"> Lower impacts to traveling public 	<ul style="list-style-type: none"> Lowest impacts to traveling public
Technical Environment	<ul style="list-style-type: none"> Dependency on the completion of other Stages 	<ul style="list-style-type: none"> Water strategy for Stage 4 will require Stage 1 or Stage 3 water infrastructure to form the Region's Ring system concept. 	<ul style="list-style-type: none"> Water strategy for Stage 4 will require Stage 1 or Stage 3 water infrastructure to form the Region's Ring system concept. 	<ul style="list-style-type: none"> Water strategy for Stage 4 will require Stage 1 or Stage 3 water infrastructure to form the Region's Ring system concept.

Category	Criteria	Stage 1 Water: S1W1	Stage 1 Wastewater: S1WW1	Stage 1 Wastewater: S1WW2
Technical Environment	<ul style="list-style-type: none"> Degree of permitting and approvals complexity 	<ul style="list-style-type: none"> Avoids co-ordination with block plan development process Species at risk habitat in area of water crossings NCPA permits for trenchless crossing 	<ul style="list-style-type: none"> Watermain to be captured with block plan development process Species at risk habitat in area of water crossings NCPA permits for trenchless crossing 	<ul style="list-style-type: none"> Watermain to be captured with block plan development process Species at risk habitat in area of water crossings NCPA permits for trenchless crossing
Land Use	<ul style="list-style-type: none"> Potential to conform to approved local (e.g., OP and Maser Community Plan), provincial (e.g., PPS) plans and policies. Identify existing official plans and schedule B1, B3 and B4 Natural Heritage 	<ul style="list-style-type: none"> Conforms Utilities permitted in future ROW Pipe crosses natural heritage system (current official plan Schedule E-12 and proposed OPA schedule 63) along South Grimsby Road 6 Work in regulated area to comply with NPCA policy document – November 2022 	<ul style="list-style-type: none"> Conforms Utility corridor permitted within Maser Community Plan Natural Heritage System or restoration area (south side of Twenty Mile Creek) Pipe crosses natural heritage system (current official plan Schedule E-12 and proposed OPA schedule 63) at the intersection of Regional Road 20 and South Grimsby Road 5 Work in regulated area to comply with NPCA policy document – November 2022 	<ul style="list-style-type: none"> Conforms Utility corridor permitted within Maser Community Plan Natural Heritage System or restoration area (south side of Twenty Mile Creek) Pipe crosses natural heritage system (current official plan Schedule E-12 and proposed OPA schedule 63) at the intersection of Regional Road 20 and South Grimsby Road 5 Work in regulated area to comply with NPCA policy document – November 2022
Land Use	<ul style="list-style-type: none"> Potential effects on current land uses, including development plans. 	<ul style="list-style-type: none"> Greater impact to fronting properties on West Street and South Grimsby Road 6 (Roundabout) 	<ul style="list-style-type: none"> Potential impact to fronting properties Potential to impact future development plans related to sending and receiving pits at northwest corner of South Grimsby Road 5 and Regional Road 20 (West Street) 	<ul style="list-style-type: none"> Potential to impact future development plans related to sending and receiving pits at northwest corner of South Grimsby Road 5 and Regional Road 20 (West Street) development plans
Natural Environment	<ul style="list-style-type: none"> Potential effects on terrestrial/aquatic habitat and species. 	<ul style="list-style-type: none"> Trenchless crossing minimizes impacts Minor vegetation removal Provincially Significant wetland consisting of swamp community along South Grimsby Road 6 Twenty Mile Creek includes wetland amphibian breeding habitat and turtle wintering. Habitat for several species of Conservation concern and deer wintering. 	<ul style="list-style-type: none"> Trenchless crossing minimizes impacts Minor vegetation removal within future utility corridor south of West Street and South Grimsby Road 5 intersection Provincially Significant wetland consisting of swamp community south of West Street and South Grimsby Road 5 intersection Twenty Mile Creek includes wetland amphibian breeding habitat and turtle wintering. Habitat for several species of Conservation concern and deer wintering. 	<ul style="list-style-type: none"> Trenchless crossing minimizes impacts Minor vegetation removal within future utility corridor south of West Street and South Grimsby Road 5 intersection Provincially Significant wetland consisting of swamp community south of West Street and South Grimsby Road 5 intersection Twenty Mile Creek includes wetland amphibian breeding habitat and turtle wintering. Habitat for several species of Conservation concern and deer wintering.
Natural Environment	<ul style="list-style-type: none"> Potential effects on species at risk (Species at Risk) and Species at Risk habitat. 	<ul style="list-style-type: none"> Potential to encounter Species at Risk in meadow east related to water crossings. Species may include Barn Swallow, Monarchs and Eastern Wood-Pewee. Grass Pickerel and Snapping Turtle habitat in creek. 	<ul style="list-style-type: none"> Potential to encounter Species at Risk within the future utility corridor. Species may include Bobolink and Eastern Meadowlark. Grass Pickerel and Snapping Turtle habitat in creek. 	<ul style="list-style-type: none"> Potential to encounter Species at Risk within the future utility corridor. Species may include Bobolink and Eastern Meadowlark. Grass Pickerel and Snapping Turtle habitat in creek.
Natural Environment	<ul style="list-style-type: none"> Potential to encounter soil and water contamination and waste disposal. 	<ul style="list-style-type: none"> None identified 	<ul style="list-style-type: none"> None identified 	<ul style="list-style-type: none"> None identified
Natural Environment	<ul style="list-style-type: none"> Anticipated environmental permitting and approval considerations. 	<ul style="list-style-type: none"> Requires Niagara Peninsula Conservation Authority work permit Anticipated Permit to Take Water Potential Species at Risk related to sending and receiving pits outside travel portion of ROW 	<ul style="list-style-type: none"> Requires Niagara Peninsula Conservation Authority work permit Anticipated Permit to Take Water Potential Species at Risk related to sending and receiving pits outside travel portion of ROW 	<ul style="list-style-type: none"> Requires Niagara Peninsula Conservation Authority work permit Anticipated Permit to Take Water Potential Species at Risk related to sending and receiving pits outside travel portion of ROW

Category	Criteria	Stage 1 Water: S1W1	Stage 1 Wastewater: S1WW1	Stage 1 Wastewater: S1WW2
Natural Environment	<ul style="list-style-type: none"> Potential effects on surface water and groundwater due to construction (i.e., dewatering of trenches during installation of watermain and/or sanitary forcemain/sewer, control of erosion and sedimentation). 	<ul style="list-style-type: none"> The installation of water infrastructure can lead to the interception of the shallow water table altering shallow groundwater flow paths Installation of infrastructure below the water table leads to the potential need for dewatering during construction and post construction and a decrease in groundwater levels 	<ul style="list-style-type: none"> The installation of water infrastructure can lead to the interception of the shallow water table altering shallow groundwater flow paths Installation of infrastructure below the water table leads to the potential need for dewatering during construction and post construction and a decrease in groundwater levels 	<ul style="list-style-type: none"> The installation of water infrastructure can lead to the interception of the shallow water table altering shallow groundwater flow paths Installation of infrastructure below the water table leads to the potential need for dewatering during construction and post construction and a decrease in groundwater levels
Natural Environment	<ul style="list-style-type: none"> Source water protection considerations. 	<ul style="list-style-type: none"> Drainage features within the study area are primarily headwater drainage (HDF) features, with some defined and regulated watercourses Twenty Mile Creek is the most significant watercourse and valley system within Smithville, with confined corridors and floodplains 	<ul style="list-style-type: none"> Drainage features within the study area are primarily headwater drainage (HDF) features, with some defined and regulated watercourses Twenty Mile Creek is the most significant watercourse and valley system within Smithville, with confined corridors and floodplains 	<ul style="list-style-type: none"> Drainage features within the study area are primarily headwater drainage (HDF) features, with some defined and regulated watercourses Twenty Mile Creek is the most significant watercourse and valley system within Smithville, with confined corridors and floodplains
Socio-Economic Environment	<ul style="list-style-type: none"> Potential nuisance impacts (e.g., disruption to access, air, dust, noise, and vibration) from construction and operations. 	<ul style="list-style-type: none"> Greater potential disruption to fronting properties on West Street and South Grimsby Road 6 including businesses and St. Martin Catholic Elementary School Potential to disrupt West Lincoln Leisureplex and Smithville Sports Complex 	<ul style="list-style-type: none"> Lower potential disruption to fronting properties Potential to disrupt West Lincoln Leisureplex and Smithville Sports Complex 	<ul style="list-style-type: none"> Lowest potential disruption to fronting properties Less potential to disrupt West Lincoln Leisureplex and Smithville Sports Complex
Socio-Economic Environment	<ul style="list-style-type: none"> Potential property requirements (temporary and permanent). 	<ul style="list-style-type: none"> Potential temporary easements on South Grimsby Road 6 and Townline Road at creeks for watermain crossings 	<ul style="list-style-type: none"> Requires temporary easement on south side of Regional Road 20 (West Street) at foot of South Grimsby Road 5 for Twenty Mile Creek watermain crossing and at Townline Road for watermain crossing Avoid permanent easement from property owner on southside of Regional Road 20 (West Street) directly south of South Grimsby Road 5 as trenchless crossing goes through residential property Requires permanent minor easement on southside of Twenty Mile Creek (land not developable). 	<ul style="list-style-type: none"> Requires temporary easement on north side of West Street and east side of South Grimsby Road 5 for Twenty Mile Creek watermain crossing Avoid permanent easement from property owner on southside of Regional Road 20 (West Street) directly south of South Grimsby Road 5 as trenchless crossing goes through residential property Requires permanent minor easement on southside of Twenty Mile Creek (land not developable).
Climate Change	<ul style="list-style-type: none"> Potential carbon footprint (e.g., energy usage, use of construction materials, construction methods and operations). 	<ul style="list-style-type: none"> Highest carbon footprint related to longest length of watermain and construction duration. 	<ul style="list-style-type: none"> Higher carbon footprint related to longer length of watermain and construction duration. 	<ul style="list-style-type: none"> Lower carbon footprint related to shorter length of watermain and construction duration.
Cultural Environment	<ul style="list-style-type: none"> Potential effects on archaeological resources. 	<ul style="list-style-type: none"> Works outside road right of way contains areas of moderate to high archaeological potential. 	<ul style="list-style-type: none"> Works outside road right of way contains areas of moderate to high archaeological potential. 	<ul style="list-style-type: none"> Works outside road right of way contains areas of moderate to high archaeological potential.
Cultural Environment	<ul style="list-style-type: none"> Potential for disruption of built heritage resources and cultural heritage landscapes. 	<ul style="list-style-type: none"> Potential heritage resource west of South Grimsby Road 6. 	<ul style="list-style-type: none"> Potential heritage resource south of West Street. 	<ul style="list-style-type: none"> Potential heritage resource south of West Street.
Cost	<ul style="list-style-type: none"> Cost of construction (including property acquisition). 	<ul style="list-style-type: none"> Highest cost relating to multiple water crossings, road restoration required, and longest watermain length 	<ul style="list-style-type: none"> Higher cost relating to multiple water crossings and length of watermain Minor cost associated with permanent easement southside of West Street at South Grimsby Road 5 	<ul style="list-style-type: none"> Lower cost relating to single water crossing and shorter length of watermain Minor cost associated with permanent easement southside of West Street at South Grimsby Road 5
Cost	<ul style="list-style-type: none"> Cost of operation / maintenance. 	<ul style="list-style-type: none"> Highest related to length of watermain length 	<ul style="list-style-type: none"> Higher than option 3 related to intermediate length of watermain length 	<ul style="list-style-type: none"> Lower related to shorter length of watermain length

1.5.2 Preferred Solutions and Rationale for Stage 4 Wastewater Service

A total of five alternatives were evaluated to address the need to expand the sanitary sewer system to Stage 4 of the Township of Lincoln Urban Expansion Project; three alternatives for the gravity sewer system for the majority of Stage 4 and two alternatives for the northern part of Stage 4A.

1.5.2.1 Gravity Sewer System for Stage 4

S4WW1

- a) Gravity sewer starting at north end of South Grimsby Road 6
- b) Easternly across the Stage 4 local collector road
- c) Southernly on north south local collector road to Townline Road
- d) Connects directly to future Port Davidson Smithville Pumping Station

S4WW2

- a) Gravity sewer south on South Grimsby Road 6 connecting to Townline Road
- b) Easternly on Townline Road to connect to future stage 3 gravity sewer S3WW1A
- c) Two crossings of a creek

S4WW3

- a) Gravity sewer starting at north end of South Grimsby Road 6
- b) Gravity sewer easternly through Stage 4 local collector road
- c) Southernly on north south local collector road to Townline Road
- d) Easternly on Townline Road to connect to future stage 3 gravity sewer S3WW1A

Rationale for Preferred Solution for Stage 4 Gravity Sewer System

S4WW1 is the preferred solution, and the rationale is summarized as follows:

1. Alignment can be directly connected to future Port Davidson Smithville Pumping Station
2. Does not rely on Stage 3 gravity sewer to be in place
3. Avoids trenchless crossings
4. Minimizes impacts to paved surfaces and travelling public (Townline Road)

5. Can be co-ordinated with Townline Road expansion
6. Optimizes overall capital investment as deeper gravity sewer for Stage 3 will not be required

1.5.2.2 Wastewater Servicing for Stage 4A

S4FM1

- a) New Smithville Pumping Station on south side of Twenty Mile Creek within staging area 4A; this station is considered a private pumping system
- b) Forcemain going north on South Grimsby Road 5 connecting northerly to Spring Creek Road
- c) Trenchless crossing of Twenty Mile Creek
- d) One crossing of railway

S4FM2

- a) New Smithville Pumping Station on south side of Twenty Mile Creek within staging area 4A; this station is considered a private pumping system
- b) New forcemain connects to future gravity sewer system for Stage 4

Rationale for preferred solution for Stage 4A

S4-FM2 is the preferred solution, and the rationale is summarized as follows:

1. Reduced construction complexity associated with no crossings of Twenty Mile Creek and railway are required
2. Lower maintenance and operation cost
3. Lower carbon footprint for construction

Alternatively, the area can be serviced by utilising a low pressure system whereby individual buildings pump their wastewater to a pressurized sewer main which will be owned and maintained by the Township; individual building pumps will be considered a private system with individual building owner responsibility.

Table 1-6: Stage 4 Wastewater Infrastructure Strategy Assessment Results

Category	Criteria	Stage 4: S4A-FM1	Stage 4: S4A-FM2	Stage 4 S4WW1	Stage 4: S4WW2	Stage 4: S4WW3
Details	-	<ul style="list-style-type: none"> ■ New Smithville Pumping Station on south side of Twenty Mile Creek within staging area 4A; this station is considered a private pumping system ■ New forcemain going north on South Grimsby Road 5 connecting northerly to Spring Creek Road ■ Trenchless crossing of Twenty Mile Creek ■ One crossing of railway 	<ul style="list-style-type: none"> ■ New Smithville Pumping Station on south side of Twenty Mile Creek within staging area 4A; this station is considered a private pumping system ■ New forcemain connect to future gravity sewer within Stage 4 <p style="text-align: center;">Preferred Solution</p>	<ul style="list-style-type: none"> ■ Gravity sewer starting at north end of South Grimsby Road 6 ■ Easternly across the Stage 4 local collector road ■ Southernly on north south local collector road to Townline Road ■ Connects directly to future Port Davidson Smithville Pumping Station <p style="text-align: center;">Preferred Solution</p>	<ul style="list-style-type: none"> ■ Gravity sewer south on South Grimsby Road 6 connecting to Townline Road ■ Easternly on Townline Road to connect to future stage 3 gravity sewer S3WW1A ■ Two crossings of North Creek 	<ul style="list-style-type: none"> ■ Gravity sewer starting at north end of South Grimsby Road 6 ■ Gravity sewer easternly through Stage 4 local collector road ■ Southernly on north south local collector road to Townline Road ■ Easternly on Townline Road to connect to future stage 3 gravity sewer S3WW1A
Technical Environment	<ul style="list-style-type: none"> ■ Potential degree of construction complexities, including number and type of water crossings, anticipated rock removal, access, working area and duration to build. 	<ul style="list-style-type: none"> ■ One crossing of Twenty Mile Creek ■ One crossing of railway ■ Anticipate in rock ■ Access from Future Development Lands (South side of Twenty Mile Creek) and South Grimsby Road 5 ■ Longer construction duration due to length of forcemain system. 	<ul style="list-style-type: none"> ■ No crossing of Twenty Mile Creek ■ Anticipate in rock ■ Access from Future Development Lands (South side of Twenty Mile Creek) ■ Shorter construction duration due to length of forcemain system. 	<ul style="list-style-type: none"> ■ No crossing of Twenty Mile Creek ■ Anticipate in rock ■ Access from Future Development Lands (South side of Twenty Mile Creek) ■ Longer construction duration associated with longer sewer main length 	<ul style="list-style-type: none"> ■ Two crossings of North Creek ■ Anticipate in rock ■ Access from South Grimsby Road 6 ■ Longer construction duration associated with multiple creek crossings 	<ul style="list-style-type: none"> ■ No crossing of Twenty Mile Creek ■ Anticipate greater in rock due to deeper sewer ■ Access from Future Development Lands (South side of Twenty Mile Creek) ■ Shorter construction duration associated with shorter sewer main length
Technical Environment	<ul style="list-style-type: none"> ■ Potential effects on roadway and utility infrastructure. 	<ul style="list-style-type: none"> ■ Greater impacts to paved surfaces 	<ul style="list-style-type: none"> ■ Lower impacts to paved surfaces 	<ul style="list-style-type: none"> ■ Lower impacts to paved surfaces 	<ul style="list-style-type: none"> ■ Greater impacts to paved surfaces ■ Potential to impact utilities 	<ul style="list-style-type: none"> ■ Lower impacts to paved surfaces
Technical Environment	<ul style="list-style-type: none"> ■ Provides good site access for maintenance vehicles, future operation and maintenance and servicing. 	<ul style="list-style-type: none"> ■ Access from future utility corridor/easement/multi use path / road 	<ul style="list-style-type: none"> ■ Access from future utility corridor /multi use path 	<ul style="list-style-type: none"> ■ Access from future utility corridor /multi use path 	<ul style="list-style-type: none"> ■ Access from existing road allowances 	<ul style="list-style-type: none"> ■ Access from future utility corridor/ multi use path
Technical Environment	<ul style="list-style-type: none"> ■ Operation efficiency. 	<ul style="list-style-type: none"> ■ Higher operation and maintenance effort relative to FM2 due to longer forcemain length ■ Requires operations and maintenance by private entity 	<ul style="list-style-type: none"> ■ Lower operation and maintenance effort relative to FM1 due to shorter forcemain length ■ Requires operations and maintenance by private entity 	<ul style="list-style-type: none"> ■ Highest operation and maintenance effort 	<ul style="list-style-type: none"> ■ Higher operation and maintenance effort 	<ul style="list-style-type: none"> ■ Lower operation and maintenance effort
Technical Environment	<ul style="list-style-type: none"> ■ Potential opportunity for current infrastructure to be decommissioned in favour of gravity solutions ■ Potential effects on traffic 	<ul style="list-style-type: none"> ■ Not applicable 	<ul style="list-style-type: none"> ■ Not applicable 	<ul style="list-style-type: none"> ■ Not applicable 	<ul style="list-style-type: none"> ■ Not applicable 	<ul style="list-style-type: none"> ■ Not applicable

Category	Criteria	Stage 4: S4A-FM1	Stage 4: S4A-FM2	Stage 4 S4WW1	Stage 4: S4WW2	Stage 4: S4WW3
Technical Environment	<ul style="list-style-type: none"> Potential effects on traffic. 	<ul style="list-style-type: none"> Greater impacts on travelling public 	<ul style="list-style-type: none"> Lower impacts on travelling public 	<ul style="list-style-type: none"> Lower impacts on travelling public 	<ul style="list-style-type: none"> Greater impacts on travelling public 	<ul style="list-style-type: none"> Lower impacts on travelling public
Technical Environment	<ul style="list-style-type: none"> Dependency on the completion of other Stages 	<ul style="list-style-type: none"> Stage 4A could be implemented without relying on the rest of Stage 4 and Stage 3 but requires Stage 1 to be in place. 	<ul style="list-style-type: none"> Stage 4A could be implemented with Stage 4 local sewer in place. . 	<ul style="list-style-type: none"> Stage 4 could be implemented without relying on Stage 3 local collection being in place. Requires new Stage 3 Smithville Pumping Station and forcemain across Twenty Mile Creek to upgraded Smithville Pumping Station. 	<ul style="list-style-type: none"> Stage 4 can only be implemented with Stage 3 local collection in place. Requires new Stage 3 Smithville Pumping Station and forcemain across Twenty Mile Creek to upgraded Smithville Pumping Station. 	<ul style="list-style-type: none"> Stage 4 can only be implemented with Stage 3 local collection in place. Requires new Stage 3 Smithville Pumping Station and forcemain across Twenty Mile Creek to upgraded Smithville Pumping Station.
Technical Environment	<ul style="list-style-type: none"> Degree of permitting and approvals complexity 	<ul style="list-style-type: none"> Species at risk habitat in area of water crossings Species at risk habitat in area of water crossings NCPA permits for trenchless crossing 	<ul style="list-style-type: none"> Forcemain to be captured with block plan development process Species at risk habitat in area of future development lands NCPA permits for trenchless crossing 	<ul style="list-style-type: none"> Sewer to be captured with block plan development process Species at risk habitat in area of future development lands NCPA permits for trenchless crossing 	<ul style="list-style-type: none"> Avoids co-ordination with block plan development process Species at risk habitat in area of water crossings NCPA permits for trenchless crossing 	<ul style="list-style-type: none"> Sewer to be captured with block plan development process Species at risk habitat in area of development lands NCPA permits for trenchless crossing
Land Use	<ul style="list-style-type: none"> Potential to conform to approved local (e.g., OP and Maser Community Plan), provincial (e.g., PPS) plans and policies. Identify existing official plans and schedule B1, B3 and B4 Natural Heritage 	<ul style="list-style-type: none"> Conforms Utility corridor permitted within Maser Community Plan Natural Heritage System or restoration area (south side of Twenty Mile Creek) Pipe crosses natural heritage system (current official plan Schedule E-12 and proposed OPA schedule 63) at Regional Road 20 (St. Catharines Street) Work in regulated area to comply with NPCA policy document – November 2022 Requires Canadian Pacific Railway approval 	<ul style="list-style-type: none"> Conforms Utility corridor permitted within Maser Community Plan Natural Heritage System or restoration area (south side of Twenty Mile Creek) Pipe does not cross a natural heritage area Work in regulated area to comply with NPCA policy document – November 2022 	<ul style="list-style-type: none"> Conforms Utility corridor permitted within Maser Community Plan Natural Heritage System or restoration area (south side of Twenty Mile Creek) Pipe does not cross a natural heritage area Work in regulated area to comply with NPCA policy document – November 2022 	<ul style="list-style-type: none"> Conforms Utilities permitted in future ROW Pipe does not cross a natural heritage area Work in regulated area to comply with NPCA policy document – November 2022 	<ul style="list-style-type: none"> Conforms Utility corridor permitted within Maser Community Plan Natural Heritage System or restoration area (south side of Twenty Mile Creek) Pipe does not cross a natural heritage area Work in regulated area to comply with NPCA policy document – November 2022
Land Use	<ul style="list-style-type: none"> Potential effects on current land uses, including development plans. 	<ul style="list-style-type: none"> Potential to impact future development plans at Northwest corner of West Street and South Grimsby Road 5 (related to watercrossing) 	<ul style="list-style-type: none"> Not applicable 	<ul style="list-style-type: none"> Not applicable 	<ul style="list-style-type: none"> Not applicable 	<ul style="list-style-type: none"> Not applicable

Category	Criteria	Stage 4: S4A-FM1	Stage 4: S4A-FM2	Stage 4 S4WW1	Stage 4: S4WW2	Stage 4: S4WW3
Natural Environment	<ul style="list-style-type: none"> Potential effects on terrestrial/aquatic habitat and species. 	<ul style="list-style-type: none"> Trenchless crossing minimizes impacts Minor vegetation removal within future utility corridor south of West Street and South Grimsby Road 5 intersection Provincially Significant wetland consisting of swamp community between South Grimsby Road 6 and Townline Road. Creek includes wetland amphibian breeding habitat and turtle wintering. Habitat for several species of Conservation concern and deer wintering. 	<ul style="list-style-type: none"> Minor vegetation removal within future utility corridor south of West Street and South Grimsby Road 5 intersection Habitat for several species of Conservation concern and deer wintering. 	<ul style="list-style-type: none"> Minor vegetation removal within future utility corridor south of West Street and South Grimsby Road 5 intersection Habitat for several species of Conservation concern and deer wintering. 	<ul style="list-style-type: none"> Trenchless crossing minimizes impacts Minor vegetation removal on South Grimsby Road 6 and Townline Road for creek crossing Provincially Significant wetland consisting of swamp community between South Grimsby Road 6 and Townline Road. Creek includes wetland amphibian breeding habitat and turtle wintering. Habitat for several species of Conservation concern and deer wintering. 	<ul style="list-style-type: none"> Minor vegetation removal within future utility corridor south of West Street and South Grimsby Road 5 intersection Habitat for several species of Conservation concern and deer wintering.
Natural Environment	<ul style="list-style-type: none"> Potential effects on species at risk (Species at Risk) and Species at Risk habitat. 	<ul style="list-style-type: none"> Potential to encounter Species at Risk within future utility corridor south of West Street and South Grimsby Road 5 intersection Grass Pickerel and Snapping Turtle habitat in creek. 	<ul style="list-style-type: none"> Potential to encounter Species at Risk within future utility corridor south of West Street and South Grimsby Road 5 intersection Grass Pickerel and Snapping Turtle habitat in creek. 	<ul style="list-style-type: none"> Potential to encounter Species at Risk within future utility corridor south of West Street and South Grimsby Road 5 intersection Grass Pickerel and Snapping Turtle habitat in creek. 	<ul style="list-style-type: none"> Potential to encounter Species at Risk in agricultural fields west of South Grimsby Road 6. Species may include Bobolink and Eastern Meadowlark. 	<ul style="list-style-type: none"> Potential to encounter Species at Risk within future utility corridor south of West Street and South Grimsby Road 5 intersection Grass Pickerel and Snapping Turtle habitat in creek.
Natural Environment	<ul style="list-style-type: none"> Potential to encounter soil and water contamination and waste disposal. 	<ul style="list-style-type: none"> None identified 	<ul style="list-style-type: none"> None identified 	<ul style="list-style-type: none"> None identified 	<ul style="list-style-type: none"> None identified 	<ul style="list-style-type: none"> None identified
Natural Environment	<ul style="list-style-type: none"> Anticipated environmental permitting and approval considerations. 	<ul style="list-style-type: none"> Requires Niagara Peninsula Conservation Authority work permit Anticipated Permit to Take Water Potential Species at Risk related to sending and receiving pits outside travel portion of ROW 	<ul style="list-style-type: none"> Requires Niagara Peninsula Conservation Authority work permit Anticipated Permit to Take Water 	<ul style="list-style-type: none"> Requires Niagara Peninsula Conservation Authority work permit Anticipated Permit to Take Water 	<ul style="list-style-type: none"> Requires Niagara Peninsula Conservation Authority work permit More permitting required due to more water crossings Anticipated Permit to Take Water Potential Species at Risk related to sending and receiving pits outside travel portion of ROW 	<ul style="list-style-type: none"> Requires Niagara Peninsula Conservation Authority work permit Anticipated Permit to Take Water
Natural Environment	<ul style="list-style-type: none"> Potential effects on surface water and groundwater due to construction (i.e., dewatering of trenches during installation of watermain and/or sanitary forcemain/sewer, control of erosion and sedimentation). 	<ul style="list-style-type: none"> The installation of infrastructure can lead to the interception of the shallow water table altering shallow groundwater flow paths Installation of infrastructure below the water table leads to the potential need for dewatering during construction and post construction and a decrease in groundwater levels study) 	<ul style="list-style-type: none"> The installation of infrastructure can lead to the interception of the shallow water table altering shallow groundwater flow paths Installation of infrastructure below the water table leads to the potential need for dewatering during construction and post construction and a decrease in groundwater levels 	<ul style="list-style-type: none"> The installation of infrastructure can lead to the interception of the shallow water table altering shallow groundwater flow paths Installation of infrastructure below the water table leads to the potential need for dewatering during construction and post construction and a decrease in groundwater levels) 	<ul style="list-style-type: none"> The installation of infrastructure can lead to the interception of the shallow water table altering shallow groundwater flow paths Installation of infrastructure below the water table leads to the potential need for dewatering during construction and post construction and a decrease in groundwater levels 	<ul style="list-style-type: none"> The installation of infrastructure can lead to the interception of the shallow water table altering shallow groundwater flow paths Installation of infrastructure below the water table leads to the potential need for dewatering during construction and post construction and a decrease in groundwater levels)

Category	Criteria	Stage 4: S4A-FM1	Stage 4: S4A-FM2	Stage 4 S4WW1	Stage 4: S4WW2	Stage 4: S4WW3
Natural Environment	<ul style="list-style-type: none"> Source water protection considerations. 	<ul style="list-style-type: none"> Drainage features within the study area are primarily headwater drainage (HDF) features, with some defined and regulated watercourses Twenty Mile Creek is the most significant watercourse and valley system within Smithville, with confined corridors and floodplains 	<ul style="list-style-type: none"> Drainage features within the study area are primarily headwater drainage (HDF) features, with some defined and regulated watercourses Twenty Mile Creek is the most significant watercourse and valley system within Smithville, with confined corridors and floodplains 	<ul style="list-style-type: none"> Drainage features within the study area are primarily headwater drainage (HDF) features, with some defined and regulated watercourses Twenty Mile Creek is the most significant watercourse and valley system within Smithville, with confined corridors and floodplains 	<ul style="list-style-type: none"> Drainage features within the study area are primarily headwater drainage (HDF) features, with some defined and regulated watercourses Twenty Mile Creek is the most significant watercourse and valley system within Smithville, with confined corridors and floodplains 	<ul style="list-style-type: none"> Drainage features within the study area are primarily headwater drainage (HDF) features, with some defined and regulated watercourses Twenty Mile Creek is the most significant watercourse and valley system within Smithville, with confined corridors and floodplains
Socio-Economic Environment	<ul style="list-style-type: none"> Potential nuisance impacts (e.g., disruption to access, air, dust, noise, and vibration) from construction and operations. 	<ul style="list-style-type: none"> Greater potential disruption to fronting properties 	<ul style="list-style-type: none"> Lower potential disruption to fronting properties 	<ul style="list-style-type: none"> Lower potential disruption to fronting properties 	<ul style="list-style-type: none"> Greater potential disruption to fronting properties 	<ul style="list-style-type: none"> Lower potential disruption to fronting properties
Socio-Economic Environment	<ul style="list-style-type: none"> Potential property requirements (temporary and permanent). 	<ul style="list-style-type: none"> Temporary easement required for Twenty Mile Creek crossing Requires permanent easement from property owner on southside of Regional Road 20 (West Street) directly south of South Grimsby Road 5 as trenchless crossing goes through residential property Requires easement on south side of Twenty Mile Creek (to be captured in future development application) for forcemain crossing 	<ul style="list-style-type: none"> None anticipated 	<ul style="list-style-type: none"> None anticipated 	<ul style="list-style-type: none"> Temporary easement required for North Creek crossing Potential temporary easements on northwest corner of South Grimsby Road 6 and Townline Road for Creek for forcemain crossing 	<ul style="list-style-type: none"> None anticipated
Climate Change	<ul style="list-style-type: none"> Potential carbon footprint (e.g., energy usage, use of construction materials, construction methods and operations). 	<ul style="list-style-type: none"> Higher carbon footprint relative to FM1A due to longer length of forcemain and construction duration 	<ul style="list-style-type: none"> Lower carbon footprint relative to FM1B due to shorter length of forcemain and construction duration 	<ul style="list-style-type: none"> Highest carbon footprint relative to S4WW2 and 3 due to the length of sewer and construction duration. 	<ul style="list-style-type: none"> Higher carbon footprint relative to S4WW1 due to the construction duration 	<ul style="list-style-type: none"> Lower carbon footprint relative to S4WW1 due to the length of the sewer and construction duration
Cultural Environment	<ul style="list-style-type: none"> Potential effects on archaeological resources. 	<ul style="list-style-type: none"> Works outside road right of way contains areas of moderate to high archaeological potential. 	<ul style="list-style-type: none"> Works outside road right of way contains areas of moderate to high archaeological potential. 	<ul style="list-style-type: none"> Works outside road right of way contains areas of moderate to high archaeological potential. 	<ul style="list-style-type: none"> Works outside road right of way contains areas of moderate to high archaeological potential. 	<ul style="list-style-type: none"> Works outside road right of way contains areas of moderate to high archaeological potential.
Cultural Environment	<ul style="list-style-type: none"> Potential for disruption of built heritage resources and cultural heritage landscapes. 	<ul style="list-style-type: none"> Potential heritage resources within area south of West Street. 	<ul style="list-style-type: none"> Potential heritage resources within area south of West Street. 	<ul style="list-style-type: none"> Potential heritage resources within area south of West Street. 	<ul style="list-style-type: none"> No potential or designated heritage resources within area. 	<ul style="list-style-type: none"> Potential heritage resources within area south of West Street.
Cost	<ul style="list-style-type: none"> Cost of construction (including property acquisition). 	<ul style="list-style-type: none"> High cost 	<ul style="list-style-type: none"> Low cost 	<ul style="list-style-type: none"> Highest 	<ul style="list-style-type: none"> High 	<ul style="list-style-type: none"> Lowest
Cost	<ul style="list-style-type: none"> Cost of operation / maintenance. 	<ul style="list-style-type: none"> Higher related to longer length of forcemain 	<ul style="list-style-type: none"> Lower related to shorter length of forcemain 	<ul style="list-style-type: none"> Highest related to longer sewer 	<ul style="list-style-type: none"> Higher related to creek crossings 	<ul style="list-style-type: none"> Lower related to shorter sewer

1.6 Recommended Water and Wastewater Servicing Strategy

The recommended strategy for water and wastewater system to accommodate the urban boundary expansion concept was identified based on the overall environment assessment results, technical feasibility and financial implications. According to the assessment results presented in the previous sections, the preferred strategy for water and wastewater system was as follow:

Preferred Water Strategy:

- Stage 1: S1W1
- Stage 2: S2W2
- Stage 3: S3W1
- Stage 4: S4W3

Preferred Wastewater Strategy:

- Stage 1: S1WW1
- Stage 2: S2WW1
- Stage 3: S3WW1A, S3WW2A and S3FM1B
- Stage 4: S4WW1 and S4A-FM2

Figure 1-5 and **Figure 1-6** present the preferred water and wastewater strategy, respectively. The required infrastructures for each strategy were colour code based on the associated staging as per the urban boundary expansion concept.

Figure 1-5: Recommended Water Servicing Strategy

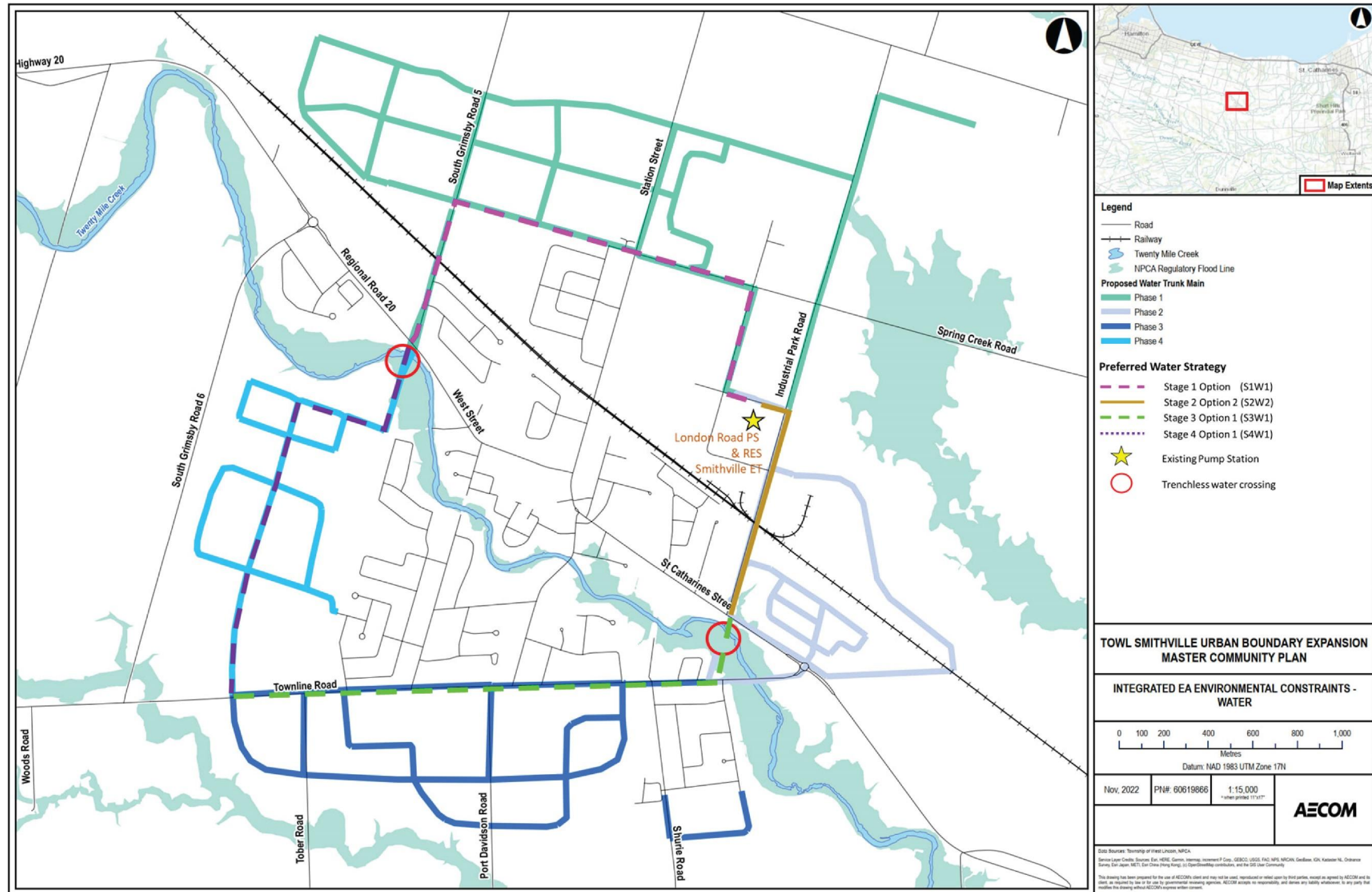


Figure 1-6: Recommended Wastewater Servicing Strategy

