141-18986-00

TOWNSHIP OF RUSSELL WATER AND WASTEWATER MASTER PLAN UPDATE

April 2016

TOWNSHIP OF RUSSELL WATER AND WASTEWATER MASTER PLAN UPDATE

Township of Russell

Project No: 141-18986-00

Date: April 2016

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April 5, 2016

Craig Cullen
Executive Director Public Works and Infrastructure Services
Township of Russell
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Subject : Township of Russell Water and Wastewater Master Plan Update

Dear Mr. Cullen,

We are pleased to provide our final report for the Township's Water and Wastewater Master Plan. The mandatory 30-day review period for the Master Plan has concluded and no comments were received.

We trust that this submission meets your expectations.

Yours truly,

Gustavo Arvizu, P. Eng., M. Eng.
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REVISION HISTORY

VERSION	DATE	DESCRIPTION
1	February 4, 2016	Issued for 30 day Review Period
2	April 5, 2016	Final Report Issued

EXECUTIVE SUMMARY

The Township of Russell is a lower tier municipality within the United Counties of Prescott Russell (UCPR) in eastern Ontario. In 2014, the Township retained WSP Canada Inc. (WSP) to complete an update to the 2004 Water and Wastewater Master Plan.

The Master Plan study area includes the geographical boundaries of the Township of Russell as defined in 2014, corresponding to an area of approximately 200 square kilometres with four urban communities: Embrun, Russell, Marionville and Limoges. The scope of the Master Plan also includes the Highway 417 Industrial Park.

The Master Plan was developed in accordance with Municipal Class Environmental Assessment (EA) document (October 2000, amended in 2007 and 2011). The Class EA process includes five phases:

- Phase 1 Problem or Opportunity
- Phase 2 Alternative Solutions
- Phase 3 Alternative Design Concepts for Preferred Solution
- Phase 4 Environmental Study Report (ESR)
- Phase 5 Implementation

This Master Plan addresses Phases 1 and 2 of Municipal Class EA process.

The Master Plan outlines a framework for future works and infrastructure requirements over the study's planning horizon of 2016 to 2031. It also provides the context for the implementation of projects which are identified as required for future servicing. More detailed investigation is required at the project-specific level for projects identified as Schedule 'B' and Schedule 'C'.

This Master Plan update builds upon the conclusions of the 2004 Master Plan and it is based on the following objectives:

- Provide reliable water and wastewater services to accommodate the projected residential, commercial, institutional and industrial development in the communities of Russell, Embrun and Marionville
- Provide water and wastewater servicing to the Highway 417 Industrial Park
- Define the Township's water and wastewater systems infrastructure requirements for the Study Area to the year 2031

The Master Plan involves an evaluation of the technical, environmental, social and cultural impacts of alternatives to address the system constraints and provide capacity for growth.

PLANNING

The population projections developed as part of the Township's Official Plan and 2013 Development Charges Study were taken as the basis for this Master Plan Update. These are based on the following assumptions:

1. 2013 population of 16,180.

2. 2013-2023 population growth of 3,620.
3. Buildout (beyond 2031) population of 22,720.

Furthermore, information provided by the Township's planning department was compiled which includes a list of all the vacant development lands and the various development proposals received by the Township. Based on that list a total of 2723 residential units are estimated during the planning horizon.

It is important to recognize that not all areas of the Township are connected to the municipal water and wastewater system (some are serviced by private wells and septic tanks). Furthermore, the number of units currently connected to the water system is greater than the number of units serviced by the municipal wastewater system. This is an important distinction when planning for the infrastructure requirements.

This Master Plan assumes that all future development within the municipal boundaries would be (unless noted otherwise) connected to the municipal water and wastewater systems.

WATER SUPPLY, TREATMENT AND DISTRIBUTION

The City of Ottawa supplies drinking water to the Township from the Leitrim Road Pumping Station through a 9 km feedermain (Russell Feedermain) connecting to the Eadie Road Metering Station and extending to the Embrun Reservoir. Given the long distance and residence time in the watermain from Ottawa, the water has to be rechloraminated to achieve the required residual for secondary disinfection before distribution to Russell, Embrun and Marionville. The Embrun Reservoir is the hub from which treated water is distributed to the rest of the system. The Reservoir is equipped with two sets of booster pumps which discharge to Embrun and Russell, respectively. The Embrun booster pumps are controlled by the level in the Embrun Water Tower, and the Russell booster pumps are controlled by the level in the Russell Water Tower. The Marionville Booster Station (formerly known as the Russell Water Treatment Plant) draws water from the Russell distribution system to feed Marionville and to fill the Marionville Water Tower. This is illustrated in Figure ES 1 below.

The 417 Industrial Park is currently not connected to the municipal water distribution system. Existing development in the Park is serviced by private well systems.

Prior to 2010, the Embrun/Marionville Water Treatment Plant and the Russell Water Treatment Plant supplied the distribution system. However, since the construction of the Russell Feedermain from Ottawa, these facilities have been decommissioned.

The Township has entered into a water supply agreement with the City of Ottawa that commits up to 11,860 m^3 over a 20-hour period to supply the Township.

Per capita water usage has declined considerably since 2010 (year when water metering was implemented in the Township). This has led to a re-evaluation of the remaining servicing capacity of the water supply system. Based on the projected 2031 serviced population, it is expected that the current agreed upon maximum supply capacity from Ottawa would be sufficient to service the forecasted growth. This is shown in Figure ES 2 below.

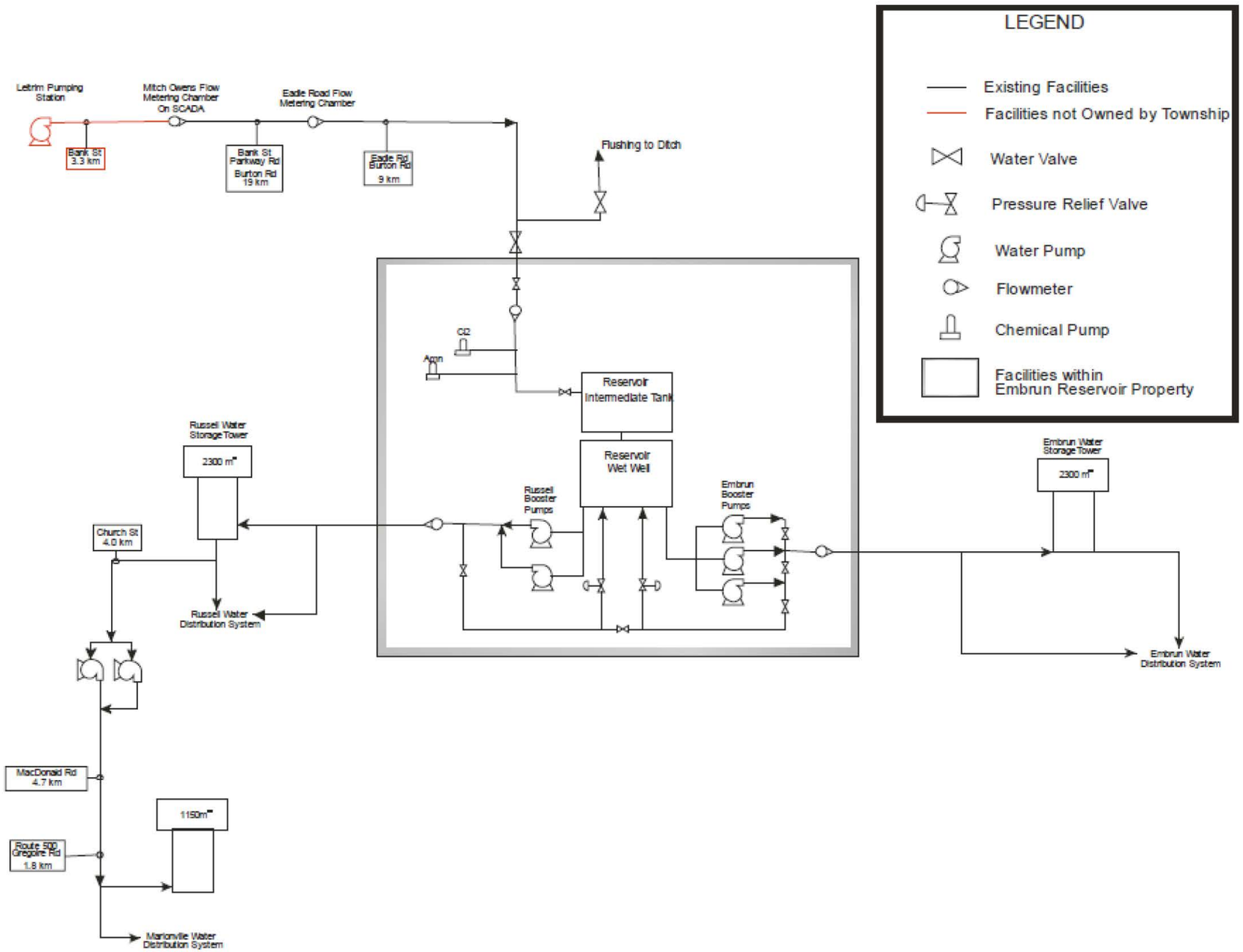

Figure ES 1 System Water Supply and Distribution System Overview

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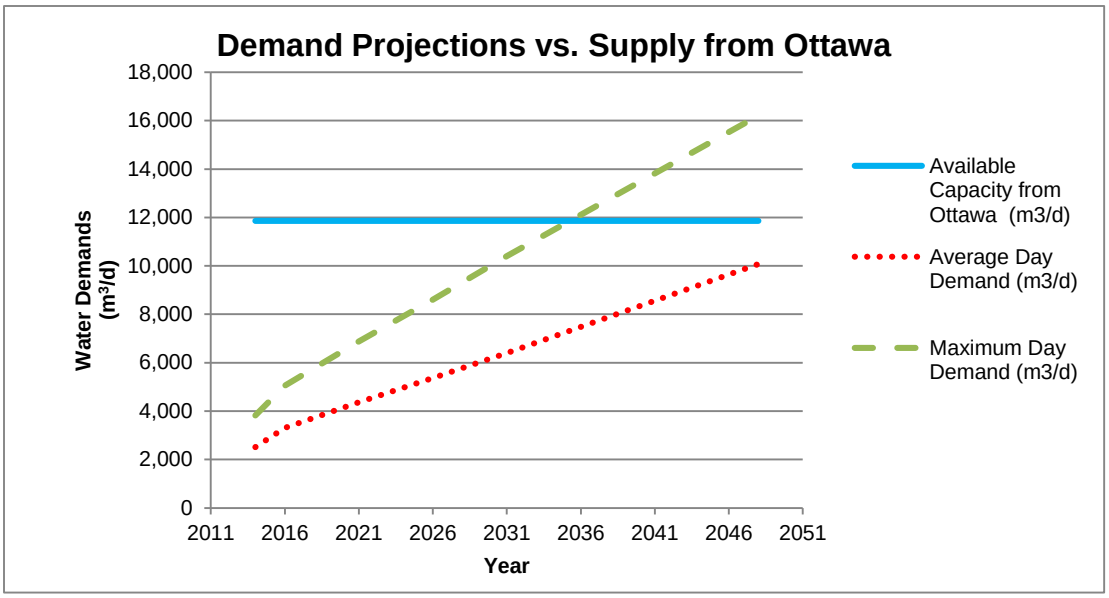

Figure ES 2 Water Demand Projections 2016-2031

The design of the distribution system is dependent on whether sufficient storage is available to account for variations in demand and to allow for emergencies and firefighting. The availability of floating storage (i.e. water towers) reduces the requirements for redundancy and extra capacity at the various booster pumping stations. The water storage requirements for the system were determined based on MOE Guidelines, and are a function of the maximum day demand of the system and the fire flow requirements. Fire flow requirements were determined based on the Fire Underwriter Survey (FUS) *Water Supply for Public Fire Protection* document. The FUS document establishes minimum fire flow requirements for various types of construction.

An analysis of the available storage and pumping capacity in Embrun, Russell and Marionville was conducted. Based on this analysis, it was determined that the storage and pumping capacity available in the different parts of the system is sufficient to accommodate growth to 2031. The only exception is Marionville, where the limited demands pose water quality constraints requiring the Marionville Water Tower to be only partially filled. This results in a reduced firefighting capacity. To address this issue, additional pumping capacity would be required at the Marionville Booster Pumping Station.

Construction of a secondary watermain loop in Embrun is recommended to improve security of supply.

No other capital projects are required to service the growth forecasted in the planning horizon.

One of the key objectives of this Master Plan is to determine the preferred approach to providing water and wastewater servicing to the Highway 417 Industrial Park. Concurrently with the development of the Master Plan, WSP completed a review of alternatives to service the Industrial Park. The preferred alternative identified involves constructing a watermain from the Eadie Road Metering Station feeding a new inground reservoir and booster pumping station in the vicinity of the Industrial Park, and constructing a watermain connection from the new booster station/reservoir to the Embrun Reservoir.

Several alternatives were evaluated to provide overall water servicing to the Township. The alternatives were evaluated with respect to their impact on the Natural Environment, the Social Environment and the Economic/Technical Environment. The preferred water servicing strategy for Russell Township includes the following:

- A new watermain from Eadie Road Metering Station to the 417 Industrial Park
- A new inground reservoir/booster station near the 417 Industrial Park
- A new watermain from the industrial park booster station/reservoir to the Embrun Reservoir
- Upgrades to Embrun Reservoir to accommodate the connection from the watermain servicing the Industrial Park
- New fire pump at the Russell Booster Station to provide fire protection for Marionville
- A new watermain along Industrial Avenue to loop the Embrun distribution system

A separate Class Environmental Assessment studies would be required for the servicing of the Industrial Park.

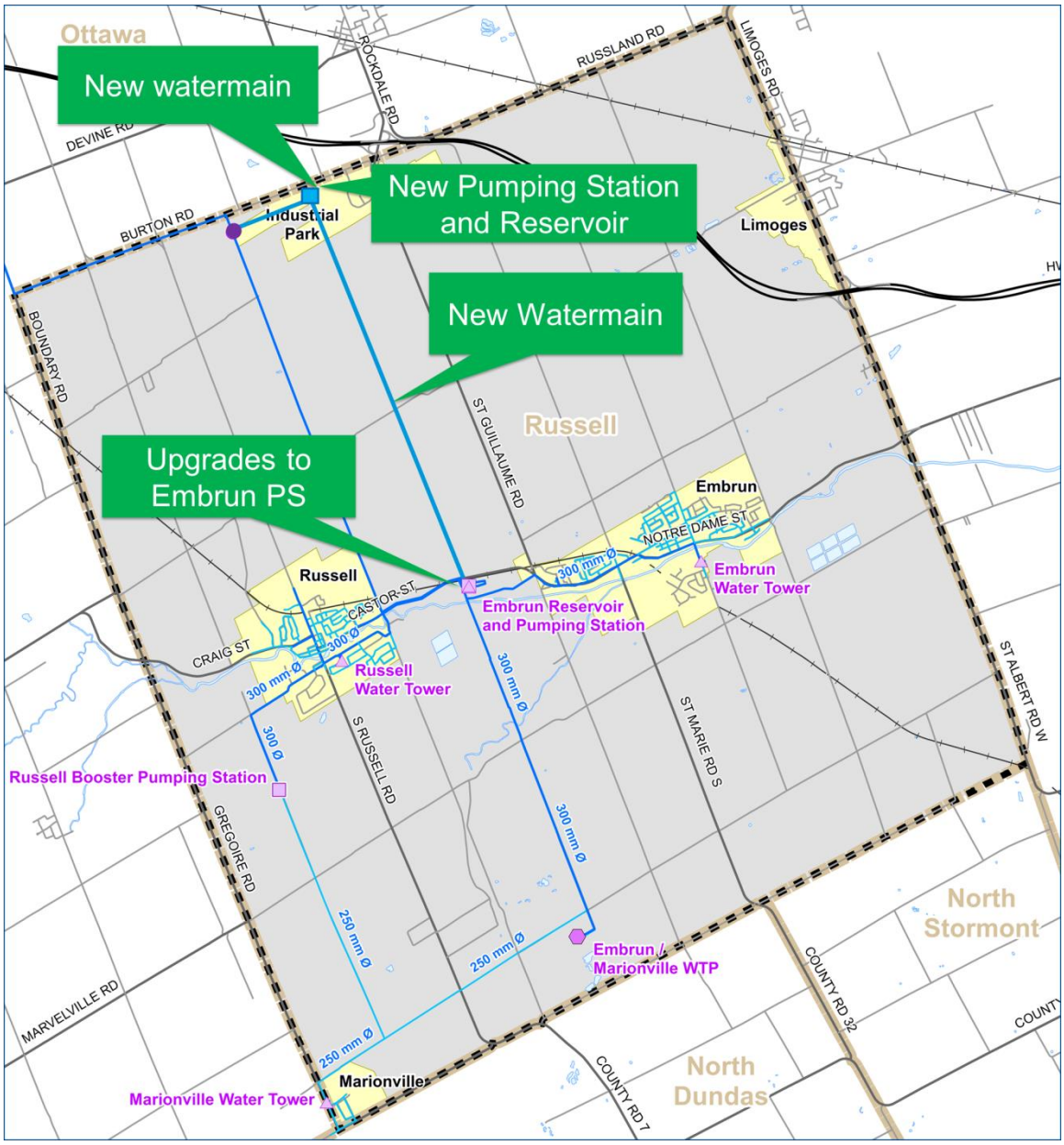

Figure ES 3 Preferred Water Servicing Strategy

SEWAGE COLLECTION, TREATMENT AND DISPOSAL

The communities of Embrun and Russell are serviced by independent wastewater systems consisting of a network of gravity sewers, and sewage pumping stations discharging to a Lagoon Treatment Facility.

Russell and 417 Industrial Park

The Russell wastewater system consists of a gravity sewer network with three distinct drainage areas, each leading to a sewage pumping station. Sewage Pumping Station (SPS) 2 services the northwest part of Russell and it discharges upstream of SPS 1's drainage area. SPS 1's drainage area includes most areas

north of the Castor River. SPS 1 discharges directly to the Russell Lagoon Facility. SPS 3 services the northwest area of Russell and it also discharges directly to the Russell Lagoon Facility.

The 417 Industrial Park is currently not connected to the municipal wastewater system. Existing development in the Park is serviced by private septic systems.

The sanitary sewage collection system and pumping station capacities for Russell were evaluated relative to the flows associated with the projected population growth. Historical data for the period 2010-2014 was analyzed and used to establish per capita wastewater design criteria which were used to estimate average daily flow projections. These were then compared to the capacity of the Russell Lagoon Facility to determine the need for expansion. Peak wastewater flows were estimated for each pumping station catchment area to assess limitations in pumping capacity.

The Russell Lagoon has sufficient capacity to service projected growth in Russell. New development within Russell would connect to the existing sanitary system. Therefore, the Do Nothing approach was deemed sufficient to service growth within Russell.

Several alternatives were considered to provide wastewater servicing of the Industrial Park. The preferred alternative involves conveying wastewater flows from the Industrial Park directly to the Russell Lagoon Facility. The alternatives have been evaluated with respect to their impact on the Natural Environment, the Social Environment and the Economic/Technical Environment.

The figure below shows the projected wastewater flows to the Russell wastewater system (including those generated in the Industrial Park). It is expected that the Russell Lagoon Facility would need to be upgraded to accommodate all of the forecasted growth. Furthermore, SPS 1 would also need to be upgraded.

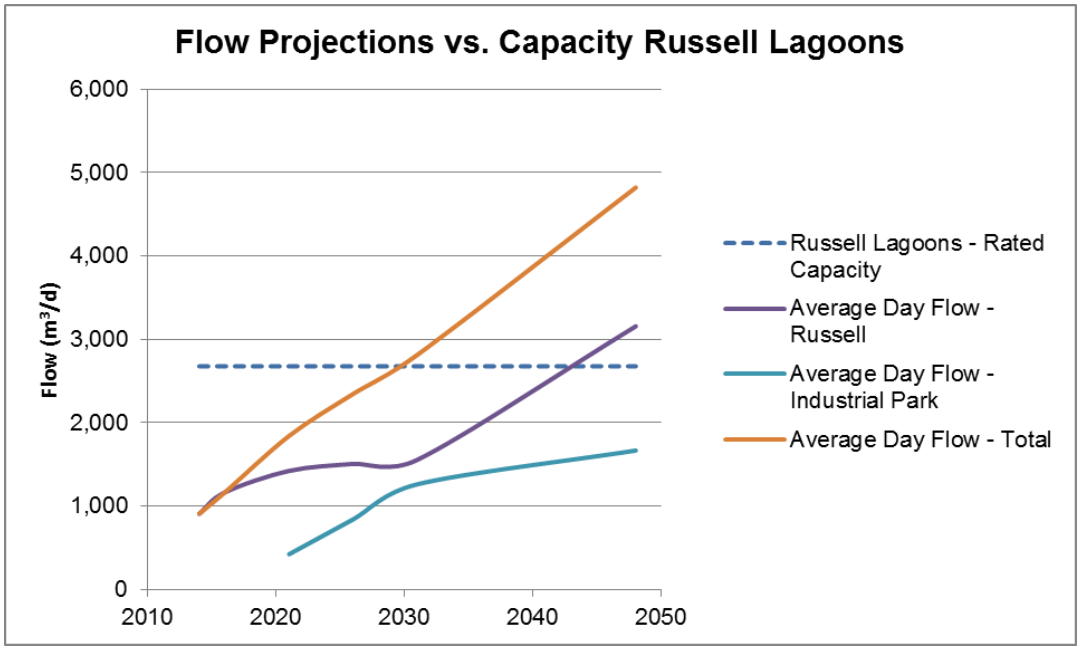

Figure ES 4 Wastewater Flow Projections 2016-2031 – Russell and 417 Industrial Park

The preferred wastewater servicing strategy for Russell is illustrated below. The recommended projects include:

- Constructing a new sewage pumping station and forcemain to the Russell Lagoons to service the 417 Industrial Park
- Capacity Upgrades at Sewage Pumping Station 1
- Expansion of Russell Lagoon Facility

Separate Class Environmental Assessment studies would be required for the servicing of the Industrial Park, the upgrades at SPS 1, and the expansion of the Russell Lagoon Facility.

Embrun

The Embrun wastewater system consists of a gravity sewer network with eight distinct drainage areas, each leading to a sewage pumping station. SPS 2, 4 and 5, all discharge upstream of SPS 1's drainage area. SPS 3 and SPS 7 discharge upstream of SPS 8. SPS 1, SPS 6 and SPS 8 discharge directly to the Embrun Lagoon Facility.

The figure below shows the projected wastewater flows to the Embrun wastewater system. The capacity of the Lagoons is considered sufficient to accommodate the forecasted growth to 2031. However, based on the location of the development areas within Embrun, upgrades would be required at SPS 1, 2, 3 and 7.

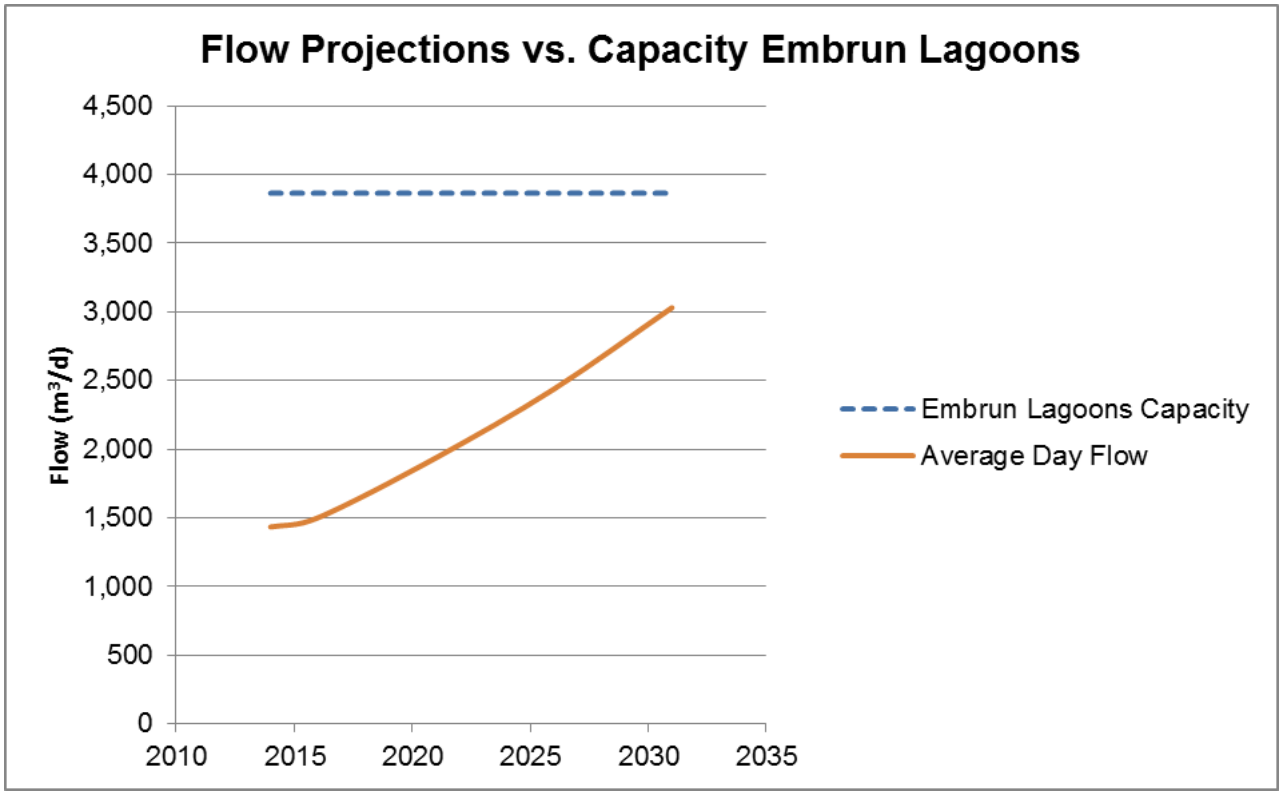

Figure ES 5 Wastewater Flow Projections 2016-2031 – Embrun

The preferred wastewater servicing strategy for Embrun is illustrated below. The recommended projects include:

- Capacity Upgrades at Sewage Pumping Station 1

- Capacity Upgrades at Sewage Pumping Station 2
- Capacity Upgrades at Sewage Pumping Station 3
- Capacity Upgrades at Sewage Pumping Station 7

Separate Class Environmental Assessment studies would be required for upgrades at the pumping stations.

The preferred wastewater servicing alternative for the Township of Russell is shown in the figure below.

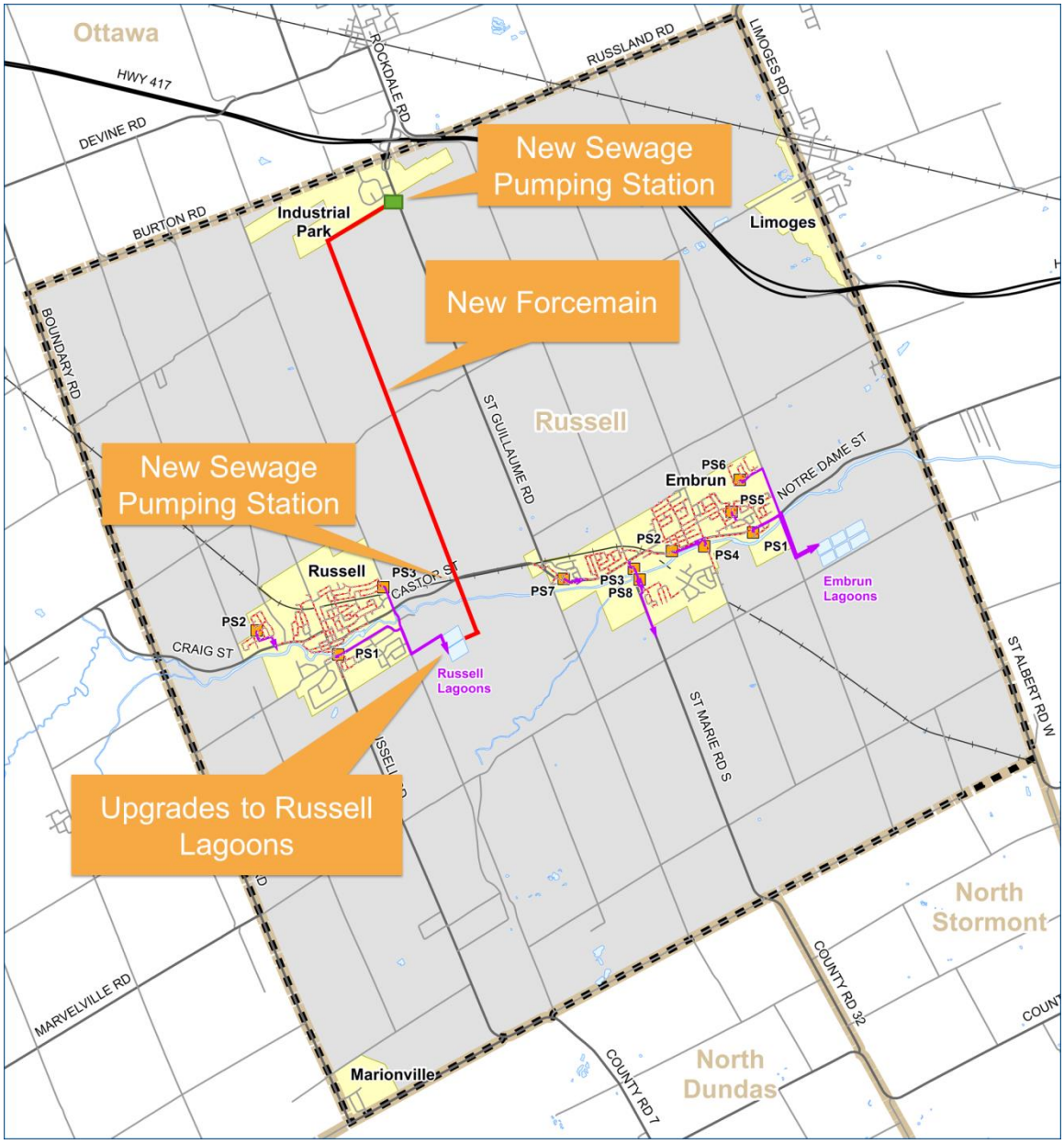

Figure ES 6 Preferred Wastewater Servicing Strategy – Embrun

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1 INTRODUCTION

WSP was retained in 2014 by Russell Township to complete a Water and Wastewater Master Plan. The objective of the Master Plan is to review the capacity of the Township's water and wastewater systems, to determine infrastructure needs, and to establish a strategy to provide water and wastewater services to accommodate growth during the 2016 to 2031 planning horizon. The Master Plan builds upon the findings of the Township's 2004 Master Plan and other studies that have been completed since.

The conclusions and recommendations provided in this Master Plan report will help the Township to prepare a Capital Plan and to identify additional investigation and planning requirements. It should be noted that the scope of the project did not include an assessment of repair, rehabilitation or replacement needs related to infrastructure assets reaching the end of their expected service lives.

1.1 STUDY AREA

The study area for the Master Plan includes within the geographical boundaries of the Township of Russell as defined in 2015 and shown in Figure 2-1. The study area encompasses an area of approximately 200 square kilometres and is approximately 13 km wide (E-W) by 16 km long (N-S).

The Township of Russell is bounded by the City of Ottawa to the west, the Nation Municipality to the east, the Township of North Dundas to the south, and the City of Clarence-Rockland to the North. There are four urban communities (Embrun, Russell, Marionville, Limoges) within the study area that represent the majority of the existing population in the municipality. Because the communities of Marionville and Limoges extend into other municipalities, the infrastructure planning (servicing area) for these two communities could extend beyond the study area. The boundaries for each of the four communities correspond to the boundaries shown in the United Counties of Prescott-Russell Official Plan ((Russell Township, 2010).

Limoges is currently serviced by the Nation Municipality and therefore is not considered as part of the scope of this Master Plan.

1.2 SCOPE OF THE MASTER PLAN

Master Plans are long range plans, which integrate infrastructure requirements for existing and future land use with environmental assessment planning principles. These plans examine an infrastructure system(s) or group of related projects in order to outline a framework for planning for subsequent projects and/or developments (Municipal Engineers Association, 2011).

The following are distinguishing features of Master Plans (Municipal Engineers Association, 2011):

a. The scope of Master Plans is broad and usually includes an analysis of the system in order to outline a framework for future works and developments. Master Plans are not typically undertaken to address a site-specific problem.

b. Master Plans typically recommend a set of works which are distributed geographically throughout the study area and which are to be implemented over an extended period of time. Master Plans provide the context for the implementation of the specific projects, which make up the plan and satisfy, as a minimum, Phases 1 and 2 of the Class EA process. Notwithstanding that these works may be implemented as separate projects, collectively these works are part of a larger management system. Master Plan studies in essence conclude with a set of preferred

alternatives and, therefore, by their nature, Master Plans will limit the scope of alternatives, which can be considered at the implementation stage.

This Water and Wastewater Master Plan documents existing conditions, forecasts infrastructure needs to service growth, and evaluate alternative servicing strategies to define the preferred solution. The Master Plan evaluates infrastructure needs in 5-year increments starting in 2016 and ending in 2031.

The 20 year planning period corresponds to the planning horizon and population projections set in the Township's Official Plan and is consistent with provincial planning principles.

2 ENVIRONMENTAL ASSESSMENT PROCESS

2.1 ENVIRONMENTAL ASSESSMENT ACT

The Ontario Environmental Assessment Act (EAA) and the associated Codes of Practice require proponents to examine and document the environmental effects that might result from major projects or activities.

The Act defines the environment broadly as:

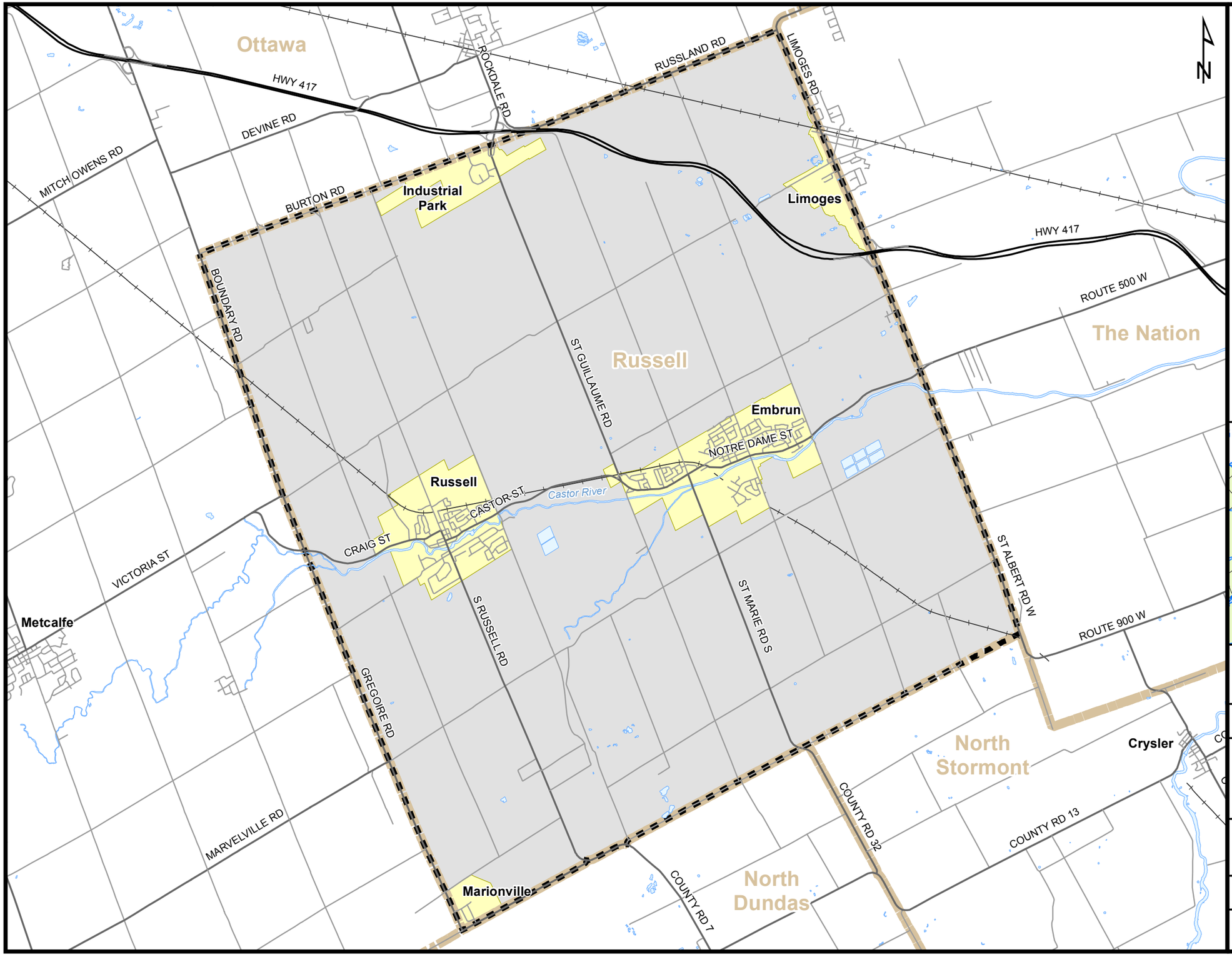
1. Air, land or water
2. Plant and animal life, including man
3. The social, economic and cultural conditions that influence the life of man or a community
4. Any building, structure, machine or other device or thing made by man
5. Any solid, liquid, gas, odour, heat, sound, vibration or radiation resulting directly or indirect from activities of man
6. Any part or combination of the foregoing and the interrelationships between any two or more of them.

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

2.2 PRINCIPLES OF ENVIRONMENTAL PLANNING

The Act sets a framework for a systematic, rational and replicable environmental planning process that is based on five key principles, as follows:

- Consultation with affected parties - Consultation with the public and government review agencies is an integral part of the planning process. Consultation allows the proponent to identify and address concerns cooperatively before final decisions are made. Consultation should begin as early as possible in the planning process.
- Consideration of a reasonable range of alternatives - Alternatives to include functionally different solutions to the proposed undertaking as well as alternative methods of implementing the preferred solution. The “do nothing” alternative must also be considered.



Legend

- Freeway
- Arterial Road
- Local Road
- Railway
- Village Boundary / Industrial Park Boundary
- Study Area
- Municipal Boundary

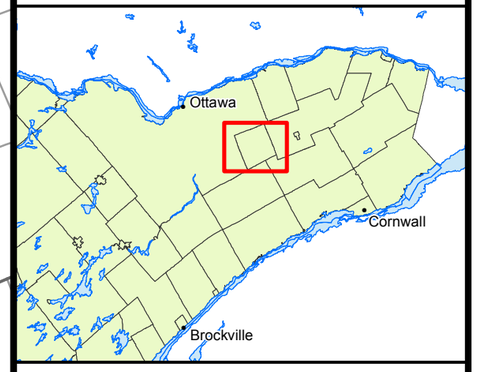


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Figure 2-1

Study Area

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- Identification and consideration of the effects of each alternative on all aspects of the environment - This includes the natural, social, cultural, technical, and economic environments.
- Systematic evaluation of alternatives in terms of their advantages and disadvantages, to determine their net environmental effects - The evaluation shall increase in the level of detail as the study moves from the evaluation of alternatives to the proposed undertaking to the evaluation of alternative methods.
- Provision of clean and complete documentation of the planning process followed – This will allow traceability of decision-making with respect to the project. The planning process must be documented in such a way that it may be repeated with similar results.

2.3 MUNICIPAL CLASS ENVIRONMENTAL ASSESSMENT

To meet the requirements of the EAA, this project is being conducted in accordance with the Class Environmental Assessment (EA) process. The requirements for undertaking a Class EA are described in the document Municipal Class Environmental Assessment, (October 2000, as amended in 2007 & 2011), Municipal Engineers Association (MEA).

The Class EA planning process requires the integration of sound engineering judgement, prudent long-term planning and protection of all aspects of the environment (natural, social, economic and cultural). This includes consultation with the public and affected agencies, to obtain comments and input, to ensure regulatory compliance and ultimately achieve acceptance for the preferred alternative.

The overall result of the Class EA process is the identification of a preferred solution which results in minimal impact on the environment.

Class Environmental Assessments were approved by the Minister of the Environment in 1987 for municipal projects having predictable and preventable impacts. The Class EA streamlines the planning and approvals process for municipal infrastructure projects (including water and wastewater projects) which display the following important characteristics in common:

- Recurring
- Similar in nature
- Usually limited in scale
- Predictable range of environmental effects
- Responsive to mitigation measures

The Class EA document applies to a group of projects which are approved under the Environmental Assessment Act, provided they are planned for according to the requirements of the Class EA. The specific requirements of the Class EA document depend on the type of project, its complexity and the significance of potential environmental impacts.

The Municipal Class Environmental Assessment (MCEA) document, prepared by the Municipal Engineers Association (October 2000, as amended in 2007 & 2011), outlines the procedures to be followed to satisfy EA requirements for water, wastewater and road projects. The process includes five phases:

- Phase 1: Problem Definition
- Phase 2: Identification and Evaluation of Alternative Solutions to Determine a Preferred Solution

- Phase 3: Examination of Alternative Methods of Implementation of the Preferred Solution
- Phase 4: Documentation of the Planning, Design and Consultation Process
- Phase 5: Implementation and Monitoring

Public and agency consultation are integral to the Class EA planning process. Projects subject to the Class EA process are classified into four possible “Schedules” depending on the degree of expected impacts. It is important to note that the Schedule assigned to a particular project is proponent-driven. For example, if a project has been designated as Schedule A, the proponent can decide to comply with the requirements of a Schedule B or C of the MEA process based on the magnitude of anticipated impacts or the special public and agency consultation requirements specific to that particular project.

Agreements made or commitments given by the proponent to affected agencies or the public during the course of the screening process must be followed through and implemented, otherwise the EA approval will be not be granted. If an affected agency or the public has a concern that cannot be resolved by discussion and negotiation with the proponent, then they can request a proponent to comply with Part II of the EA Act. Through issuance of a Part II Order, Schedule “B” and Schedule “C” projects may be elevated to an individual EA, requiring the proponent to comply with Part II of the EA Act. Schedule “B” projects could also be elevated to a Schedule “C”.

The Class EA process flowchart is provided in Figure 2-2 below.

SCHEDULE A PROJECTS

Schedule A projects are minor, operational and maintenance activities and are pre-approved without the need for further assessment. Projects with this designation are typically limited in scale and have minimal adverse environmental impacts. Examples of Schedule A projects include expansion of waterworks to connect to an existing system. This type of project is pre-approved and the proponent may proceed without following the procedures set out in any other part of the Class EA process.

SCHEDULE A+ PROJECTS

Schedule A+ projects were introduced by MEA in 2007. Similar to Schedule A, these projects are also pre-approved. However the main difference is that for Schedule A+ projects, the public must be advised prior to the project implementation. Examples of Schedule A+ projects include upgrades to a water treatment plant up to its existing rated capacity where no land acquisition is required; and the establishment, extension or enlargement of a sewage collection system and all necessary works to connect the system to an existing sewage or natural drainage outlet, provided all such facilities are in either an existing road allowance or an existing utility corridor, including the use of trenchless technology for water crossings.

SCHEDULE B PROJECTS

Schedule B projects generally include improvements and minor expansions to existing facilities where there is potential for some adverse environmental impacts. These projects require screening of alternatives for their environmental impacts and completion of Phases 1 and 2 of the Class EA planning process. If outstanding issues remain after the public review period, any party may request that the Minister of the Environment consider a Part II Order (also known as elevating the project to a Schedule C or an Individual EA).

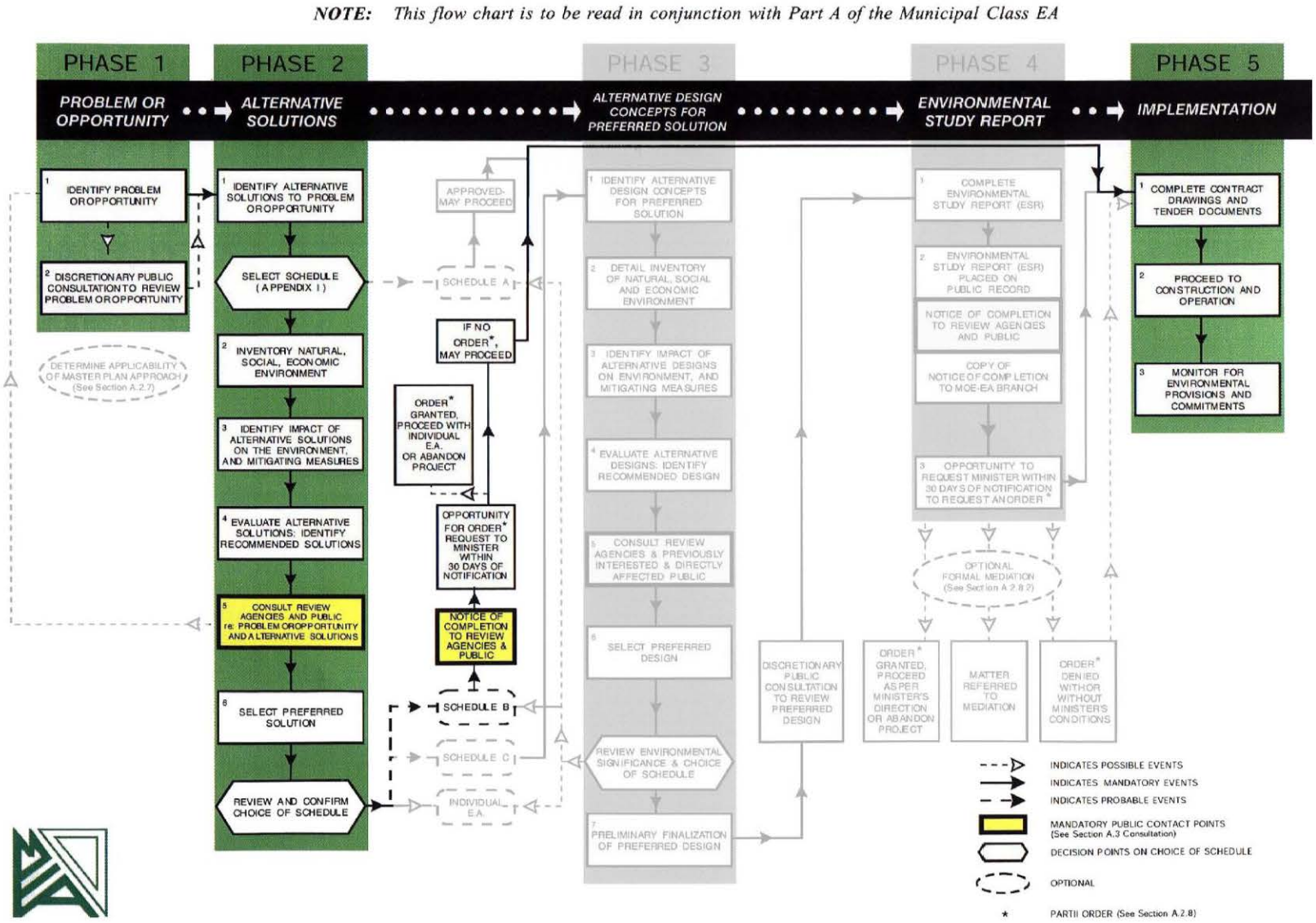

Figure 2-2 Municipal Class EA Process

Provided no significant impacts are identified and no requests for a Part II order to a Schedule C or Individual Environmental Assessment are received, Schedule B projects are approved and may proceed directly to implementation. Examples include construction of new water storage facilities and water/wastewater conveyance facilities (pumping stations), among others.

SCHEDULE C PROJECTS

Schedule C projects generally include the construction of new facilities and major expansions to existing facilities. These projects are typically more complex and have the potential for significant environmental effects. As a result they proceed under full planning and documentation procedures and satisfy all five phases of the Class EA planning process. Phase 3 involves the assessment of alternative methods of carrying out the project, as well as public consultation on the preferred conceptual design. Phase 4 normally includes the preparation of an Environmental Study Report which is filed for public review. Provided no significant impacts are identified and no requests for Part II Order or elevating to an Individual Environmental Assessment are received, Schedule C projects are then approved and may proceed to Phase 5: implementation. Some examples of a Schedule C projects are construction of a new water system including water supply and distribution system and expansion of a wastewater treatment facility.

2.4 MASTER PLANNING

While the planning and design process described above is a process by which municipalities may plan municipal works on a project by project basis, the MCEA process allows for cases when it is beneficial to begin the planning process by considering a group of related projects, or an overall system, e.g. water, wastewater and/or roads network, or a number of integrated systems, e.g. infrastructure master plan, prior to dealing with project specific issues. By planning in this way, the need and justification for individual projects and the associated broader context are better defined.

Master Plans are long range plans which examine infrastructure systems or groups of related projects to outline a framework for planning of subsequent projects and/or developments.

The following are distinguishing features of Master Plans:

a. Their scope is broad and usually includes a system-level analysis to outline a framework for future works. Master Plans are typically not focused on a site-specific problem.

b. Master Plans typically recommend a set of works which are distributed geographically throughout the study area and which are to be implemented over an extended period of time.

c. Master Plans provide the context for the implementation of specific projects which make up the plan and satisfy, as a minimum, Phases 1 and 2 of the Class EA process. Notwithstanding that these works may be implemented as separate projects, collectively these works are part of a larger management system. Master Plan studies in essence conclude with a set of preferred alternatives and, therefore, by their nature, Master Plans limit the scope of alternatives which can be considered at the implementation stage.

The MCEA document (Appendix 4) outlines several approaches to conducting Master Plans.

Approach # 1 was adopted for the completion of this Master Plan. This process involves the preparation of a Master Plan document at the end of Phases 1 and 2 of the MCEA process, and is done at a level of detail which would require more investigation at the project-specific level to fulfill the requirements for the specific Schedule B and C projects identified within the Master Plan. The Master Plan document is made available for public comment prior to being approved by the municipality.

The Master Plan will become the basis for future investigations for specific Schedule B and C projects identified within it. Schedule B projects would require the filing of a Project File for review while Schedule C projects would have to fulfill Phases 3 and 4 prior to filing an Environmental Study Report for public review.

3 POLICY DOCUMENTS AND PLANNING STUDIES

3.1 THE PLANNING ACT, 1990

The Planning Act establishes the mechanisms and rules for land use planning in Ontario, outlining how land uses may be controlled, and who may control them. The Act sets the basis for the preparation of official plans and planning policies for future development, and it provides municipalities with local autonomy to make decisions and streamline the planning process. The Act empowers local citizens to provide their input to their municipal council and, where permitted, to appeal decisions to the Ontario Municipal Board.

3.2 PROVINCIAL POLICY STATEMENT, 2014

The Provincial Policy Statement (PPS) is a key component of Ontario's planning system as it sets policy direction on matters of provincial interest related to land use planning, growth management, environmental protection, and public health and safety; and aims to provide a stronger policy framework that guides communities in Ontario toward a higher quality of life and a better long-term future.

The PPS establishes the various municipalities' roles in planning for growth, intensification and redevelopment. New settlement area policies will only permit expansions where it is demonstrated that opportunities for growth are not available through intensification, redevelopment or in designated areas. The PPS also requires municipalities to co-ordinate and provide direction on policies with cross municipal boundaries, such as natural heritage systems and resource management. The PPS provides the basis or context for all Provincial Plans and Municipal Official Plans. The Province issued a new PPS on February 24, 2014, which came into effect on April 30, 2014.

3.3 OFFICIAL PLAN FOR THE UNITED COUNTIES OF PRESCOTT AND RUSSELL PLANNING AREA

The United Counties of Prescott and Russell Official Plan (Stantec, 2006) was adopted by the Council of the Corporation of the United Counties of Prescott and Russell on May 23, 2006.

Of relevance to this Master Plan is Schedule 'A', Land Use Designations, which designates the Villages of Embrun, Russell and Limoges as Urban Policy Areas, while the Village of Marionville is designated as a Community Policy Area. All the lands north of Highway 417, other than Limoges, as well as a limited number of properties south of the said highway, are designated Rural Policy Areas. The rest of the lands within the boundaries of the Township of Russell are, with the exception of several Mineral Aggregate Extraction Areas (licensed pits and quarries and Reserve Areas) and the 417 Industrial Park (designated as Trade and Industry Policy Area) are all designated Agricultural Resource Policy Area.

The County's Official Plan establishes policies for growth and settlements which primarily apply to Urban Policy Area and Community Policy Area designations. Some sections, particularly those considered as the most relevant to the Township of Russell Master Plan project are listed below.

3.3.1 GROWTH AND SETTLEMENT POLICIES

"The Urban Policy Area is intended to absorb a significant part of future growth in the United Counties.

The Urban Area policies are intended to create a planning framework which will encourage and support diversified, mixed use communities. The policies are intended to ensure that local Councils will have the ability and authority to shape their communities in accordance with local needs and local characteristics. The policies are also intended to permit continued development while also ensuring that costly unplanned engineered water and sewer infrastructures will not be required to resolve environmental problems in the future" [s.2.2.1].

3.3.2 LOCAL INFRASTRUCTURE PLANNING

"Council recognizes that the responsibility for the planning, construction and maintenance of some infrastructures is the responsibility of local municipalities. Council is aware of on-going efforts to resolve local infrastructure problems. Continued efforts to find solutions to local infrastructure problems by local municipalities are considered to be appropriate and in conformity with the policies of the United Counties Official Plan." [s.3.2.1].

3.3.3 GENERAL WATER AND WASTEWATER POLICIES

"The following general policies shall apply:

1. Development will not be encouraged where such development would result in unplanned expansions to existing water and wastewater infrastructures.

2. Development shall generally be directed to communities which can reasonably provide or extend full water and wastewater services.

3. On lands located along water transmission main routes, existing or new development on partial servicing (water service only) is permitted in accordance with the municipality's connection policies. New lot creation with a direct connection to the municipal water service shall be in accordance with section 7.4.2. Plans of subdivisions with a direct connection to the municipal water service shall not be approved.

4. The allocation of infrastructure capacity for infill and economic development purposes is encouraged.

5. Although it is recognized that the United Counties do not provide water and wastewater services, Council may assist local municipalities with the operation and/or expansion of water and wastewater systems when requested to do so. The upper tier involvement will be limited to technical assistance provided by the Public Works Department and the support of local efforts to secure financial assistance from senior levels of government. Such support will generally be provided when proposed improvements are consistent with the policies of the Official Plan or required to resolve health or environmental problems" [s.3.4.1] (parts only).

3.3.4 WATER AND WASTEWATER POLICIES IN THE URBAN POLICY AREA

Development shall be permitted only where it is confirmed by the local municipality that there is sufficient reserve capacity in the municipal water and sewer services in accordance with Ministry of the Environment guidelines and regulations.

Some Urban Policy Areas include lands where development has proceeded on the basis of municipal water only, or on private services. The Plan recognizes such areas as exceptions in the Urban Policy Area. Development on municipal water or on private water and septic services will only be permitted where the following conditions are met:

1. A local Official Plan specifically identifies the lands in question, either through a textual description or on mapping which forms part of the plan, and further describes the related level of water and sewer services

2. A local Official Plan includes appropriate policies which address the need to ensure long term water and waste water servicing needs

3. The municipality is satisfied that there will be no additional pressure for costly unplanned extension of full municipal services to the subject lands

4. Local zoning by-laws include provisions for larger frontages and lot areas

Partial services shall only be permitted where they are necessary to address failed individual on-site water and/or sewage services and within an Urban Policy Area to allow for infilling and rounding out of existing development on partial services. There must be reserve sewage or water system capacity and site conditions must be suitable for the long-term provision of services" [s.2.2.6]

3.3.5 WATER AND WASTEWATER POLICIES IN THE COMMUNITY POLICY AREA

"Some communities in the Community Policy Area designation were developed on the basis of communal sewage treatment services or municipal water services. The principal reason for the development of partial servicing in these communities was the need to resolve groundwater contamination problems. Continued development may take place in these communities on the basis of partial services provided that there is sufficient capacity in the existing infrastructure and provided that there is no negative impact on groundwater resources. Council may require evidence, in the form of a hydrogeology study or an Impact Assessment Study which confirms that the proposed development is feasible from a health and environment standpoint.

Development on private services in partially serviced communities shall not be permitted without an amendment to this Official Plan.

Development of five residential units or lots or more on communal water or communal waste water services may be permitted, subject to the provisions of section 7.4.1, where municipal water and/or waste water services cannot be provided and where site conditions are suitable over the long term. Communal systems are subject to the requirements of the Safe Drinking Water Act. Subsurface sewage disposal systems with a design capacity greater than 10,000 litres per day require approval under the Ontario Water Resources Act.

The expansion of the service capacity of the existing municipal or communal system in these communities for the purpose of increasing the development capacity of the community in question may

be permitted without an amendment to this Official Plan provided that the limits of the designation are not altered. Where an expansion to the limits of the Community Policy Area is proposed, the policies of Section 2.3.3 shall apply.

The expansion of communal or municipal water or sewer services is permitted within the limits of the policy area where the expansion is required for health or environmental purposes." [s2.3.6]

3.4 TOWNSHIP OF RUSSELL OFFICIAL PLAN

The Official Plan of the Township of Russell was adopted by the Council of the Corporation of the Township of Russell on August 23, 2010.

Schedule A1 through A5 of the Official Plan identifies the Land Use Designations for Embrun, Russell, Limoges, Marionville and the Highway 417 Industrial Park. The predominant land use designation within the village boundaries is Residential. In the Villages of Embrun and Russell, there are large areas designated Open Space, several areas designated Commercial and Industrial, some areas designated as Business Park, and some areas designated Multi-Unit Residential.

Along the shores of the Castor River, the Plan identifies a series of Sensitive Lands, which include both Unstable Slopes and/or Flood Risk Areas.

Similar to the Schedule A of the Counties Official Plan, the Schedule A of the Township of Russell Official Plan, with the exception of the Villages described above, designates most of the lands south of Highway 417 as "Agriculture". The intersection of Highway 417 and St. Guillaume Road (417 Industrial Park) is designated Industrial Park.

North of Highway 417, with the exception of the Village of Limoges, the designation of the lands is General Rural.

Schedule B identifies the roads within the Township limits both by jurisdiction and by their function. All County Roads are designated Village Major Collectors, while the rest of the roads are identified as Local Roads. An exception to this is a portion of Burton Road north of the 416 Industrial Park, which is shown on the plan as a Village Minor Collector.

The following are some of the most relevant policies of the Township Official Plan dealing with development issues in the Municipality:

"On this basis, the role of the Township of Russell Official Plan is to guide and direct the use of land within the Township's four Villages (Embrun, Russell, Limoges, and Marionville) and the industrial park adjacent to Highway 417. The boundaries of these areas are illustrated on Schedules A1-A5 and correspond to the boundaries of their respective policy designations as per the County Official Plan (Urban Policy Area, Community Policy Area, or Trade and Industry Policy Area). This Official Plan provides a vision for the future growth within these areas and a policy framework to guide their physical development for a period of 20 years, i.e. until the year 2031. These areas remain subject to the County Official Plan policies, which must be read in conjunction with this document. With the exception of the Highway 417 Industrial Park, the scope of the Township of Russell Official Plan does not include the areas located outside the Village boundaries, which are entirely subject to the policies of the County Official Plan." [s1.1] (parts only).

3.4.1 WATER AND WASTEWATER – GENERAL POLICIES

“All new development will generally occur on the basis of full municipal services, with the exception of Marionville where development on partial municipal services may be allowed (water only) and the Highway 417 Industrial Park where development on private services may be allowed.

Development will not be encouraged where such development would result in, or could lead to, unplanned expansions to existing water and wastewater infrastructures.

Development shall generally be directed to areas where water and wastewater services, if available, can reasonably be extended. Development applications on lands that are not serviced or partially serviced may be refused on the basis that full services will be extended to these lands in the future.

Development shall be permitted only where it is confirmed by the Township that there is sufficient reserve capacity in the municipal water and sewer services in accordance with Ministry of the Environment guidelines and regulations.

Council may consider the need to expand the public piped systems within the Villages, and may proceed to do so without an amendment to this Official Plan.

There are no plans to extend public piped systems into the rural areas, beyond the Village designations. Notwithstanding the foregoing, public piped systems may be extended beyond the Villages for specific projects approved by the Council of the Township of Russell, including the Highway 417 Industrial Park development, subject to an amendment to the County Official Plan. Council will explore means to bring public piped systems to the Highway 417 Industrial Park.

The developer shall be responsible for all costs related to the introduction or extension of any service required by virtue of these policies and an agreement to this effect shall be signed by the developer prior to final approval of the development.” [s5.1.1] (parts only).

3.4.2 WATER AND WASTEWATER – EMBRUN AND RUSSELL

“Future development in the Villages of Embrun and Russell will generally occur on the basis of full municipal services.

For the purposes of servicing and development, the Villages of Embrun and Russell are divided into ‘Full Municipal Serviced Areas’ and ‘Non-Serviced Development’. ‘Non-Serviced Development’ is identified on Schedules A1 and A2, while the remaining areas are considered ‘Full Municipal Serviced Areas’. ‘Full Municipal Serviced Areas’ may also include partially serviced areas.

Council shall consider development applications within the ‘Full Municipal Serviced Areas’, excluding partially serviced areas, provided there is reserve capacity in both municipal systems to service the proposed development.

Within the ‘Non-Serviced Development’ and partially serviced areas, Council may consider development applications which would have the effect of increasing the number of dwelling units (i.e. infilling and/or intensification) without the need for an Official Plan Amendment, subject to the other policies of this Plan. In particular, the site conditions must be suitable for the long-term provision of private individual services.” [s5.1.1.1] (parts only).

3.4.3 WATER AND WASTEWATER – LIMOGES

“Future development in the Village of Limoges will generally occur on the basis of full municipal services, subject to available capacity in The Nation Municipality.” [s5.1.1.2] (parts only).

3.4.4 WATER AND WASTEWATER – MARIONVILLE

“Marionville is serviced by municipal water and private wastewater disposal systems in the form of septic systems. It is not expected that municipal wastewater services will be provided to Marionville within the planning period (up to 2031).” [s5.1.1.3] (parts only).

3.4.5 WATER AND WASTEWATER – HIGHWAY 417 INDUSTRIAL PARK

“The Highway 417 Industrial Park does not currently have access to municipal water and wastewater services and is serviced by private wells and septic systems. Future development in the Highway 417 Industrial Park will occur on the basis of private services.

Notwithstanding the foregoing, public piped systems may be extended to the Highway 417 Industrial Park development, subject to an amendment to the County Official Plan.” [s5.1.1.3] (parts only).

3.5 ZONING BY-LAW

In addition to the above-listed documents, the Township of Russell has a comprehensive Zoning By-law, updated on July 2011. The Zoning By-law implements the policies of the Township Official Plan and is deemed to conform also to the Official Plan of the Counties of Prescott and Russell.

4 EXISTING CONDITIONS

The majority of the land within the villages of Embrun and Russell is serviced by municipal water and wastewater. However, not all of the areas connected to the water system are connected to the wastewater system.

Water and wastewater servicing in Limoges is provided by the Nation Municipality.

Marionville is connected to the municipal water system. However, no municipal wastewater system is available.

The 417 Industrial Park is currently not connected to the municipal systems. Existing development in the Park is serviced by private well and septic systems.

4.1 WATER SYSTEM

4.1.1 SYSTEM OVERVIEW

The City of Ottawa supplies drinking water to the Township from the Leitrim Road Pumping Station through a 9 km feedermain (Russell Feedermain) connecting to the Eadie Road Metering Station and extending to the Embrun Reservoir. Given the long distance and residence time in the watermain from Ottawa, the water has to be rechloraminated at the Embrun Reservoir to achieve the required residual for secondary disinfection before distribution to Russell, Embrun and Marionville.

The Reservoir is equipped with two sets of booster pumps which discharge to Russell and Embrun, respectively. The Russell booster pumps are controlled by the level in the Russell Water Tower, and the Embrun booster pumps are controlled by the level in the Embrun Water Tower. The Marionville Booster Station (formerly known as the Russell Water Treatment Plant) draws water from the Russell distribution system to feed Marionville and to fill the Marionville Water Tower. This is illustrated in Figure 4-1 below.

Prior to 2010, the Embrun/Marionville Water Treatment Plant and the Russell Water Treatment Plant supplied the distribution system. However, since the construction of the Russell Feedermain from Ottawa, these facilities have been decommissioned.

The Township has entered into a water supply agreement with the City of Ottawa that commits up to 11,860 m^3 over a 20-hour period to supply the Township.

The Township owns and operates the water facilities in the municipality.

MOE issued on August 25, 2011 Drinking Water Works Permit 184-201 that describes the system and which together with Municipal Drinking Water License 184-101 sets the requirements for the operation and maintenance of the drinking water system. The following table summarizes the capacities of the various facilities in the Township's water system.

Table 4-1 Water Storage Facilities in Water System

FACILITY	CAPACITY
Embrun Reservoir	1,410 m^3
Russell Water Tower	2,300 m^3
Embrun Water Tower	2,300 m^3
Marionville Water Tower	1,135 m^3

Table 4-2 Pumping Facilities in Water System

FACILITY	FIRM CAPACITY	DESCRIPTION
Russell Booster Station (Embrun Reservoir)	31.4 L/s @ 52.8 m	Two pumps (one duty, one standby) each having a design flow rate of 31.4 L/s at a total dynamic head of 52.8 m Standby power
Embrun Booster Station (Embrun Reservoir)	57.5 L/s @ 52.34 m	Three pumps (two duty, one standby), each having a design flow rate of 28.75 L/s at a total dynamic head of 52.34 m Standby power
Marionville Booster Station (Russell Water Treatment Plant)	7.18 L/s @ 38 m	Two pumps (one duty, one standby), each having a design flow rate of 7.18 L/s at a total dynamic head of 38 m Standby power

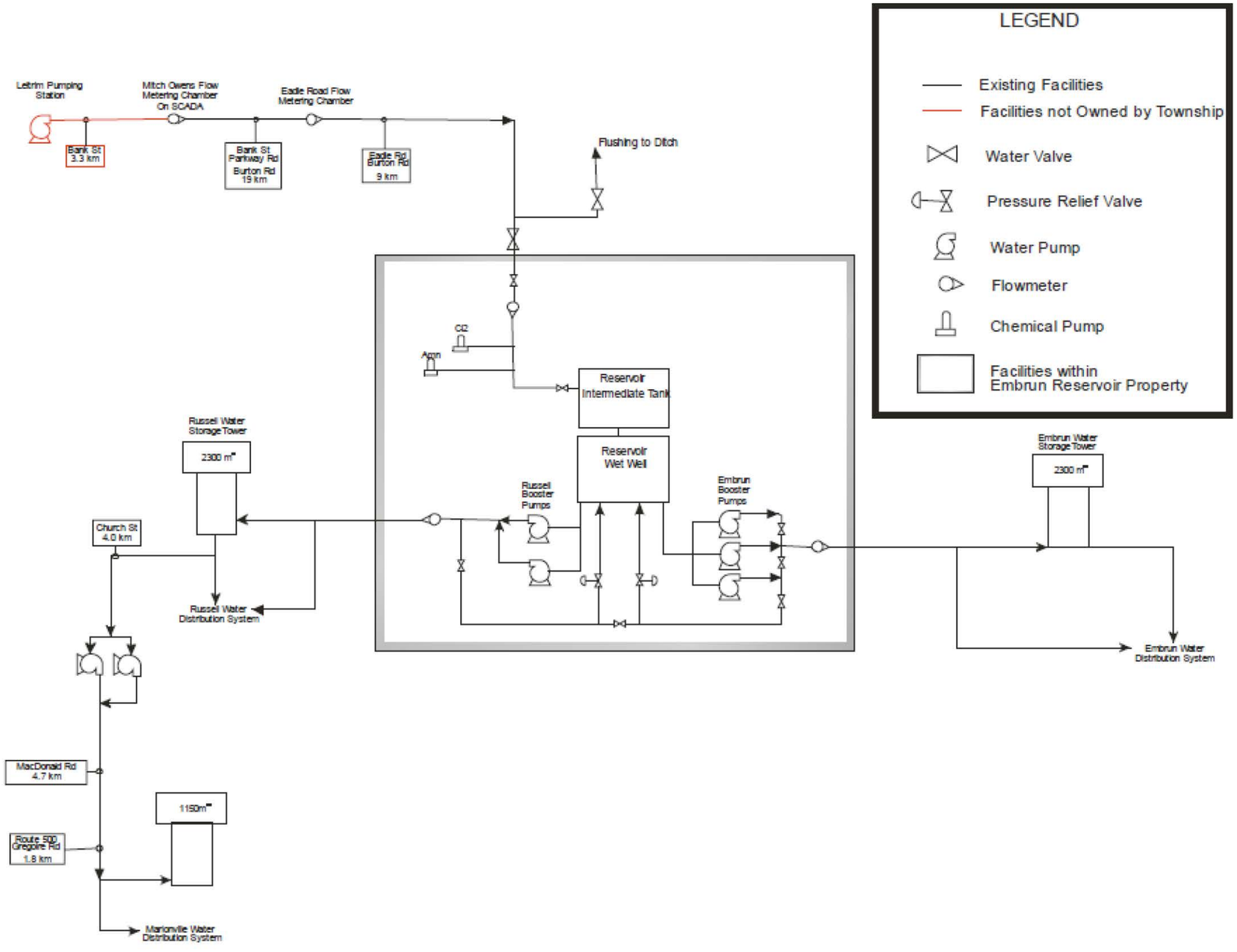

Figure 4-1 System Water Supply and Distribution System Overview

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In 2015 WSP completed a condition assessment of the Township's water and wastewater infrastructure which includes additional information on the existing facilities and the investment requirements to maintain the equipment in good operating order (WSP, 2015).

The Limoges Water Treatment Plant located in The Nation Municipality feeds the water distribution systems serving the portion of the community of Limoges within the Township of Russell and the community of Le Baron Estate Development. Since the water system is under the responsibility of The Nation Municipality, the present Master Plan will not provide further details on this system.

There are approximately 27 km of feedermain and rough 62 km of distribution watermain in Township's distribution system. The overall water distribution system is shown in Figure 4-2 below.

provides a map of the water distribution network for the community of Russell. The development in the Community of Russell north of the Castor River, is serviced by a distribution network except for one neighborhood at the east end of the Community. The distribution network also services the immediate neighborhoods located south of the Castor River and east of South Russell Road. The remaining developed lands inside the Community boundaries located south of the Castor River and west of South Russell Road are serviced by private water systems. Two watermains cross the Castor River, providing adequate looping for fire protection and for emergencies.

Much of the development on municipal water in Embrun is located north of the Castor River. Only a portion of St Jacques Street, south of the Castor River is serviced by the distribution system. The elevated water storage tank is located on the south side of river. The remaining developed lands inside the Community boundaries and located south of the Castor River are serviced by private water systems.

All streets within the community of Marionville are mostly serviced with 150 mm diameter pipes. The only exception is the 250 mm diameter main on Gregoire Street and the portion Marionville Road up to the School.

Ottawa
HWY 417
DEVINE RD
MITCH OWENS RD
ROCKDALE RD
RUSSLAND RD
LIMOGES RD
BURTON RD
Industrial Park
Limoges
HWY 417
Eadie Rd Metering Station
Ottawa Feedermain
BOUNDARY RD
ROUTE 500 W
The Nation
Russell
ST GUILLAUME RD
Embrun
NOTRE DAME ST
Russell
CASTOR ST
300 mm Ø
Embrun Water Tower
Embrun Reservoir and Pumping Station
CRAIG ST
300 Ø
Russell Water Tower
300 mm Ø
300 mm Ø
S RUSSELL RD
ST MARIE RD S
ST ALBERT RD W
VICTORIA ST
Metcalfe
Marionville Booster Pumping Station
GREGOIRE RD
ROUTE 900 W
300 mm Ø
250 mm Ø
250 mm Ø
Embrun / Marionville WTP (Decommissioned)
Crysler
North Stormont
MARVELVILLE RD
COUNTY RD 32
COUNTY RD 13
250 mm Ø
Marionville
Marionville Water Tower
COUNTY RD 7
North Dundas

Legend

- Water Treatment Plant
- Elevated Storage Tank or Reservoir
- Pumping Station
- Metering Station
- Distribution Watermain
- Trunk Watermain
- Freeway
- Arterial Road
- Local Road
- Railway
- Village Boundary / Industrial Park Boundary
- Study Area
- Municipal Boundary

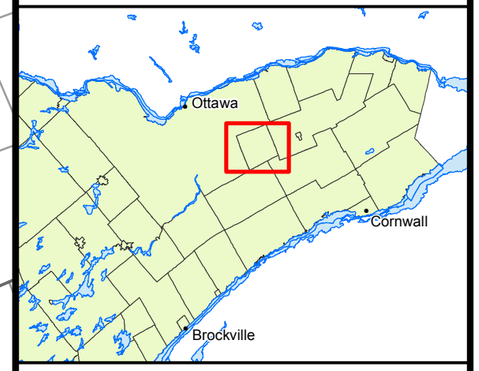

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Figure 4-2

Water Distribution System

4.1.2 SERVICED POPULATION

The 2014 estimated population serviced by the municipal water works systems for the urban communities of Embrun, Russell and Marionville was 6,717, 5,102 and 362 respectively. It must also be noted that there are some dwellings in Russell and Embrun which are on private wells and which are not serviced by the municipal water system.

The equivalent total estimated population within the three communities serviced by the municipal water system was 12,181 people in 2014.

4.1.3 WATER DEMANDS

The average and maximum day demand at the three communities between 2010 and 2014 are 2,531 m^3/d and 4,640 m^3/d. It should be noted however that the maximum day occurred in 2010 (the year when metering was started to be implemented). Maximum day demands have decreased significantly since 2011 and have remained relatively the same since. A spreadsheet showing historical water demands over the period 1999 to 2014 is included in **Appendix A**.

The five-year maximum day demand corresponds to 39.1% of the allowable maximum supply from Ottawa of 11,860 m^3/day.

4.1.4 WATER QUALITY IN DISTRIBUTION NETWORK

According to the 2014 Water and Sewer Annual Operations Compliance Report, the quality of the water distributed to the three communities met all the Ontario Drinking Water Standards outlined in the Safe Drinking Water Act, 2002.

4.1.5 FIRE PROTECTION

The water distribution systems can adequately provide fire flow within all three communities.

4.2 WASTEWATER SYSTEM - RUSSELL

The Township of Russell services the communities of Russell and Embrun with two separate municipal sanitary systems. A portion of each community currently operates on private sewage disposal systems.

The collection infrastructure is primarily composed of gravity sewer systems, pumping stations and forcemains. Together these components transport wastewater from the serviced buildings to the respective municipal treatment facilities near Embrun and Russell. In each community, the wastewater treatment is performed in stabilization lagoons. Final discharge of the treated wastewater is into the Castor River for both locations.

The community of Marionville does not currently have any sanitary works. There are no plans for providing this community with sanitary works in the next 20 years.

The 417 Industrial Park is currently not connected to the municipal wastewater system. Existing development in the Park is serviced by private septic systems.

A portion of the community of Limoges is within the Township of Russell, and is serviced by a gravity sewer, a pumping station and a waste stabilization lagoon system owned and operated by the Nation Municipality. This sanitary system is not considered in the scope of this Master Plan.

4.2.1 SYSTEM OVERVIEW

COLLECTION

The Russell wastewater system consists of a gravity sewer network with three distinct drainage areas, each leading to a sewage pumping station. Sewage Pumping Station (SPS) 2 services the northwest part of Russell and it discharges upstream of SPS 1's drainage area. SPS 1's drainage area includes most areas north of the Castor River. SPS 1 discharges directly to the Russell Lagoon Facility. SPS 3 services the northwest area of Russell and it also discharges directly to the Russell Lagoon Facility. The Russell Lagoon Facility is located to the east of the community on the south side of the river.

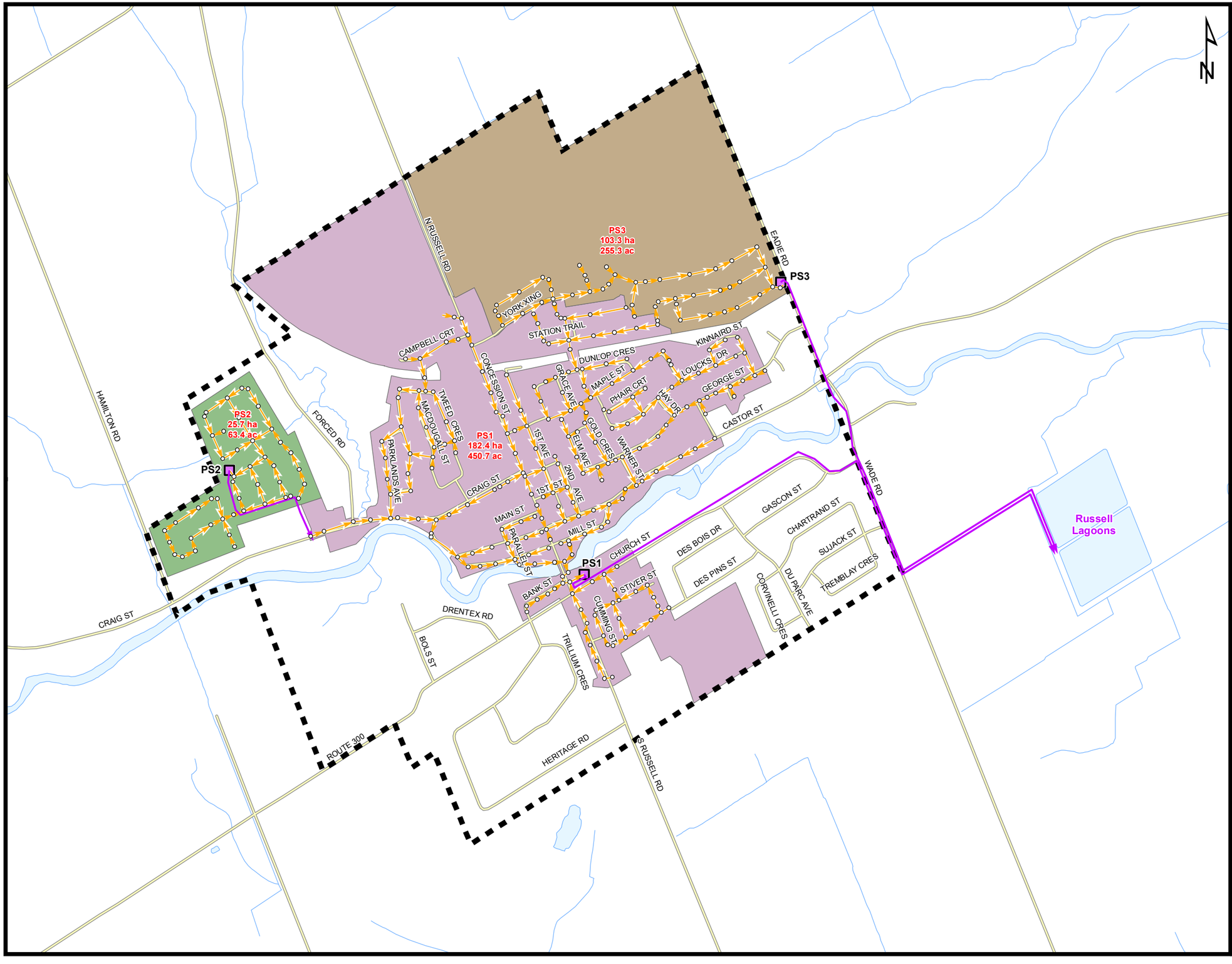
An overview of the collection system can be seen in Figure 4-3 below. The majority of development north of the Castor River in the community of Russell is serviced by a sanitary wastewater gravity system except for two residential/commercial subdivisions. The neighborhoods immediately abutting the bridge on Russell South Road, south of the Castor River, are also serviced by a gravity sanitary system. The remaining developed lands inside the community boundaries are serviced by private sewage systems.

Most of the piping within the collection system is 200 mm or 250 mm diameter, except for the 300 mm diameter collector pipe along Mill Street and across the Castor River to SPS 1.

Table 4-3 Russell Collection System Pumping Stations

FACILITY	FIRM CAPACITY	DESCRIPTION
SPS 1	80 L/s @ 44 m TDH	Two pumps (one duty, one standby) each having a design flow rate of 80 L/s at a total dynamic head of 44 m 300 mm diameter forcemain Standby power diesel generator
SPS 2	23.5 L/s @ 12.2 m TDH	Two pumps (one duty, one standby) each having a design flow rate of 23.47 L/s at a total dynamic head of 12.2 m 150 mm diameter forcemain Standby power diesel generator
SPS 3	110 L/s @ 19 m TDH	Two pumps (one duty, one standby) each having a design flow rate of 110 L/s at a total dynamic head of 19 m 400 mm diameter forcemain Standby power diesel generator Standby power diesel generator

The station servicing Mother Teresa Catholic Elementary School, at the North end of the community is privately owned and operated and is not included in the scope of this report.



Legend

- Sanitary Sewer Pumping Station
- Sanitary Sewer Manhole
- Sanitary Sewer
- Sanitary Forcemain
- Roadway
- Watercourse
- Village Boundary

Sanitary Sewer Drainage Areas

- Pumping Station 1 Drainage Area
- Pumping Station 2 Drainage Area
- Pumping Station 3 Drainage Area

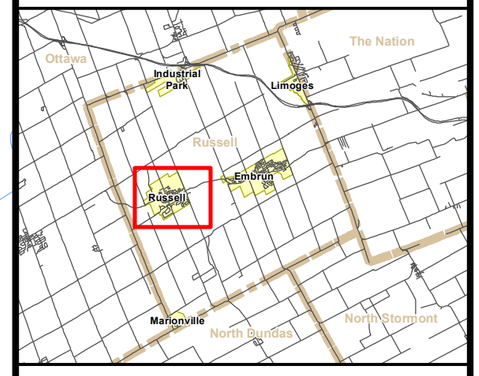


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Figure 4-3

Sanitary Collection System
Russell

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TREATMENT

The Russell Lagoon Facility is a facultative waste stabilization pond system with seasonal discharge to Castor River. The Russell Lagoon was recently upgraded to a rated design capacity of 2,675 m³/d. The upgrades included modification of the inlet works; the addition of two waste stabilization cells and a storage cell (all of the new cells equipped with an aeration system); and an automatic control system to control the rate of effluent discharge to the Castor River. The system includes alum addition for phosphorus removal.

An overview of the Russell sewage treatment process and its connection to the rest of the pumping facilities in the collection system can be seen in Figure 4-4.

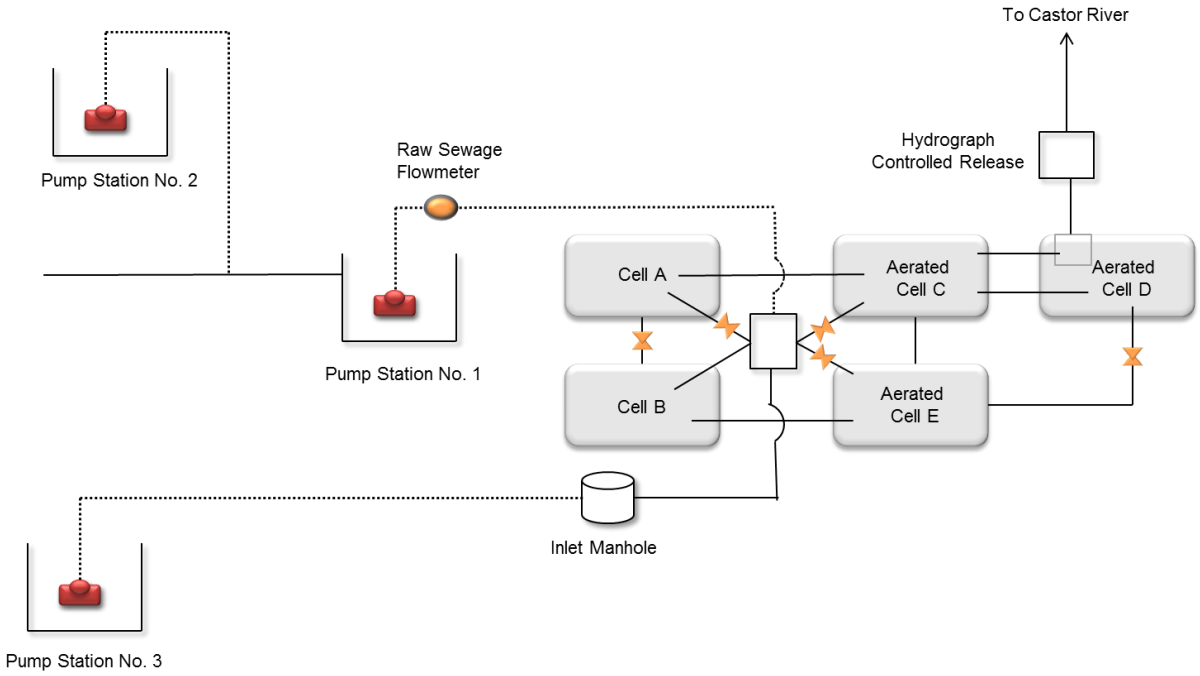

Figure 4-4 Russell Lagoon Facility Process Schematic

The operation and maintenance conditions for the facility are established in Environmental Compliance Approval (ECA) 3202-9XMPMQ issued August 25, 2015.

Despite the facility being rated for 2,675 m³/d, the ECA sets the facility's Maximum Operating Capacity at 2,000 m³/d until a Total Phosphorus Management (TPM) Agreement with the South Nation Conservation Authority has been established stating otherwise. Furthermore, the ECA requires that the proposal detailing the TPM Agreement be submitted to the Ministry for review upon

the average daily flow of the facility reaching 1,700 m^3/d (Ministry of the Environment and Climate Change, 2015).

Effluent discharge from the Lagoon Facility is done seasonally, on a controlled basis. The ECA establishes two discharge seasons:

- Spring: starting when the liquid surface in the lagoon is substantially free of ice cover and ending April 30. The rate of discharge is such that a dilution ratio (river flow rate to effluent discharge rate) is 67.1:1 at a minimum.
- Fall: starting October 1 and ending December 15. The rate of discharge is such that a dilution ratio is 13:1 at a minimum.

4.2.2 SERVICED POPULATION

The 2014 estimated population serviced by the Russell sewage system was 4,127. The estimated equivalent number of dwellings was 1,394. It should be noted that this population does not match that serviced by the municipal water system (there are more units connected to the municipal water system than units serviced by the sewage system).

4.2.3 WASTEWATER FLOWS

The capacity of the Russell Lagoon is expressed in terms of the average day influent raw sewage flow.

Based on the historical data for the past five years, the average day influent flow was 870 m^3/day, which corresponds to 43.5% of the allowable maximum capacity of 2,000 m^3/day and 32.5% of the rated capacity of 2,675 m^3/day.

A spreadsheet showing historical wastewater flows over the period 1999 to 2014 is included in **Appendix B**.

4.2.4 TREATED EFFLUENT QUALITY

The ECA for Russell Lagoon specifies effluent objectives and effluent limits for BOD, TSS, TAN, TP, hydrogen sulphide and pH. The ECA also requires testing of the effluent for acute lethality to Rainbow Trout and *Daphnia Magna*.

The effluent objectives and limits are compared to average effluent quality data for the period 2011-2013 for the Russell Lagoon in Table 4-4 below.

Table 4-4: Russell Lagoon Effluent Objectives, Limits and 2011-2013 Effluent Quality

EFFLUENT PARAMETER	AVERAGE CONCENTRATION OBJECTIVE	AVERAGE CONCENTRATION LIMIT	AVERAGE EFFLUENT QUALITY (2011-2013)
$CBOD_5$	20.0 mg/L	30.0 mg/L	3.5 mg/L
Total Suspended Solids	20.0 mg/L	30.0 mg/L	5.2 mg/L
Total Phosphorus	< 0.5 mg/L	0.5 mg/L 1.0 kg/d or 365 kg/year (average loading)	0.08 mg/L

EFFLUENT PARAMETER	AVERAGE CONCENTRATION OBJECTIVE	AVERAGE CONCENTRATION LIMIT	AVERAGE EFFLUENT QUALITY (2011-2013)
Total Ammonia Nitrogen	1.0 mg/L (Fall) 5.0 mg/L (Spring)	2.0 mg/L (Fall) 10.0 mg/L (Spring)	0.08 mg/L (Fall) 0.73 mg/L (Spring)
Hydrogen Sulphide	N/A	Non-detectable	0
pH	6.5 – 8.5	6.0 – 9.5	7.1-9.4

As noted above, the Lagoon's performance is excellent with effluent concentrations well below the requirements set by the ECA.

4.2.1 ASSIMILATIVE CAPACITY OF THE CASTOR RIVER

The Castor River receives treated effluent from Embrun and Russell, as well as the nearby community of Limoges (Nation Municipality), before it joins the South Nation River. Stantec completed an assimilative capacity review of the Castor River in 2005. According to the study (Stantec, 2005), the limiting criterion for discharge was ammonia in the fall.

The Castor River can assimilate 1,590,000 m^3 of effluent with an average discharge concentration of 2.0 mg/L Total Ammonia Nitrogen (TAN) during the fall discharge window of October 1 – December 15 (Total Ammonia Nitrogen for the spring discharge would be acceptable at 10 mg/L). This corresponds to an average flow of 21,487 m^3/d during the fall. This volume of effluent indicates that approximately 17% of the assimilative capacity of the river has been utilized, when considering flows from Embrun, Russell and Limoges (based on the 1073 m^3/d rated capacity of the Limoges St. Isidore Lagoons per their existing C of A).

It should be noted however that historical effluent discharges of TAN from the Russell Lagoons have been less than 2 mg/L, which indicates that the assimilative capacity of the Castor River would be even greater.

4.3 WASTEWATER SYSTEM – EMBRUN

4.3.1 SYSTEM OVERVIEW

COLLECTION

Much of the development in the community of Embrun is located north of the Castor River. The majority of the community is serviced by a sanitary wastewater gravity system, except for about three residential neighborhoods and two commercial subdivisions. Additionally, a portion of St. Jacques Street south of the Castor River, is serviced by the gravity sanitary system. The remaining developed lands inside the community boundaries and located south of the Castor River are serviced by private sewage systems.

Most of the sanitary sewers consist of 250 and 300 mm diameter gravity sewers. A 400 mm diameter trunk sewer runs on Notre-Dame Street between St-Augustin Street and SPS 1. The community is currently divided into eight drainage areas each leading to a sewage pumping station. SPS 2, 4 and 5, all discharge upstream of SPS 1's drainage area. SPS 3 and SPS 7 discharge upstream of SPS 8. SPS 1, SPS 6 and SPS 8 discharge directly to the Embrun Lagoon Facility.

An overview of the drainage areas and sewers is presented in the figure below. The extent of the drainage areas is described below.

Table 4-5 Embrun Collection System Drainage Areas

DRAINAGE AREA	CONTRIBUTING AREAS	DISCHARGES TO
1	This area, located on the north shore of the river, includes the portion of the community east of St-Augustin Street, from the river to Patenaude Subdivision. This drainage area receives sewage from SPS 2, 4 and 5.	Flows by gravity to SPS 1.
2	It covers the central portion of the community north of the river, from St-Augustin to Ste-Marie Street, and from the river to the northern limit of the community. St-Jacques Nursing Home and Riviere Castor School are the large flow contributors within this area. SPS 3 discharges into this drainage area.	Flows by gravity to SPS 2.
3	This area services the portion of the community west of Ste-Marie Street. The Municipal Building complex (serviced by SPS 7) discharges into this drainage area. Place d'Embrun Shopping Center is the only large flow contributor in this area.	Drains to SPS 3.
4	This drainage area includes the residential development area located south of the river and west of St. Jacques Road. Embrun High School is largest flow contributor in this area.	Drains to SPS 4.
5	This area is servicing the northeastern portion of the community, north of Drainage area no.1, and east of St-Augustin Street.	Drains to SPS 5.
6	This area corresponds to the Clouthier Subdivision.	Drains to SPS 3.
7	This drainage area services commercial development in the west portion of the village receiving flow from the new Embrun West collector.	Drains to SPS 7.
8	This station services the Melanie East Subdivision and other development south of the river off St. Marie Road.	Drains to SPS 8.

Eight sewage pumping stations service the community of Embrun. All except SPS 4 and SPS 8 are located on the north side of the Castor River. The locations of these stations are presented in Figure 4-5. A description of the pumping stations follows:

- **SPS 1**, located south of Notre-Dame Street and east of St. Augustine Street. The pumping station is equipped with two pumps (one duty, one standby) each rated at 113 L/s with a Total Dynamic Head (TDH) of 14.7 m and a standby diesel generator. The 300 mm diameter forcemain was twinned in the year 2000 with a second 300 mm diameter forcemain discharging to the inlet of the Embrun lagoon Facility.
- **SPS 2** is situated beside a creek on Notre-Dame Street near the center of the community. The station is capable of 56 L/s at 13.3 m TDH (two pumps: one duty, one standby). The station is equipped with a standby diesel generator. The sewage is pumped through a 250 mm diameter forcemain up to the gravity sewer at the corner of Notre-Dame and St-Augustin Streets, near St-Jacques Bridge.
- **SPS 3** is located south of Notre-Dame Street, east of Ste-Marie Street, has a firm capacity of 30.0 L/s at 13.5 m TDH (two pumps: one duty, one standby). It is equipped with a standby diesel generator. The 150 mm diameter forcemain runs north on Ste-Marie Street to the intersection with Notre-Dame Street.
- **SPS 4** located south of Notre-Dame Street and east of St. Jacques Street. The 100 mm diameter forcemain from this station is attached to the bridge crossing the nearby Castor River, and discharges into the Notre-Dame Street gravity sewer near St-Jacques Street. The station is rated at 10.3 L/s with 8.6 m TDH (two pumps: one duty, one standby), and is equipped with a standby diesel generator.
- **SPS 5** is located in the northeast portion of the community, in a public park. It is the only station equipped with self-priming pumps; all others have submersible pumps. The rated capacity is 34.0 L/s at 16.5 m TDH. The 125 mm diameter forcemain extends to the gravity sewer on Lapointe Boulevard.
- **SPS 6** is located in the Clouthier Subdivision. The rated capacity is 128.2 L/s at 38.3 m TDH. The 300 mm diameter forcemain that discharges to the Embrun Lagoon.
- **SPS 7** is servicing three municipal buildings in the west part of the community and the flows conveyed by the new Embrun West Sewer. The pump station capacity is 8.5 L/s at a TDH of 9.2 m. The 100 mm diameter forcemain extends to the gravity sewer on Notre-Dame Street.
- **SPS 8** is located at the west end of Embrun, south of Castor River and it services the Melanie East Subdivision. The pump station capacity is 132 L/s at a TDH of 59.6 m. The 300 mm diameter forcemain extends from Route 400 to the distribution box at the inlet of the Embrun Lagoon.

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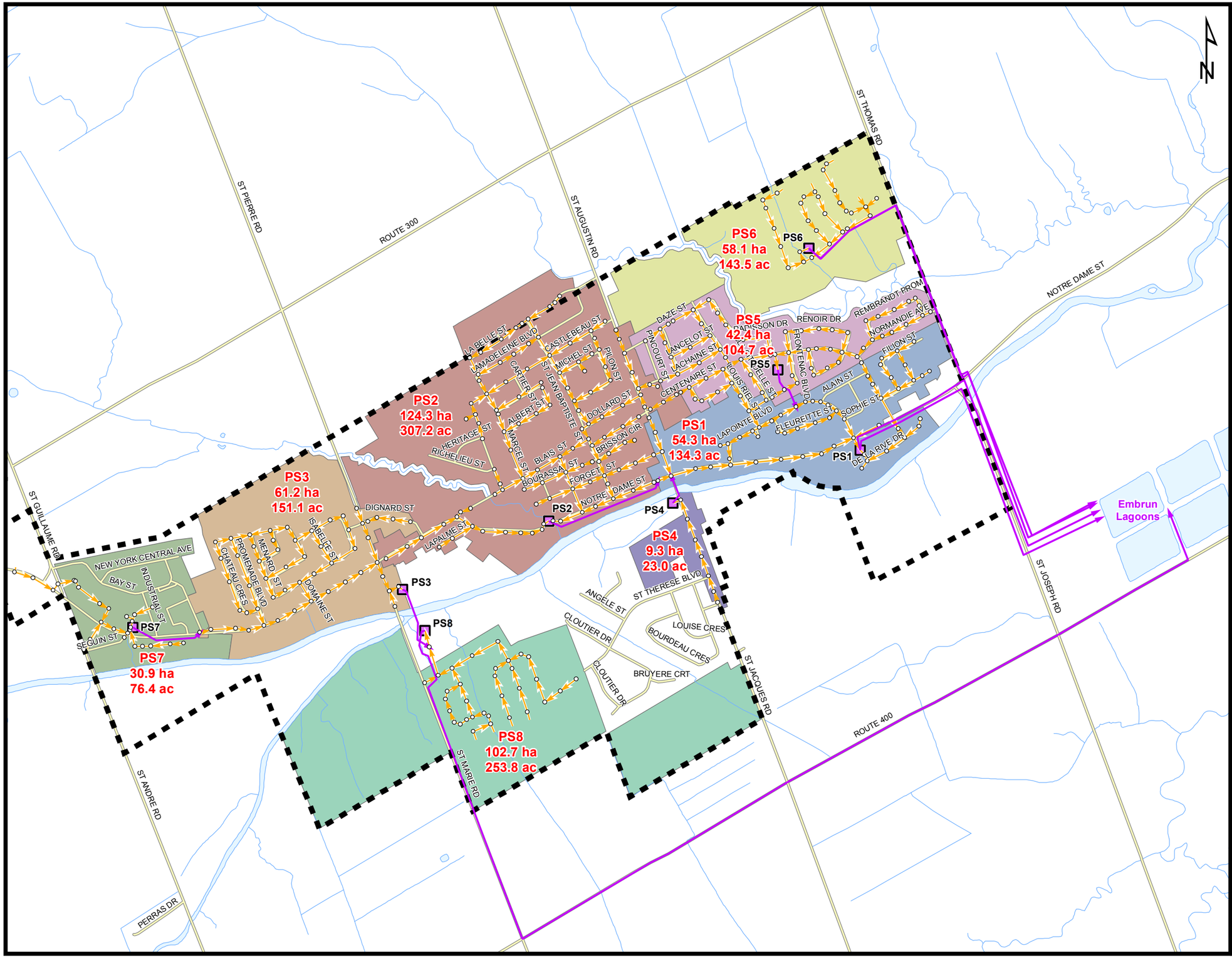

Legend

- Sanitary Sewer Pumping Station
- Sanitary Sewer Manhole
- Sanitary Sewer
- Sanitary Forcemain
- Roadway
- Watercourse
- Village Boundary

Sanitary Sewer Drainage Areas

- Pumping Station 1 Drainage Area
- Pumping Station 2 Drainage Area
- Pumping Station 3 Drainage Area
- Pumping Station 4 Drainage Area
- Pumping Station 5 Drainage Area
- Pumping Station 6 Drainage Area
- Pumping Station 7 Drainage Area
- Pumping Station 8 Drainage Area

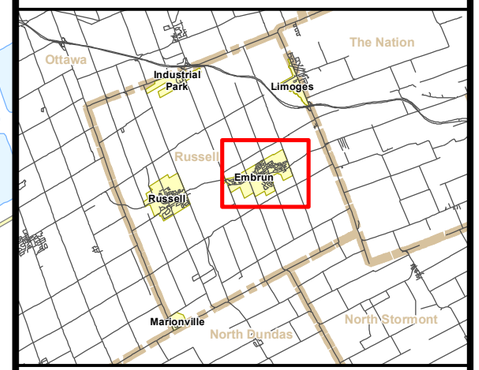

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Figure 4-5

Sanitary Collection System
Embrun

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TREATMENT

The Embrun Lagoon Facility consists of eight lagoons. Four of the lagoons are equipped with an aeration system. The facility is also equipped with an alum injection system to improve phosphorus removal, and a hydrograph controlled release system that controls the effluent discharge in proportion to the flows in the Castor River. The Lagoon Facility's rated capacity as set in the ECA is 3,865 m^3/d (Ministry of the Environment, 2014).

The operation of the Embrun Lagoons is subject to the Amended Environmental Compliance Approval 3996-9H4PX7 dated March 19, 2014. An overview of the Embrun sewage treatment facility and its connection to the rest of the pumping facilities in the collection system can be seen in Figure 4-6 below.

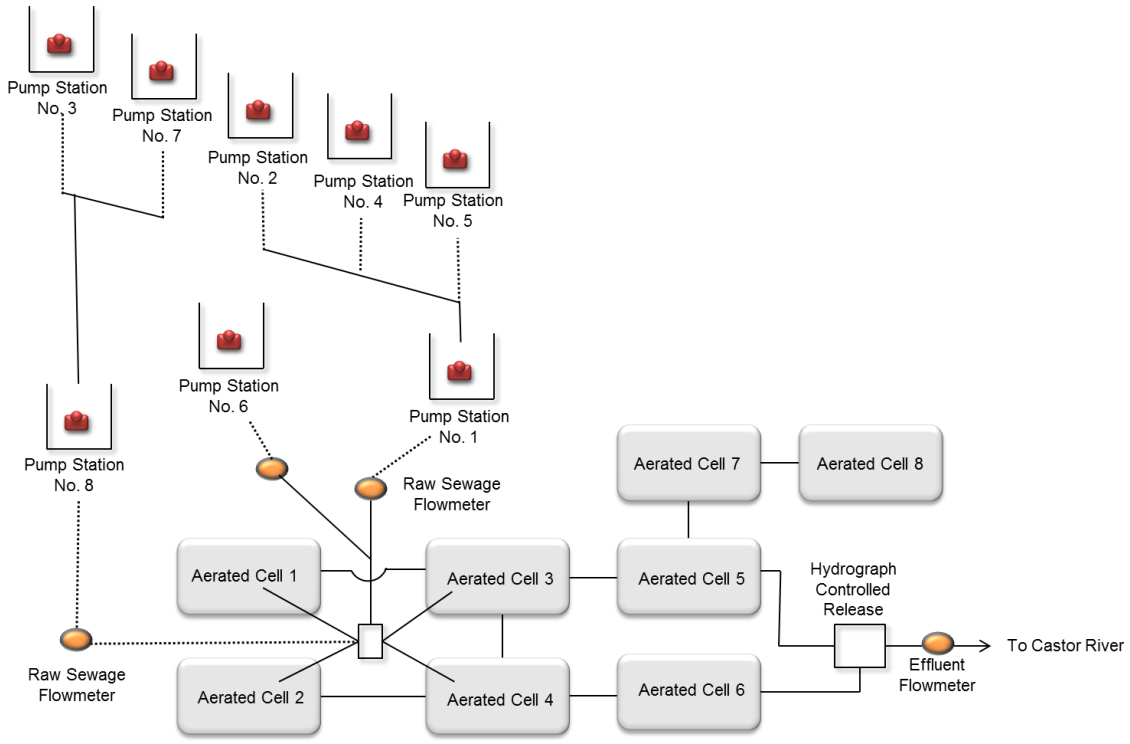


Figure 4-6 Embrun Lagoon Facility Process Schematic

Effluent discharge from the Lagoon Facility is done seasonally, on a controlled basis. The ECA establishes two discharge seasons:

- Spring: starting on March 15 (or when the liquid surface in the lagoon is partially free of ice cover) and ending April 30. The rate of discharge is such that a dilution ratio (river flow rate to effluent discharge rate) is between 17.3:1 and 115:1.
- Fall: starting October 1 and ending December 15. The rate of discharge is such that a dilution ratio (river flow rate to effluent discharge rate) is between 7.9:1 and 12:1.

The existing 900 mm diameter outfall pipe has been determined to be capable of a maximum full flow of 848 L/s based upon the minimum slope of 0.22%.

4.3.2 SERVICED POPULATION

The 2014 estimated population serviced by the Embrun sewage system was 6,260. The estimated equivalent number of dwellings was 1,928. It should be noted that this population does not match that serviced by the municipal water system (there are more units connected to the municipal water system than units serviced by the sewage system).

4.3.3 WASTEWATER FLOWS

The capacity of the Embrun Lagoon Facility is expressed in terms of the average day influent raw sewage flow.

Based on the historical data for the past five years, the average day influent flow was 1,484 m^3/day, which corresponds to 38.4% of the facility's rated capacity of 3,865 m^3/day.

A spreadsheet showing historical wastewater flows over the period 1999 to 2014 is included in **Appendix B**.

4.3.4 TREATED EFFLUENT QUALITY

The ECA for Embrun Lagoon specifies effluent objectives and effluent limits for BOD, TSS, TAN, TP, hydrogen sulphide and pH. The ECA also requires testing of the effluent for acute lethality to Rainbow Trout and *Daphnia Magna*.

The effluent objectives and limits are compared to average effluent quality data for the period 2011-2014 for the Embrun Lagoon in Table 4-4 below.

Table 4-6 Embrun Lagoon Effluent Objectives, Limits and 2011-2014 Effluent Quality

EFFLUENT PARAMETER	AVERAGE CONCENTRATION OBJECTIVE	AVERAGE CONCENTRATION LIMIT	AVERAGE EFFLUENT QUALITY (2011-2014)
$CBOD_5$	20.0 mg/L	30.0 mg/L	2.8 mg/L
Total Suspended Solids	20.0 mg/L	30.0 mg/L	6.8 mg/L
Total Phosphorus	< 0.5 mg/L	0.56 mg/L 357 kg (fall season loading) 433 kg (spring season loading)	0.12 mg/L
Total Ammonia Nitrogen	1.0 mg/L (Fall) 5.0 mg/L (Spring)	2.0 mg/L (Fall) 10.0 mg/L (Spring)	0.7 mg/L (Fall) 4.8 mg/L (Spring)
Hydrogen Sulphide	N/A	Non-detectable	0
pH	6.5 – 8.5	6.0 – 9.5	7.1-8.5

As noted above, the Lagoon's performance is excellent with effluent concentrations well below the requirements set by the ECA.

4.3.5 ASSIMILATIVE CAPACITY OF THE CASTOR RIVER

The Castor River receives treated effluent from Embrun and Russell, as well as the nearby community of Limoges (Nation Municipality), before it joins the South Nation River. Stantec completed an assimilative capacity review of the Castor River in 2005. According to the study (Stantec, 2005), the limiting criterion for discharge was ammonia in the fall.

The Castor River can assimilate 1,590,000 m^3 of effluent with an average discharge concentration of 2.0 mg/L Total Ammonia Nitrogen during the fall discharge window of October 1 – December 15 (Total Ammonia Nitrogen for the spring discharge would be acceptable at 10 mg/L). This corresponds to an average flow of 21,487 m^3/d during the fall. This volume of effluent indicates that approximately 17% of the assimilative capacity of the river has been utilized, when considering flows from Embrun, Russell and Limoges (based on the 1073 m^3/d rated capacity of the Limoges St. Isidore Lagoons per their existing C of A).

It should be noted however that historical effluent discharges of TAN from the Russell Lagoons have been less than 2 mg/L, which indicates that the assimilative capacity of the Castor River would be even greater.

5 FUTURE REQUIREMENTS

5.1 GROWTH PROJECTIONS

The Township's and the Counties' Official Plan included population forecasts to the year 2031. Given these projections and information provided by the Township's Planning Department, the service populations for the water and wastewater systems were estimated in five year intervals to the 2031 planning horizon. These population forecasts also correspond to those used for the financial plan developed to project the Township's water and wastewater rates (WSP, 2015).

The projections for the population serviced by the municipal water and wastewater systems are summarized in Table 5-1 and Table 5-2, respectively.

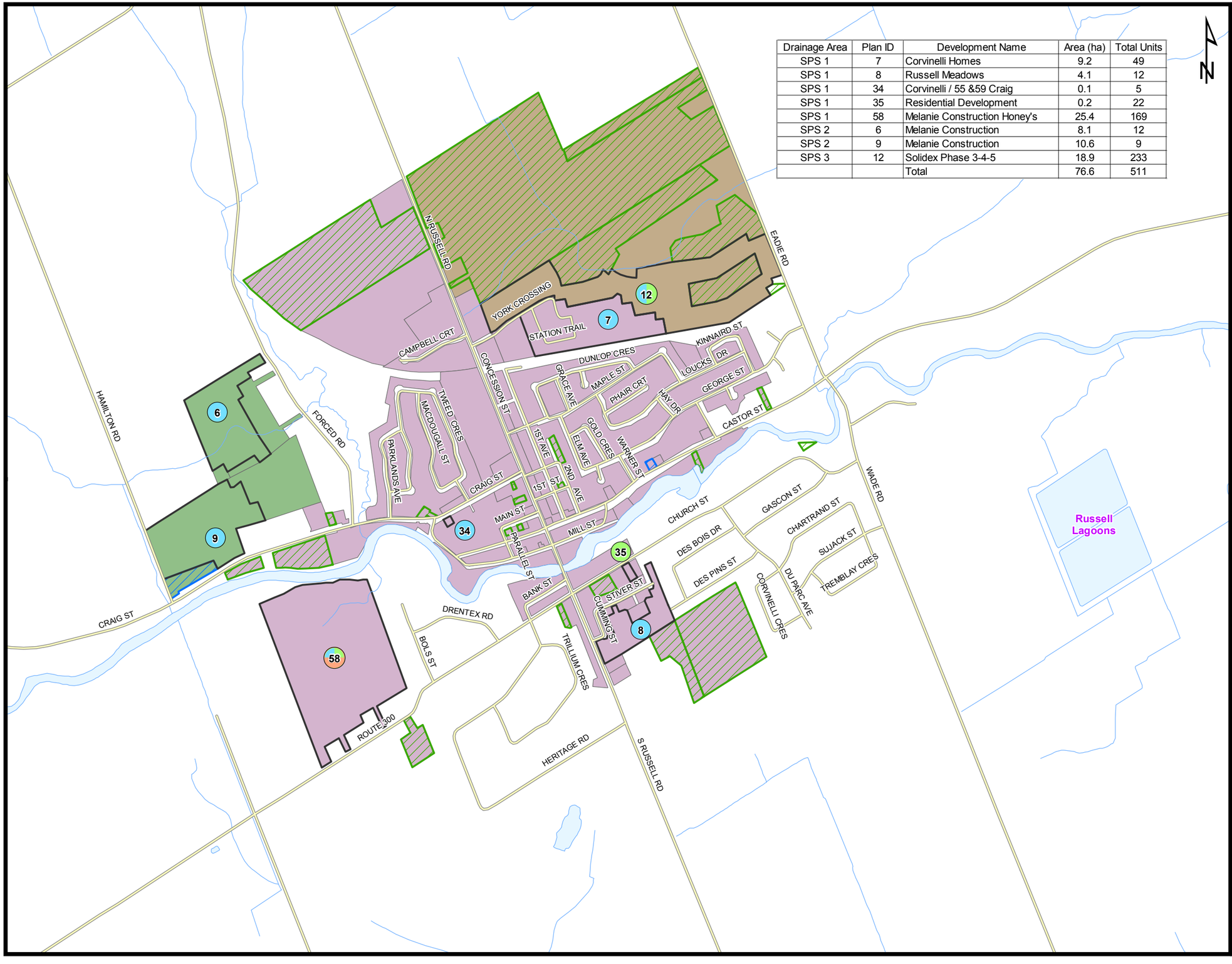
Table 5-1 Serviced Population Projections – Water System

YEAR	2011-2016	2016-2021	2021-2026	2026-2031
Russell	6,006	6,909	7,332	7,539
Embrun	7,972	9,807	11,915	14,408
Marionville	370	428	428	428

Table 5-2 Serviced Population Projections – Wastewater System

YEAR	2011-2016	2016-2021	2021-2026	2026-2031
Russell	5,050	5,953	6,376	6,583
Embrun	6,477	8,312	10,420	12,913

Drainage Area	Plan ID	Development Name	Area (ha)	Total Units
SPS 1	7	Corvinelli Homes	9.2	49
SPS 1	8	Russell Meadows	4.1	12
SPS 1	34	Corvinelli / 55 &59 Craig	0.1	5
SPS 1	35	Residential Development	0.2	22
SPS 1	58	Melanie Construction Honey's	25.4	169
SPS 2	6	Melanie Construction	8.1	12
SPS 2	9	Melanie Construction	10.6	9
SPS 3	12	Solidex Phase 3-4-5	18.9	233
		Total	76.6	511



Legend

- Roadway
- Watercourse
- Future Development up to 2031
- Future Commercial 2031 to Buildout
- Future Residential 2031 to Buildout

Sanitary Sewer Drainage Areas

- Pumping Station 1 Drainage Area
- Pumping Station 2 Drainage Area
- Pumping Station 3 Drainage Area
- 6 — 2016 - 2021 Development
- 35 — 2021 - 2026 Development
- 51 — 2026 - 2031 Development

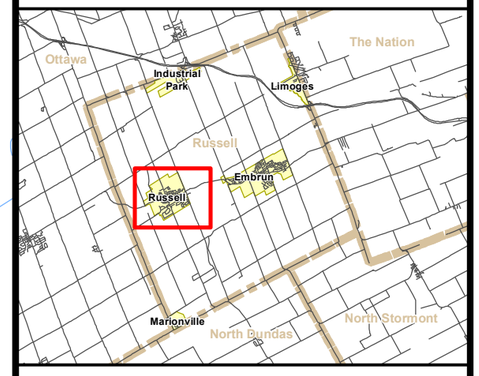


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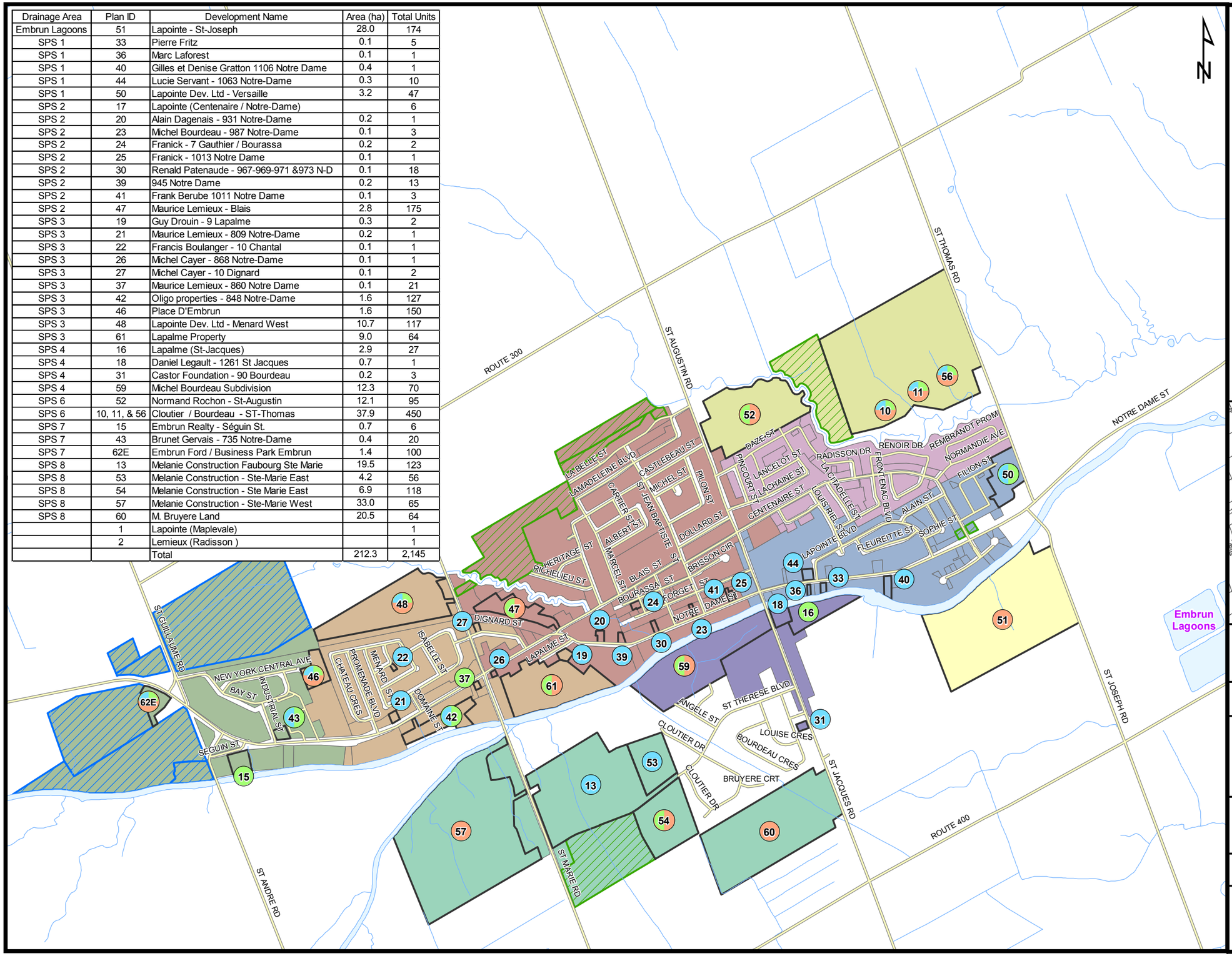
Figure 5-1

Development Areas Russell

Drainage Area	Plan ID	Development Name	Area (ha)	Total Units
Embrun Lagoons	51	Lapointe - St-Joseph	28.0	174
SPS 1	33	Pierre Fritz	0.1	5
SPS 1	36	Marc Laforest	0.1	1
SPS 1	40	Gilles et Denise Gratton 1106 Notre Dame	0.4	1
SPS 1	44	Lucie Servant - 1063 Notre-Dame	0.3	10
SPS 1	50	Lapointe Dev. Ltd - Versaille	3.2	47
SPS 2	17	Lapointe (Centenaire / Notre-Dame)		6
SPS 2	20	Alain Dagenais - 931 Notre-Dame	0.2	1
SPS 2	23	Michel Bourdeau - 987 Notre-Dame	0.1	3
SPS 2	24	Franick - 7 Gauthier / Bourassa	0.2	2
SPS 2	25	Franick - 1013 Notre Dame	0.1	1
SPS 2	30	Renald Patenaude - 967-969-971 &973 N-D	0.1	18
SPS 2	39	945 Notre Dame	0.2	13
SPS 2	41	Frank Berube 1011 Notre Dame	0.1	3
SPS 2	47	Maurice Lemieux - Blais	2.8	175
SPS 3	19	Guy Drouin - 9 Lapalme	0.3	2
SPS 3	21	Maurice Lemieux - 809 Notre-Dame	0.2	1
SPS 3	22	Francis Boulanger - 10 Chantal	0.1	1
SPS 3	26	Michel Cayer - 868 Notre-Dame	0.1	1
SPS 3	27	Michel Cayer - 10 Dignard	0.1	2
SPS 3	37	Maurice Lemieux - 860 Notre Dame	0.1	21
SPS 3	42	Oligo properties - 848 Notre-Dame	1.6	127
SPS 3	46	Place D'Embrun	1.6	150
SPS 3	48	Lapointe Dev. Ltd - Menard West	10.7	117
SPS 3	61	Lapalme Property	9.0	64
SPS 4	16	Lapalme (St-Jacques)	2.9	27
SPS 4	18	Daniel Legault - 1261 St Jacques	0.7	1
SPS 4	31	Castor Foundation - 90 Bourdeau	0.2	3
SPS 4	59	Michel Bourdeau Subdivision	12.3	70
SPS 6	52	Normand Rochon - St-Augustin	12.1	95
SPS 6	10, 11, & 56	Cloutier / Bourdeau - ST-Thomas	37.9	450
SPS 7	15	Embrun Realty - Séguin St.	0.7	6
SPS 7	43	Brunet Gervais - 735 Notre-Dame	0.4	20
SPS 7	62E	Embrun Ford / Business Park Embrun	1.4	100
SPS 8	13	Melanie Construction Faubourg Ste Marie	19.5	123
SPS 8	53	Melanie Construction - Ste-Marie East	4.2	56
SPS 8	54	Melanie Construction - Ste Marie East	6.9	118
SPS 8	57	Melanie Construction - Ste-Marie West	33.0	65
SPS 8	60	M. Bruyere Land	20.5	64
	1	Lapointe (Maplevale)		1
	2	Lemieux (Radisson)		1
		Total	212.3	2,145



Legend

- Roadway
- Watercourse
- Future Development up to 2031
- Future Commercial 2031 to Buildout
- Future Residential 2031 to Buildout

Sanitary Sewer Drainage Areas

- Pumping Station 1 Drainage Area
- Pumping Station 2 Drainage Area
- Pumping Station 3 Drainage Area
- Pumping Station 4 Drainage Area
- Pumping Station 5 Drainage Area
- Pumping Station 6 Drainage Area
- Pumping Station 7 Drainage Area
- Pumping Station 8 Drainage Area
- Embrun Lagoons
- 13 2016 - 2021 Development
- 15 2021 - 2026 Development
- 51 2026 - 2031 Development

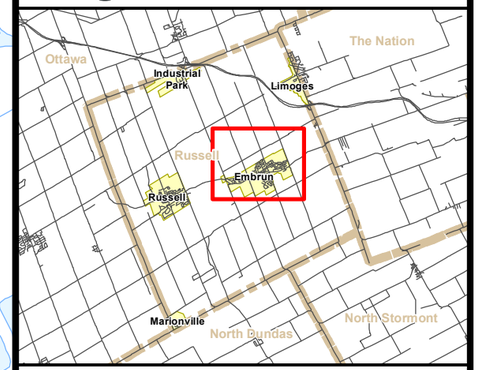


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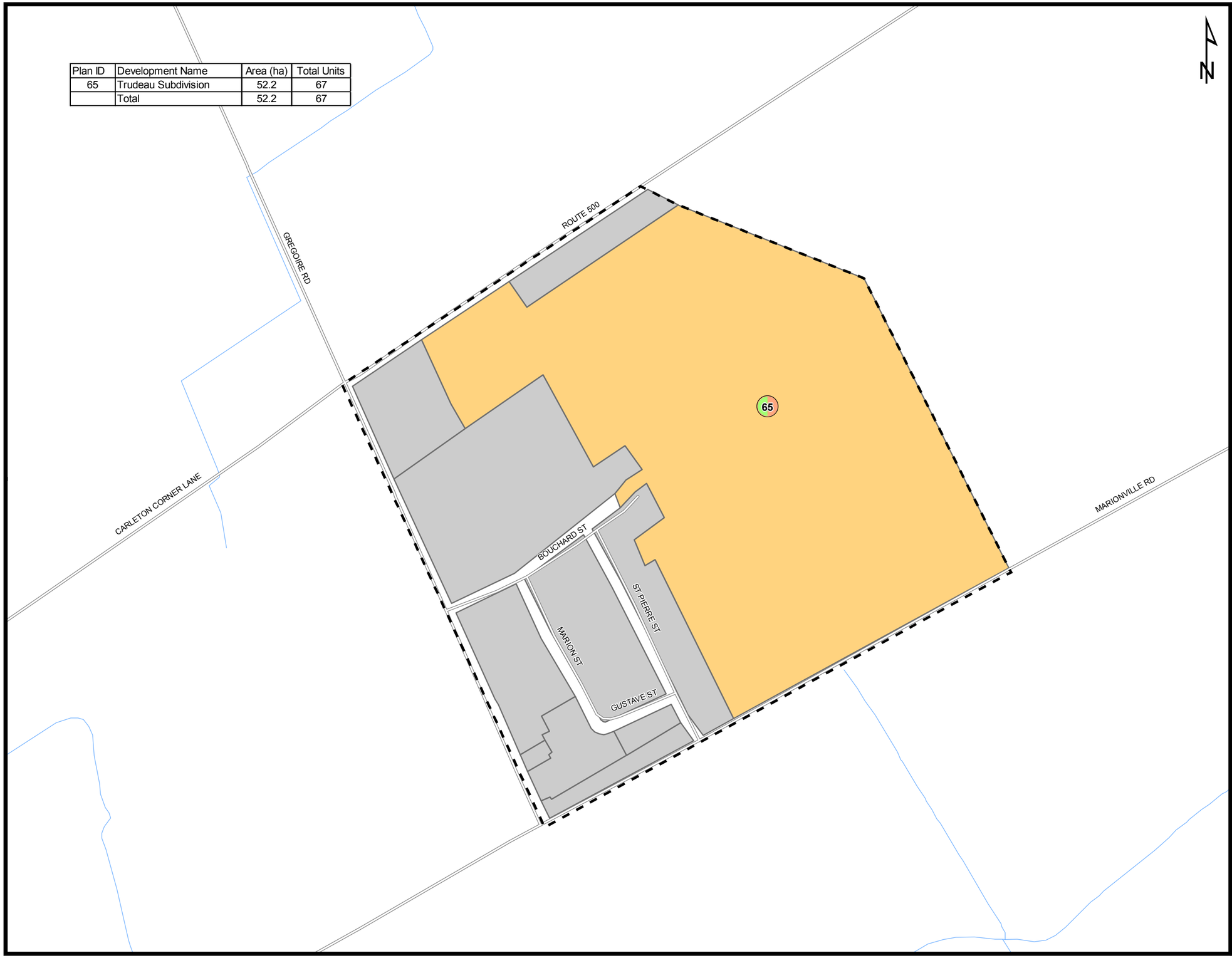
Figure 5-2

Development Areas Embrun

Plan ID	Development Name	Area (ha)	Total Units
65	Trudeau Subdivision	52.2	67
	Total	52.2	67



Legend

- Roadway
- Watercourse
- Village Boundary Line
- Existing Landuse
- Future Residential
- 13 — 2016 - 2021 Development
- 15 — 2021 - 2026 Development
- 51 — 2026 - 2031 Development

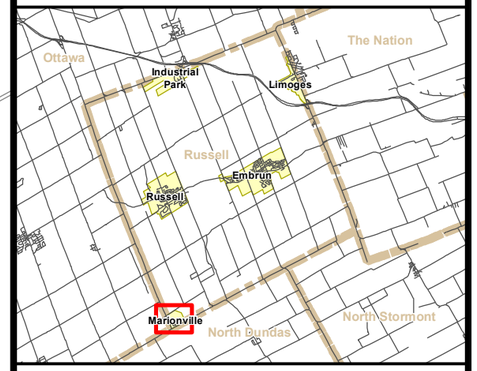


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Figure 5-3

Development Areas
Marionville

HIGHWAY LANE

RUSSLAND RD

HWY 417

ROCKDALE RD

ST PIERRE RD

CORDUROY RD

BURTON RD

ENTERPRISE ST

Area 1
54.7 ha
135.1 ac

1

CLEMENT RD

UNIVERSELLE ST

ENTERPRISE ST

COMMERCE ST

3

Area 3
37.7 ha
93.1 ac

2

Area 2
90.4 ha
223.3 ac

ST GUILLAUME RD

N

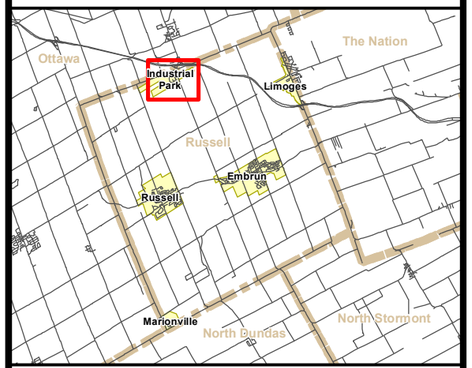
Legend

- Freeway
- Arterial Road
- Local Road

417 Industrial Park Areas

- Area 1
- Area 2
- Area 3

- 1 — 2016 - 2021 Development
- 2 — 2021 - 2026 Development
- 3 — 2026 - 2031 Development
- 3 — 2031 - Build Out



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Russell Township
Water & Wastewater
Master Plan Update

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Figure 5-4

417 Industrial Park

For the purposes of this Master Plan, the 417 (Vars) Industrial Park has been subdivided into three areas of potential development within the 2016-2031 planning horizon, corresponding to 220 ha (543 acres) as shown in Figure 5-4.

These areas are described briefly below:

- **Area 1:** Existing business development west of St. Guillaume Road – approximately 118.6 acres.
- **Area 2:** Vacant lands owned by the Township west of St. Guillaume Road and west of Area 1 – approximately 220.4 acres.
- **Area 3:** Vacant, privately-owned lands located east of St. Guillaume Road – approximately 87.5 acres.

Additional details on the 417 Industrial Park study area are provided in a report prepared to evaluate servicing alternatives for the Park (WSP, 2015).

5.2 PHASING OF FUTURE GROWTH

The Township's Planning Department provided a list of development areas, the estimated equivalent number of residential units and their expected timing. A number of these development areas have been draft approved or at the proposal stage. Therefore, these properties were assumed to be developed ahead of other areas for which no proposals have been registered.

The total number of development units identified in Russell, Embrun and Marionville, and the corresponding population growth closely corresponds to the population projections indicated in the Official Plan for the 2031 planning year. It is assumed that all future growth would be serviced by the municipal water system (all three communities) and the wastewater system (Russell and Embrun only).

The assumed development phasing for each community is summarized in Table 5-3. The development areas (colour coded based on when they are assumed to be developed) are shown in Figure 5-1, Figure 5-2 and Figure 5-3.

Table 5-3 Development Phasing – Russell, Embrun and Marionville

YEAR	2011-2016	2016-2021	2021-2026	2026-2031	Total Growth 2016-2031
Russell	289	301	141	69	511
Embrun	231	612	703	831	2,145
Marionville	-	-	32	35	67
Total Number of Units	**520**	**913**	**876**	**935**	**2,723**

The areas within the 417 Industrial Park projected to be developed in the 417 Industrial Park over the various planning periods are shown in Table 5-4.

Table 5-4 Development Phasing – 417 Industrial Park

PHASE	NUMBER OF HECTARES DEVELOPED	AREAS DEVELOPED
2011-2016	-	
2016-2021	42	Area 1, Area 2
2021-2026	84	Area 1, Area 2
2026-2031	126	Area 1, Area 3

5.3 DESIGN CRITERIA

The following design criteria were used to forecast future requirements for the water and wastewater systems. The design criteria are based on historical water demands and wastewater flows, where applicable or on MOE Guidelines.

One residential unit was assumed to have an equivalent population of 3 people.

5.3.1 WATER DESIGN CRITERIA

5.3.1.1 UNIT WATER DEMAND CRITERIA

The water demand criteria shown in Table 5-5 below are based on historical values of water consumption in the system over the period 2010 to 2014. The corresponding average day demand is 2,531 m^3/d. This represents a per capita average day consumption is 230 L/cap/d. This value is within the range indicated in the *Design Guidelines for Drinking-Water Systems* (Ministry of the Enviroment , 2008).

The maximum day demand during the 2010-2014 period was 4,640 m^3/d, and it was recorded in 2010 when the metering program was first implemented. 2011 was the first full year of water metering. The demand data shows that average day and maximum day demands dropped with the implementation of metering, and maximum day demands have been relatively constant since. For this reason, the maximum day demand for 2010 was not considered to determine the maximum day peaking factor design value. Instead, a value of 1.53 was adopted, which corresponds to the 2011 maximum day demand. A spreadsheet showing historical water demands over the period 1999 to 2014 is included in **Appendix A**.

An average day demand value of 10 m^3/ha/d was adopted for development in the Industrial Park.

The design criteria adopted for this Master Plan are summarized in Table 5-5 below.

Table 5-5 Water System Design Criteria

CRITERIA	VALUE	REFERENCE
Average Day Demand – Residential	230 L/cap/day	Derived from Historical Data (2010-2014).
Average Day Demand – 417 Industrial Park	10.0 m^3/ha/d	*Vars Industrial Park Water and Wastewater Servicing Option Evaluation – Update* (WSP, 2015)
Maximum Day Factor - Residential	1.53	Derived from Historical Data (2011-2014).
Density Factor (Industrial Park)	75%	Applied to gross area to determine the actual building area.
Maximum Day Factor – 417 Industrial Park	2.00	*Vars Industrial Park Water and Wastewater Servicing Option Evaluation – Update* (WSP, 2015)
Peak Hour Factor	2.85	Value recommended in MOE Guidelines for populations between 10,001 and 25,000.

Maximum day and peak hour demands are obtained by multiplying the average day demand by the corresponding peaking factors.

For the purposes of this Master Plan a fire flow requirement of 8,000 L/min (133 L/s) was adopted corresponding to the value recommended in the *FUS Water Supply for Public Fire Protection* document (Fire Underwriters Survey , 1999) for contiguous buildings. The corresponding fire duration is 2 hours.

5.3.1.2 WATER TREATMENT CAPACITY

The Township does not operate a water treatment facility.

As noted above, the Township has entered into a water supply agreement with the City of Ottawa that commits up to 11,860 m^3 over a 20-hour period to supply the Township.

For the purposes of this Master Plan, it is therefore assumed that 11,860 m^3/d is the maximum supply capacity available to the Township.

5.3.1.3 BOOSTER PUMPING STATION CAPACITY

Pumping stations are rated based on their firm capacity. If sufficient floating storage is available in a particular pressure district, the MOE defines firm capacity as the capacity of the station with the largest pump out of service. If there is insufficient or no floating storage, firm capacity is defined as the capacity with the two largest pumps out of service (Ministry of the Enviroment , 2008).

For each pressure district, the pumping stations have to be designed to provide peak hour or maximum day plus fire demands (whichever are greater), if no floating storage is available. If

sufficient floating storage is available, then the pumping station only needs to be designed to provide maximum day demands.

The Township's system consists of three pressure districts: Russell, Embrun and Marionville. The booster pumps in the Embrun Reservoir need to satisfy the above requirements for the Russell and Embrun pressure districts, while the Marionville Booster Station needs to be sized for the Marionville system demands.

5.3.1.4 TREATED WATER STORAGE CAPACITY

Storage requirements are based on the requirement to meet water demands that exceed the capacity of the supply source (in this case, allocated maximum supply from the City of Ottawa) and to satisfy fire flow demands. When the available supply is sufficient to satisfy the maximum day demands of the distribution system, storage requirements are determined using the following formula from the MOE Guidelines (Ministry of the Enviroment , 2008):

$$Storage = A + B + C$$

Where: A = Fire Storage, B = Equalization Storage = 25% of maximum day demand, and C = emergency storage = 25% of (A+B). Fire storage is the product of the fire flow and fire duration based on FUS requirements.

When the system can supply more than just the maximum day demand (but less than the peak demand), the fire storage requirements can be determined using the following formula:

$$A = (Peak\ Demand - Pumping\ Station\ Firm\ Capacity) \times Fire\ Duration$$

Where: peak demand is the greater of the peak hour demand and the maximum day plus fire demand.

Per MOE Guidelines, elevated storage should be designed such that the elevation of the equalization volume (B) is such that a minimum pressure of 275 kPa (40 psi) can be maintained in the system under peak hour flow conditions. The fire (A) and emergency (C) volumes should be at elevations that produce 275 kPa (40 psi) during peak hour demand conditions, and 140 kPa (20 psi) under the maximum day plus fire flow condition (Ministry of the Enviroment , 2008).

5.3.1.5 DISTRIBUTION CAPACITY

Watermains have to be sized to carry the greater of the maximum day plus fire flow or peak hour demand. The range of acceptable pressures under normal conditions (average to peak hour flows) is 275 kPa (40 psi) to 690 kPa (100 psi), while during fire flow conditions pressures may drop to 140 kPa (20 psi) (Ministry of the Enviroment , 2008). The maximum allowable water velocity in the distribution system is 3 m/s (Ministry of the Enviroment , 2008).

5.3.2 WASTEWATER DESIGN CRITERIA

5.3.2.1 UNIT WASTEWATER DESIGN CRITERIA

The unit flow criteria for growth adopted for this assessment are shown in Table 5-6 below. These values were derived from historical flow data over the period 2010 to 2014. Since Russell and Embrun are serviced by two independent wastewater systems, different design criteria were defined for these two communities.

Based on the five-year historical data, the average day influent flow to the Russell Lagoon Facility was 870 m^3/day. The average day flow to the Embrun Lagoon Facility was 1,484 m^3/day. The corresponding per capita average day flow is 238 L/cap/d and 231 L/cap/d for Russell and Embrun, respectively.

An average day flow value of 10 m^3/ha/d was adopted for development in the Industrial Park.

Table 5-6: Wastewater System Design Criteria

CRITERIA	VALUE	REFERENCE
Average Day Flow – Residential Russell	238 L/cap/day	Historical data 2010 - 2014
Average Day Flow – Residential Embrun	231 L/cap/day	Historical data 2010 - 2014
Average Day Flow – 417 Industrial Park	10.0 m^3/ha/d	*Vars Industrial Park Water and Wastewater Servicing Option Evaluation – Update* (WSP, 2015)
Density Factor (Industrial Park)	75%	Applied to gross area to determine the actual building area.
Peak Extraneous Flow Allowance	32.8 m^3/ha/d	Standard Value applied by Township
Peak Flow Factor – 417 Industrial Park	2.5	*Vars Industrial Park Water and Wastewater Servicing Option Evaluation – Update* (WSP, 2015)

Average day flows are obtained by adding the residential and industrial flow contributions.

The peak flow is the sum of residential, industrial and I&I (extraneous) peak flow contributions. Peak residential flows are obtained by multiplying the average day flows by the Harmon Peaking Factor, a commonly used factor for determining peak wastewater flows in municipal wastewater systems. The formula for calculating the Harmon Peaking Factor is as follows (Ministry of the Environment, 2008):

$$Harmon\ Peaking\ Factor = 1 + \frac{14}{(4 + P^{\frac{1}{2}})}$$

where P= the design contributing population in thousands.

Peak ICI flows are obtained by multiplying the institutional, commercial and industrial average day flows by the ICI peaking factor.

5.3.2.2 WASTEWATER TREATMENT

Wastewater treatment facilities are rated for average day flows. Plant effluent limits and objectives are established in the Environmental Compliance Approval (ECA) for the facility.

5.3.2.3 SEWAGE PUMPING CAPACITY

The firm capacity of the pumping station (with the largest pump out of service) must allow pumping of peak wet weather flows for the catchment (Ministry of the Environment, 2008).

5.3.2.4 SEWERS

The sewer system is sized to convey peak instantaneous flows. Sewage flows are made up of wastewater discharges from residential, commercial, institutional and industrial establishments, plus extraneous flow components from such sources as groundwater and surface runoff.

In addition to being able to convey peak flows, sufficient flow velocity should be maintained to transport the sewage solids to avoid deposition and the development of nuisance conditions under lower flow conditions. The minimum acceptable flow velocity in sewers is 0.6 m/s (Ministry of the Environment, 2008).

5.4 FUTURE WATER SYSTEM REQUIREMENTS

5.4.1 WATER DEMANDS AND SUPPLY CAPACITY REQUIREMENTS

The unit flow criteria indicated in Section 5.3.1.1 were used to estimate the future water demands in the Township. The demands corresponding to the population growth forecasts to the year 2031 are listed in Table 5-7 below. The demand projections shown below also include the demands associated with the 417 Industrial Park.

Table 5-7 Water Demand Projections

YEAR	POPULATION	AVERAGE DAY DEMAND (M^3/D)	MAXIMUM DAY DEMAND (M^3/D)	PEAK HOUR DEMAND (M^3/D)
2016	14,348	3,300	5,054	9,405
2021	17,144	4,363	6,879	12,435
2026	19,675	5,365	8,611	15,291
2031	22,375	6,406	10,402	18,258

A desktop analysis of the demand projections is included in **Appendix C**.

As noted above, the available maximum day supply capacity from the City of Ottawa is 11,860 m^3/d.

Thus, the available capacity is sufficient to meet the forecasted demands of the system to 2031. The projected average day and maximum day demands are plotted versus the available supply capacity in Figure 5-5 below.

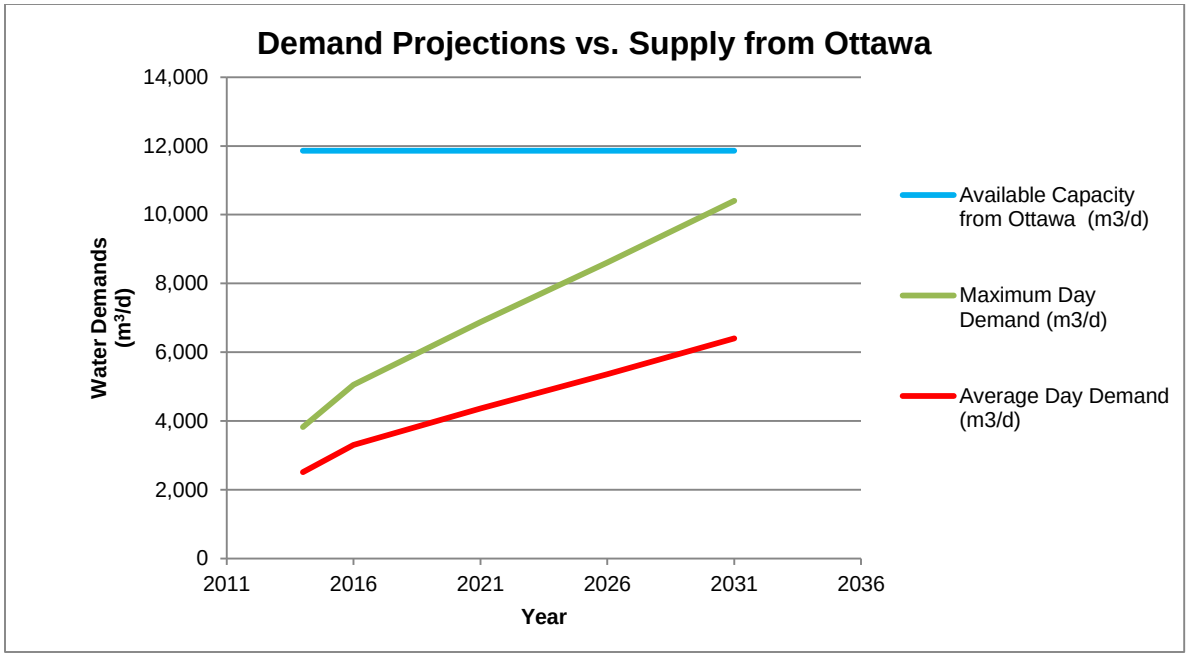

Figure 5-5 Water Demand Projections vs. Available Supply Capacity

5.4.2 WATER DISTRIBUTION SYSTEM ANALYSIS

The system in general is vulnerable in case of a loss of supply from Ottawa. However, the existing available storage capacity would be sufficient to provide adequate servicing if the emergency conditions for an extended period of time (i.e. over 30 hours).

5.4.2.1 RUSSELL

Hydraulic modeling of the distribution system indicates that the existing watermain distribution system can satisfy the required demand including fire protection for the community. Additional water distribution capacity is required to service future development in the North segment of the community, specifically along Concession Street.

5.4.2.2 EMBRUN

The distribution system is vulnerable to breaks along Notre-Dame Street. System development shall consider fire flow requirements within new subdivisions and a second major watermain.

5.4.2.3 MARIONVILLE

Hydraulic modeling of the distribution system indicates that the existing watermain distribution system can satisfy the required demand including fire protection for the community. Since little development is foreseen in the 5-year horizon, the present water distribution network will not require upgrades or modifications.

5.4.3 PUMPING STATIONS AND STORAGE

Given the projected demands and fire flow requirements an assessment was carried out of the available pumping capacity and storage available within the distribution system overall and within each pressure district.

As detailed in Sections 5.3.1.3 and 5.3.1.4, a combination of pumping and storage is necessary to adequately supply the system even during peak flow conditions.

To assess the suitability of the existing distribution system a two-step approach was taken:

- **Step 1:** Compare the firm capacity of a pumping station servicing a pressure district to the estimated peak flows (i.e. maximum day demand plus fire flow) during the planning horizon.
- **Step 2:** Determine the storage requirements for the pressure district.

The system is considered to be adequate, if the firm capacity of a pumping station is greater than the maximum day demand and the available storage is greater than or equal to the required storage (calculated per MOE Guidelines).

The results of the first step indicate that the Russell Booster Station has sufficient capacity to meet maximum day demands during the entire planning horizon. Embrun Booster Station has sufficient capacity up to 2026. However, it will need to be upgraded to meet maximum day demands projected for 2031. Lastly, the Marionville Booster Station (formerly known as the Russell Water Treatment Plant) has sufficient capacity to meet maximum day demands throughout the planning horizon. However, in all three cases, the maximum day plus day demands exceed the pumping capacity of the stations.

The results of the storage assessment indicate that Russell and Marionville have sufficient floating storage to provide equalization, fire and emergency storage. Embrun's elevated tank provides sufficient floating storage up until 2021. However, the combination of floating storage and pumping capacity are sufficient to meet the demand requirements up to the 2031 planning horizon.

It should be noted that although the Marionville Water Tower has a capacity of 1,135 m^3, the low demands in the system have led Township staff to only use a portion of the available storage to avoid water quality issues. This practice is expected to continue given that very little growth is expected to occur in Marionville. Thus, for the purposes of this evaluation it was assumed that only 50% of the tower capacity would be available. This results in the need for addition pumping capacity to provide sufficient fire protection to Marionville.

The above analysis is included in **Appendix C**.

5.5 FUTURE WASTEWATER SYSTEM REQUIREMENTS – RUSSELL

5.5.1 WASTEWATER FLOWS AND TREATMENT CAPACITY REQUIREMENTS – RUSSELL AND 417 INDUSTRIAL PARK

The unit flow criteria indicated in Section 5.3.2 were used to estimate the future wastewater flows in Russell and in Embrun. The flows corresponding to the population growth forecasts to the year 2031 are presented in below. A desktop analysis of historical wastewater flows and future flow projections is included in **Appendix D**.

Table 5-8 Flow Projections – Russell

YEAR	POPULATION	AVERAGE DAY FLOW (M3/D)
2016	5,050	1,200
2021	5,953	1,415
2026	6,376	1,516
2031	6,583	1,565

The flow projections associated with the servicing of the 417 Industrial Park are shown below.

Table 5-9 Flow Projections – Industrial Park

YEAR	DEVELOPED AREA (HA)	AVERAGE DAY FLOW (M3/D)
2016	0	0
2021	42	420
2026	84	840
2031	126	1,260

Given its location, wastewater from the 417 Industrial Park is expected to be conveyed to the Russell Lagoon Facility. For this reason, the total flows to the Russell Lagoons would be the sum of the wastewater generated in the community of Russell and those generated in the Industrial Park.

Table 5-10 Flow Projections – Russell and Industrial Park

YEAR	AVERAGE DAY FLOW (M3/D)
2016	1,200
2021	1,835
2026	2,356
2031	2,825

The rated capacity of the Russell Lagoon Facility is 2,675 m^3/d. However, the current ECA for the facility sets the Maximum Operating Capacity at 2,000 m^3/d until a Total Phosphorus Management (TPM) Agreement with the South Nation Conservation Authority has been established. The ECA also states that a proposal detailing the TPM Agreement has to be submitted to the Ministry for review upon the average daily flow of the facility reaching 1,700 m^3/d (Ministry of the Environment and Climate Change, 2015).

Figure 5-6 below shows the projected wastewater flows to be discharged to the Russell Lagoons versus the capacity of the facility. The plot also shows the capacity limits set on the facility's ECA as described above. The Russell Lagoon Facility would have sufficient capacity to service the projected growth both in the village of Russell and in the 417 Industrial Park until 2026. Therefore, a capacity expansion would be required before 2031.

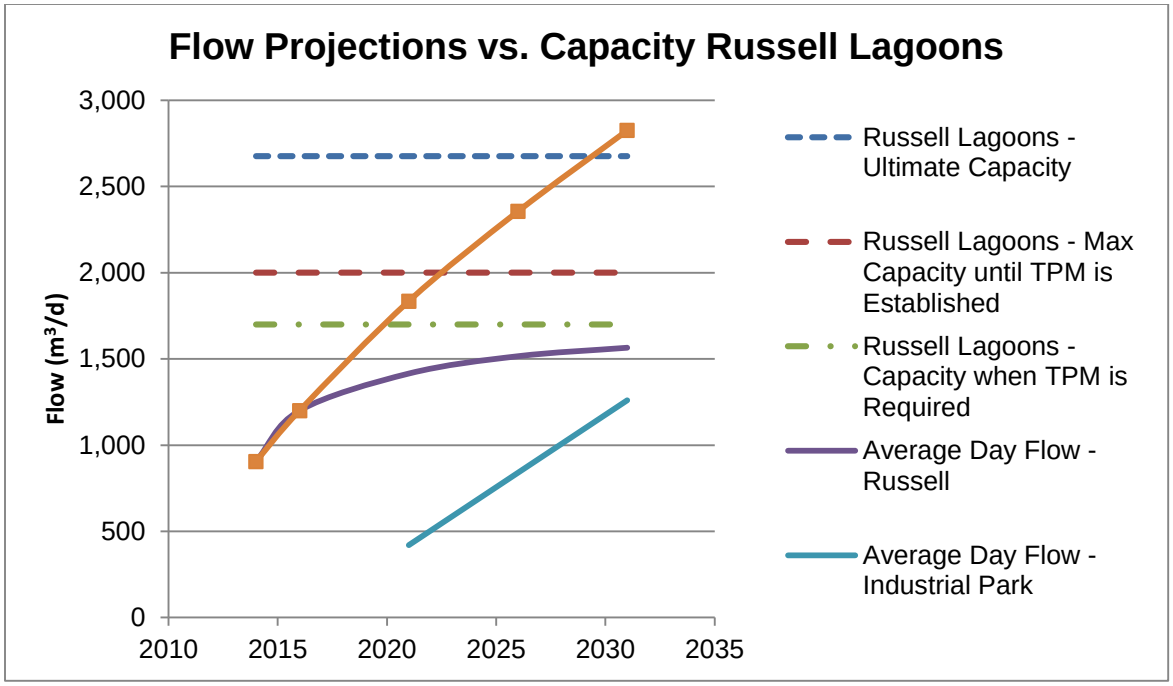

Figure 5-6 Wastewater Flow Projections vs. Available Supply Capacity – Russell Lagoons

5.5.2 WASTEWATER FLOWS AND TREATMENT CAPACITY REQUIREMENTS – EMBRUN

Table 5-11 Flow Projections – Embrun

YEAR	POPULATION	AVERAGE DAY FLOW (M3/D)
2016	6,477	1,540
2021	8,312	1,976
2026	10,420	2,477
2031	12,913	3,070

The rated capacity of the Embrun Lagoon Facility is 3,865 m^3/d. Figure 5-7 shows the projected wastewater flows to be discharged to the Embrun Lagoons versus the capacity of the facility. The capacity has sufficient capacity to service the forecasted growth to the year 2031.

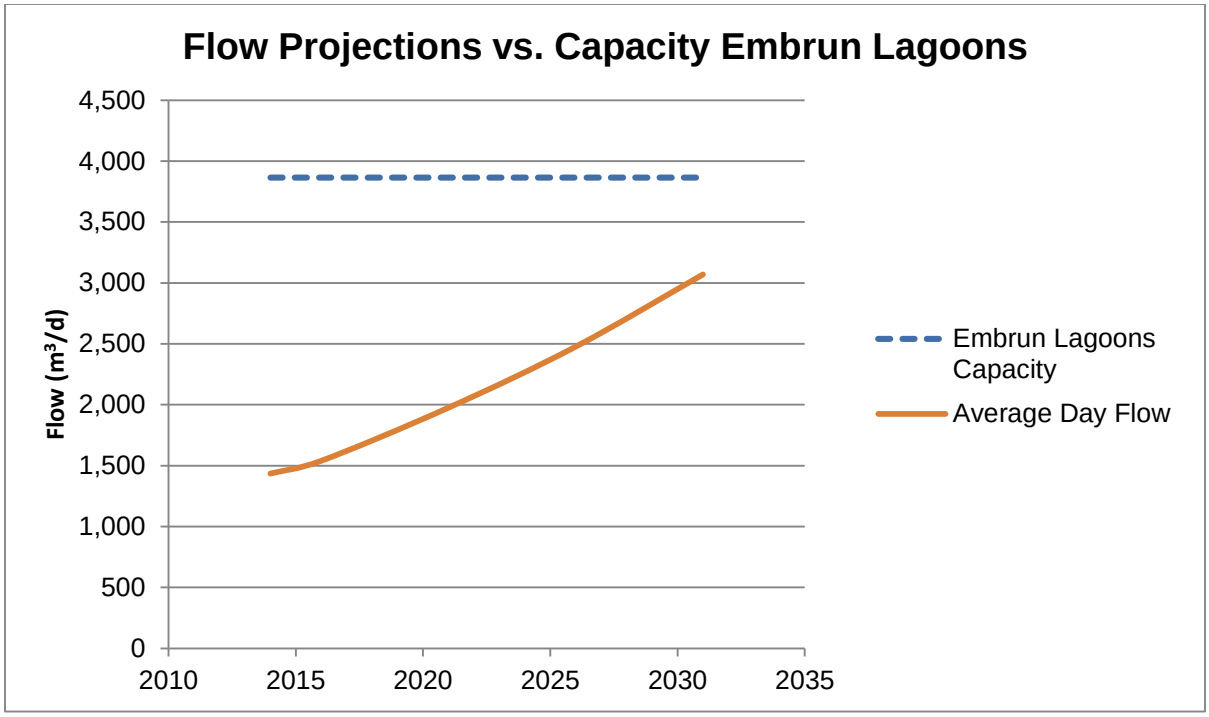

Figure 5-7 Wastewater Flow Projections vs. Available Supply Capacity – Embrun Lagoons

5.5.3 SEWER MODELLING FINDINGS – RUSSELL

A sanitary sewer spreadsheet was received from the Township. The Sanitary Sewer Calculation Sheet was originally developed by Stantec as part of the 2004 Master Plan.

The spreadsheet was updated to include new development areas and reviewed by the Township to confirm the accuracy of the information (particularly with regards to the material, dimensions and inverts of the sewers).

The ultimate flows projected for each drainage area were estimated by adding the estimated flow contribution from existing development to the flows estimated for future development areas as shown in Figure 5-1. The sanitary sewer spreadsheet is included in **Appendix E**.

For each of the scenarios modeled, the system was checked for surcharging of sewers and capacity exceedance at the pumping stations. The peak flows into each of the pumping stations determined through modeling of the various planning scenarios are shown in Table 5-12.

Table 5-12 Sewage Pumping Station Peak Influent Flow Rates - Russell

SEWAGE PUMPING STATION	EXISTING STATION CAPACITY (L/S)	2016 PEAK FLOW (L/S)	2031 PEAK FLOW (L/S)
SPS 1	86.0	89.8	**101.6**
SPS 2	23.5	15.5	16.5
SPS 3	110.0	-	7.6

The sewer capacity review revealed some gravity sewers that will have a limited or no residual capacity after 2031. These pipes are listed in Table 5-13 and shown in Figure 5-8.

It should be noted that the Sanitary Sewer Calculation Sheet is based on many assumptions regarding the flow contribution from existing and future development to different sewers and the amount of infiltration to estimate the peak wet weather flow. Without a true knowledge of the real flow in the sewers (i.e. flow monitoring, it is difficult to determine which of these pipes needs upgrading. It is therefore recommended that a more accurate and calibrated hydraulic model of the sanitary sewer systems be developed prior to making decisions on replacement/upgrade of trunk sewers.

Table 5-13 Sewers Approaching their Hydraulic Capacity - Russell

LOCATION	FROM MH	TO MH
Craig Street	130	129
Craig Street	128	124
Mill Street	124	118
Mill Street	118	117
Mill Street	117	108
Mill Street	108	105
Mill Street	105	102
Castor Street	8	9
Parking lot south of Mill Street (north of river crossing)	96	97

5.5.4 SEWER MODELLING FINDINGS – EMBRUN

A sanitary sewer spreadsheet was received from the Township. The Sanitary Sewer Calculation Sheet was originally developed by Stantec as part of the 2004 Master Plan.

The spreadsheet was updated to include new development areas and reviewed by the Township to confirm the accuracy of the information (particularly with regards to the material, dimensions and inverts of the sewers).

The ultimate flows projected for each drainage area were estimated by adding the estimated flow contribution from existing development to the flows estimated for future development areas as shown in Figure 5-2. The sanitary sewer spreadsheet is included in **Appendix E**.

For each of the scenarios modeled, the system was checked for surcharging of sewers and capacity exceedance at the pumping stations. The peak flows into each of the pumping stations determined through modeling of the various planning scenarios are shown in Table 5-14.

Drainage Area	Plan ID	Development Name	Area (ha)	Total Units
SPS 1	7	Corvinelli Homes	9.2	49
SPS 1	8	Russell Meadows	4.1	12
SPS 1	34	Corvinelli / 55 &59 Craig	0.1	5
SPS 1	35	Residential Development	0.2	22
SPS 1	58	Melanie Construction Honey's	25.4	169
SPS 2	6	Melanie Construction	8.1	12
SPS 2	9	Melanie Construction	10.6	9
SPS 3	12	Solidex Phase 3-4-5	18.9	233
		Total	76.6	511

Legend

- Sanitary Sewer Pumping Station
- Sanitary Sewer Manhole
- Sanitary Sewer
- Sanitary Forcemain
- Surcharged Sanitary Sewer
- Future Development up to 2031
- Future Commercial 2031 to Buildout
- Future Residential 2031 to Buildout

Sanitary Sewer Drainage Areas

- Pumping Station 1 Drainage Area
- Pumping Station 2 Drainage Area
- Pumping Station 3 Drainage Area

- 6 — 2016 - 2021 Development
- 35 — 2021 - 2026 Development
- 51 — 2026 - 2031 Development

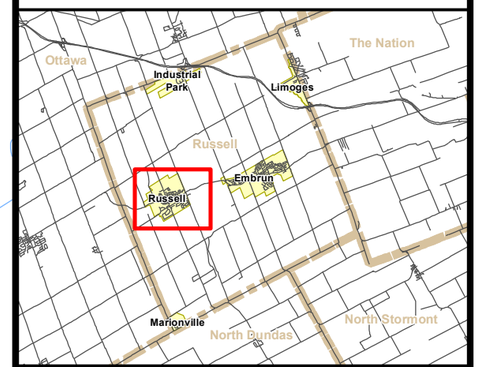

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Figure 5-8

Sewers Approaching Capacity Russell

Table 5-14 Sewage Pumping Station Peak Influent Flow Rates - Embrun

SEWAGE PUMPING STATION	EXISTING STATION CAPACITY (L/S)	2016 PEAK FLOW (L/S)	2031 PEAK FLOW (L/S)
SPS 1	113.0	98.0	**164.3**
SPS 2	56.0	45.4	**78.4**
SPS 3	30.0	**34.8**	**99.2**
SPS 4	10.3	4.6	8.5
SPS 5	34.0	28.4	28.9
SPS 6	128.2	0.0	16.0
SPS 7	8.5	**6.5**	**27.5**
SPS 8	132.0	34.5	**136.2**

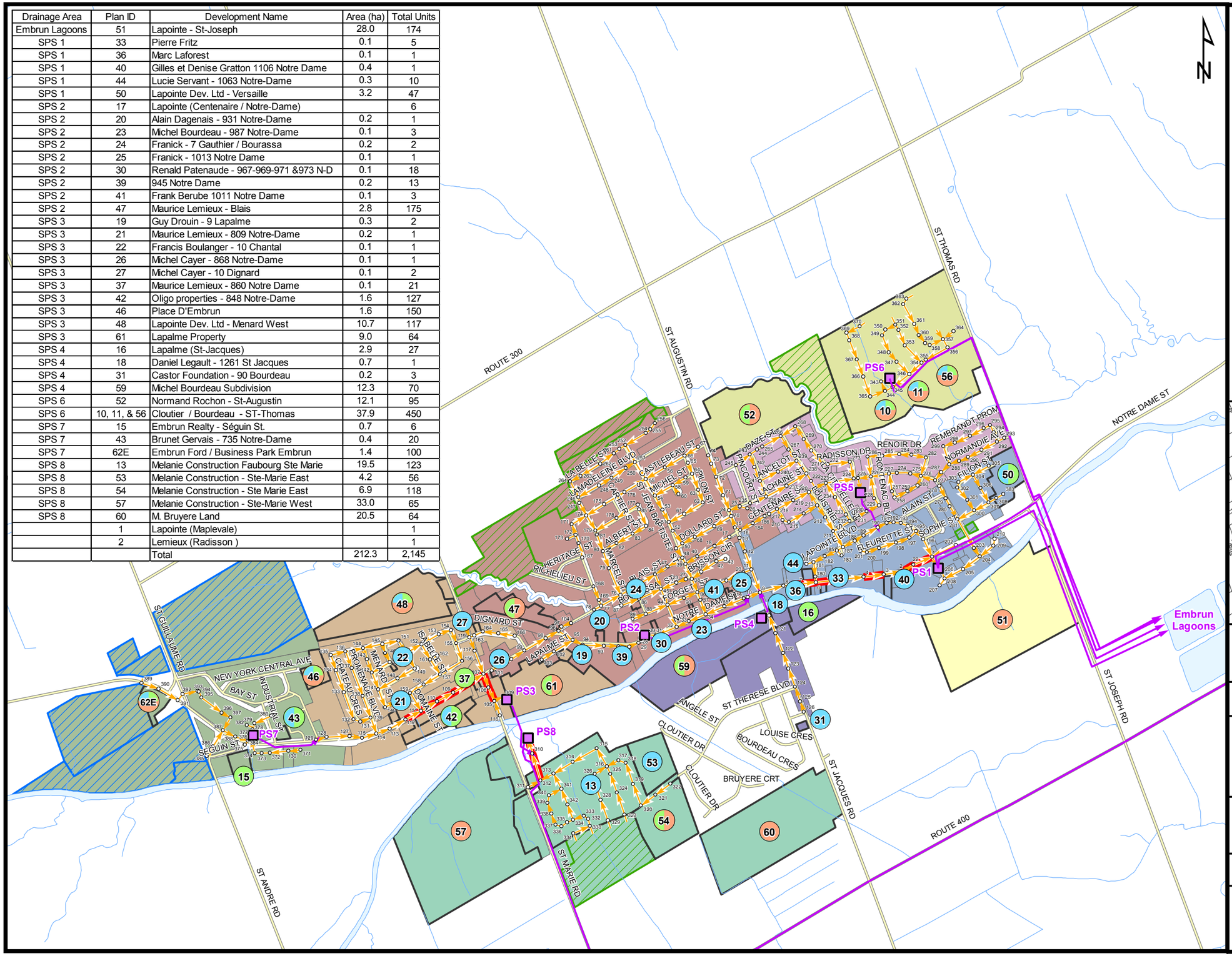
The sewer capacity review revealed some gravity sewers that will have a limited or no residual capacity after 2031. These pipes are listed in Table 5-15 and shown in Figure 5-9.

It should be noted that the Sanitary Sewer Calculation Sheet is based on many assumptions regarding the flow contribution from existing and future development to different sewers and the amount of infiltration to estimate the peak wet weather flow. Without a true knowledge of the real flow in the sewers (i.e. flow monitoring, it is difficult to determine which of these pipes needs upgrading. It is therefore recommended that a more accurate and calibrated hydraulic model of the sanitary sewer systems be developed prior to making decisions on replacement/upgrade of trunk sewers.

Table 5-15 Sewers Approaching their Hydraulic Capacity - Embrun

LOCATION	FROM MH	TO MH
Sewer directly upstream of SPS8	310	SPS 8
County Road # 3	112	SPS 3
Notre-Dame Street	10	9
Notre-Dame Street	7	5
Notre-Dame Street	4	3
Notre-Dame Street	2	SPS 1

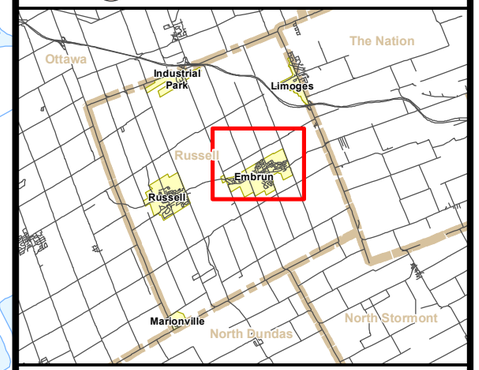
Drainage Area	Plan ID	Development Name	Area (ha)	Total Units
Embrun Lagoons	51	Lapointe - St-Joseph	28.0	174
SPS 1	33	Pierre Fritz	0.1	5
SPS 1	36	Marc Laforest	0.1	1
SPS 1	40	Gilles et Denise Gratton 1106 Notre Dame	0.4	1
SPS 1	44	Lucie Servant - 1063 Notre-Dame	0.3	10
SPS 1	50	Lapointe Dev. Ltd - Versaille	3.2	47
SPS 2	17	Lapointe (Centenaire / Notre-Dame)		6
SPS 2	20	Alain Dagenais - 931 Notre-Dame	0.2	1
SPS 2	23	Michel Bourdeau - 987 Notre-Dame	0.1	3
SPS 2	24	Franick - 7 Gauthier / Bourassa	0.2	2
SPS 2	25	Franick - 1013 Notre Dame	0.1	1
SPS 2	30	Renald Patenaude - 967-969-971 &973 N-D	0.1	18
SPS 2	39	945 Notre Dame	0.2	13
SPS 2	41	Frank Berube 1011 Notre Dame	0.1	3
SPS 2	47	Maurice Lemieux - Blais	2.8	175
SPS 3	19	Guy Drouin - 9 Lapalme	0.3	2
SPS 3	21	Maurice Lemieux - 809 Notre-Dame	0.2	1
SPS 3	22	Francis Boulanger - 10 Chantal	0.1	1
SPS 3	26	Michel Cayer - 868 Notre-Dame	0.1	1
SPS 3	27	Michel Cayer - 10 Dignard	0.1	2
SPS 3	37	Maurice Lemieux - 860 Notre Dame	0.1	21
SPS 3	42	Oligo properties - 848 Notre-Dame	1.6	127
SPS 3	46	Place D'Embrun	1.6	150
SPS 3	48	Lapointe Dev. Ltd - Menard West	10.7	117
SPS 3	61	Lapalme Property	9.0	64
SPS 4	16	Lapalme (St-Jacques)	2.9	27
SPS 4	18	Daniel Legault - 1261 St Jacques	0.7	1
SPS 4	31	Castor Foundation - 90 Bourdeau	0.2	3
SPS 4	59	Michel Bourdeau Subdivision	12.3	70
SPS 6	52	Normand Rochon - St-Augustin	12.1	95
SPS 6	10, 11, & 56	Cloutier / Bourdeau - ST-Thomas	37.9	450
SPS 7	15	Embrun Realty - Séguin St.	0.7	6
SPS 7	43	Brunet Gervais - 735 Notre-Dame	0.4	20
SPS 7	62E	Embrun Ford / Business Park Embrun	1.4	100
SPS 8	13	Melanie Construction Faubourg Ste Marie	19.5	123
SPS 8	53	Melanie Construction - Ste-Marie East	4.2	56
SPS 8	54	Melanie Construction - Ste Marie East	6.9	118
SPS 8	57	Melanie Construction - Ste-Marie West	33.0	65
SPS 8	60	M. Bruyere Land	20.5	64
	1	Lapointe (Maplevale)		1
	2	Lemieux (Radisson)		1
		Total	212.3	2,145



- Sanitary Sewer Pumping Station
- Sanitary Sewer
- Sanitary Forcemain
- Surcharged Sanitary Sewer
- Future Development up to 2031
- Future Commercial 2031 to Buildout
- Future Residential 2031 to Buildout

Sanitary Sewer Drainage Areas

- Pumping Station 1 Drainage Area
- Pumping Station 2 Drainage Area
- Pumping Station 3 Drainage Area
- Pumping Station 4 Drainage Area
- Pumping Station 5 Drainage Area
- Pumping Station 6 Drainage Area
- Pumping Station 7 Drainage Area
- Pumping Station 8 Drainage Area
- Embrun Lagoons
- 13 2016 - 2021 Development
- 15 2021 - 2026 Development
- 51 2026 - 2031 Development



WSP

Project No. 141-18986-00

Russell Township
Water & Wastewater
Master Plan Update

0 250 500 750 m

1:18,000

Figure 5-9

Sewers Approaching Capacity
Embrun

6 PROBLEM DEFINITION

As indicated in Section 2.3, Phase 1 of the Municipal Class EA process involves establishing the objectives of the Study and defining the "Problem."

Some of the existing water and wastewater infrastructure is insufficient to meet the needs for the projected population growth (residential and employment) in the Study Area.

Therefore, the Problem/Opportunity for the Township of Russell Water and Wastewater Master Plan has been defined as follows:

How to provide municipal water and wastewater infrastructure to service the growth forecasted to the year 2031, while minimizing impacts on the natural, cultural, social, and agricultural features in the study area.

7 ALTERNATIVE SOLUTIONS

As indicated in Section 2.3, Phase 2 of the Municipal Class EA process involves identifying and evaluating alternative solutions to the problem or opportunity described in Phase 1.

The alternatives to provide water and wastewater servicing to the Study Area as described below.

7.1 WATER SYSTEM

In Section 5.4, the following issues/constraints were identified:

- The existing water supply capacity from Ottawa is sufficient to meet the demands forecasted for the Township. However, the system is vulnerable in case of a break to the Russell Feedermain from Ottawa.
- The distribution system in Embrun is vulnerable to breaks (particularly along Notre-Dame Street).
- Additional pumping capacity would be required to provide adequate fire protection to Marionville.
- The 417 Industrial Park is currently not connected to the municipal water system.

Given these limitations/issues, four alternative solutions were identified for the Township's Water System:

7.1.1 W1 - DO NOTHING

No infrastructure upgrades would be carried out to the distribution system.

This alternative would allow servicing some of the growth in Russell and Embrun. However, the The issues in the Embrun and Marionville distribution systems would not be addressed and the system would continue to be vulnerable to a loss of supply from Ottawa. No municipal water servicing would be available to the 417 Industrial Park.

7.1.2 W2 - WATERMAIN FROM EADIE RD. METERING CHAMBER TO BOOSTER PUMPING STATION AND RESERVOIR IN THE 417 INDUSTRIAL PARK

The Booster Pumping Station/Reservoir would include a rechloramination system and would provide sufficient storage for fire protection and emergency reserve to the Industrial Park. This option would allow servicing of the Industrial Park by connecting directly to the Russell Feedermain from Ottawa.

A new watermain along Industrial Avenue would be constructed to provide redundancy in Embrun. The Marionville Booster Pumping Station would be upgraded to provide additional capacity for fire protection.

This option would provide servicing to the Industrial Park and resolve other issues in the Embrun and Marionville distribution systems. However, it would not address the issue of lack of redundancy in the source of supply. Alternative W2 is shown schematically in the figure below.

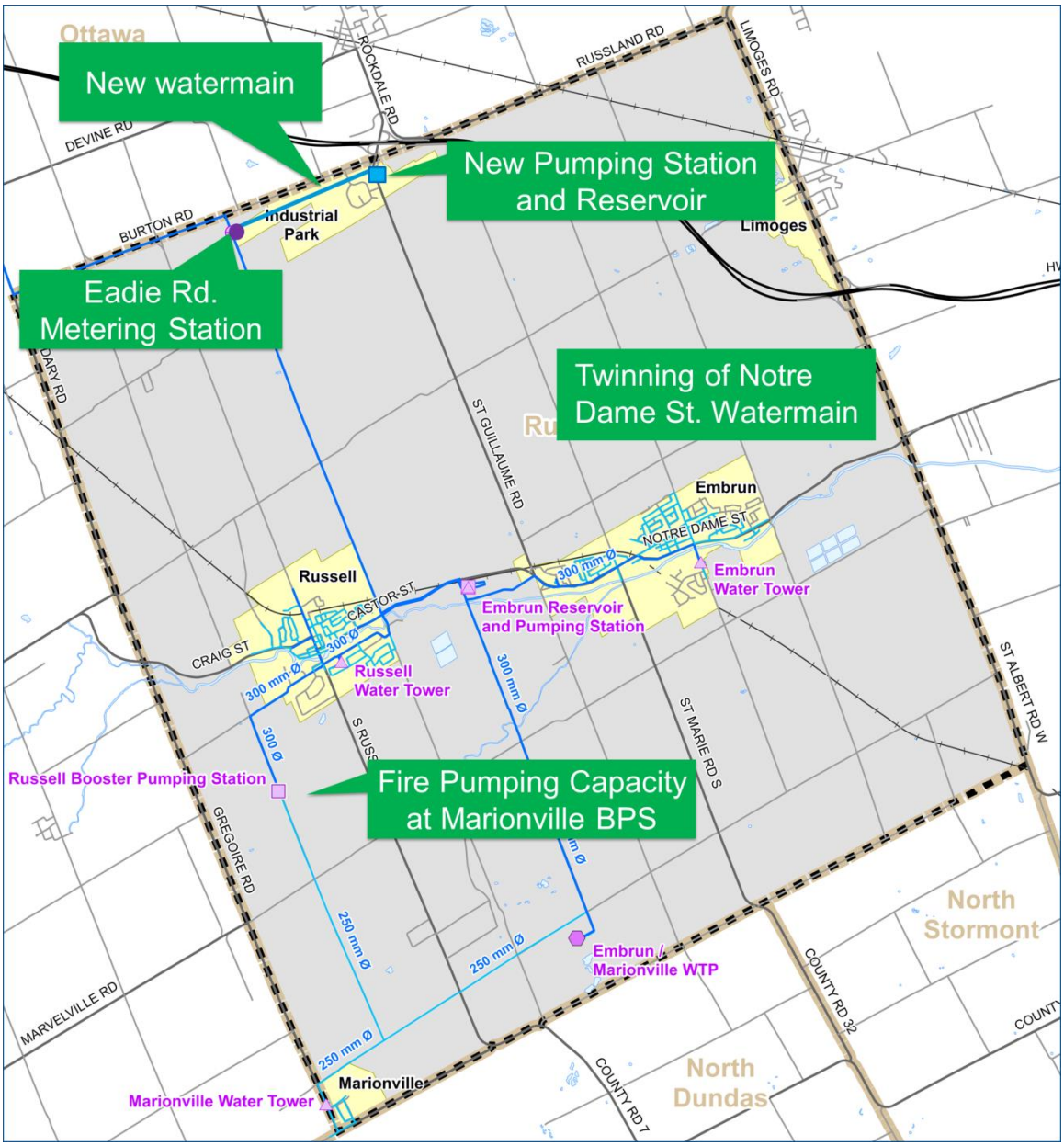


Figure 7-1 Alternative W2 - New watermain connection to Eadie Rd. Metering Chamber and New Booster Pumping Station and Reservoir in 417 Industrial Park

7.1.3 W3 - WATERMAIN FROM EADIE RD. METERING CHAMBER TO NEW BOOSTER PUMPING STATION AND RESERVOIR AND NEW FEEDERMAIN FROM EMBRUN RESERVOIR

This option is a variation of Alternative W2 that includes a new watermain extending from the Embrun Reservoir to a new Booster Station/Reservoir in Industrial Park.

As part of this alternative, the Marionville Booster Pumping Station would also be upgraded to provide additional capacity for fire protection, and a new watermain along Industrial Avenue would be constructed to provide redundancy in Embrun.

This option would provide servicing to the Industrial Park and resolve other issues in the Embrun and Marionville distribution systems. This option would also provide additional flexibility and storage capacity to the Township in case of loss of supply from Ottawa. The reservoir and booster station in the Industrial Park would act as a second hub in the distribution system providing back-up supply to Russell, Embrun and Marionville (via Russell) in case of a failure at the Embrun Reservoir. Alternative W3 is shown schematically in the figure below.

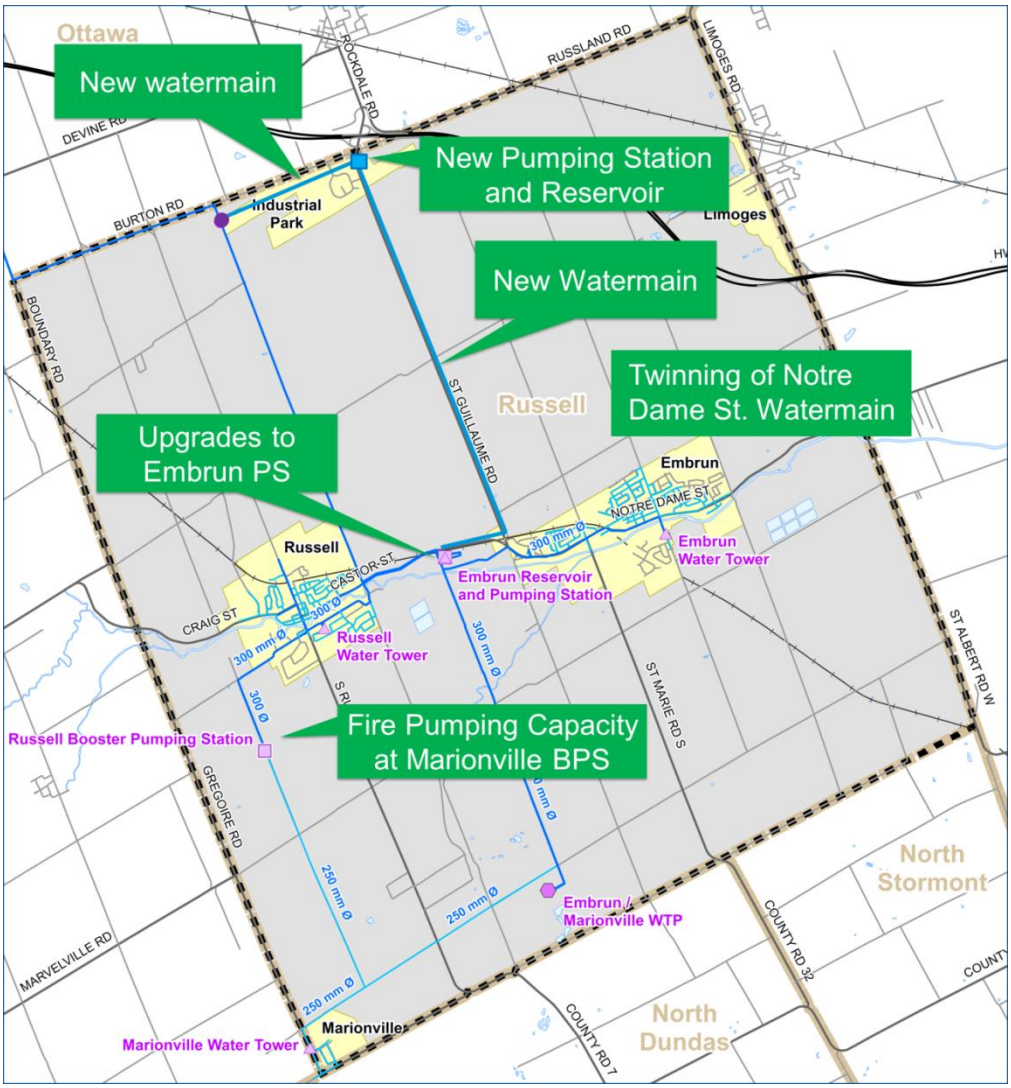


Figure 7-2 Alternative W3 - Watermain connection to Eadie Rd. Metering Chamber, Industrial Park Booster Station/Reservoir and Feedermain from Embrun Reservoir to Industrial Park

7.1.4 W4 – RECOMMISSIONING OF EMBRUN/MARIONVILLE WTP AND WATERMAIN FROM THE EMBRUN RESERVOIR TO 417 INDUSTRIAL PARK

The Embrun/Marionville Water Treatment Plant (WTP) is currently out of commission. The majority of the equipment is still in good condition. However, some upgrades would be required to bring back the facility to working order.

There is an existing 300 mm diameter watermain connection from the WTP to the Embrun Reservoir which would allow the water produced at the WTP to be distributed to Russell or Embrun. There is also a 250 mm watermain from the WTP to Marionville.

The WTP's rated capacity of 5,616 m^3/d would be sufficient to satisfy the demand requirements of the Industrial Park (WSP, 2015).

This option would involve the construction of a new watermain from the Embrun Reservoir to the Industrial Park. An elevated tank would be constructed at the Industrial Park to provide balancing, fire and emergency storage to the Industrial Park.

The Embrun/Marionville WTP would be dedicated to supply the Industrial Park while Russell, Embrun and Marionville, would continue to be serviced by the Ottawa supply.

In case of a loss of supply from Ottawa, however, the water produced at the WTP could be used to feed the rest of the system albeit requiring the operation of valves at the Embrun Reservoir and the issuance of a drinking water advisory.

As part of this alternative, the Marionville Booster Pumping Station would also be upgraded to provide additional capacity for fire protection, and a new watermain along Industrial Avenue would be constructed to provide redundancy in Embrun.

Alternative W4 would provide servicing to the Industrial Park and resolve other issues in the Embrun and Marionville distribution systems. This option would also provide additional flexibility and storage capacity to the Township in case of loss of supply from Ottawa. The Embrun/Marionville WTP would act as a second source of supply to the in the distribution system.

Alternative W4 is shown schematically in Figure 7-3 below.

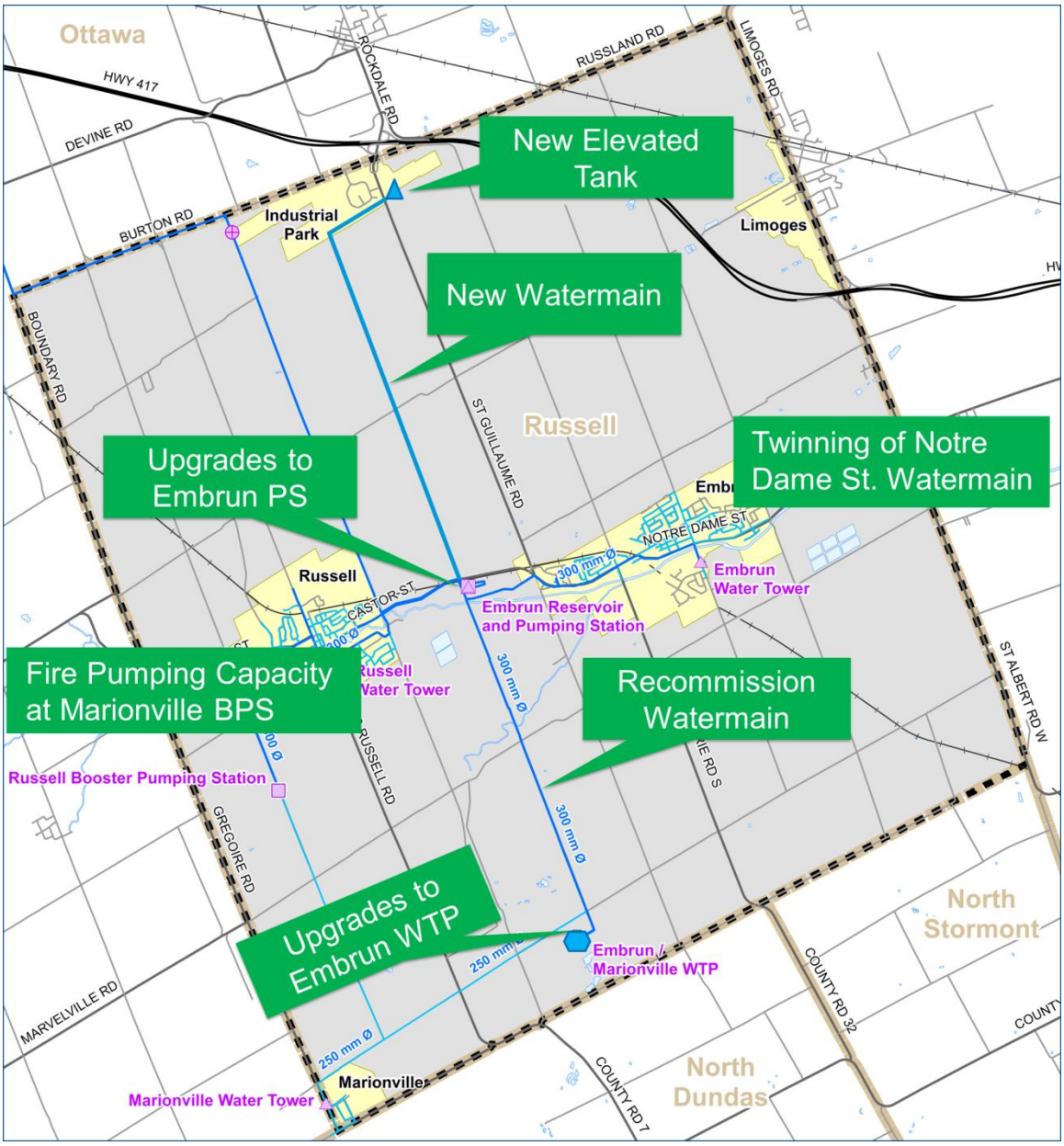


Figure 7-3 Alternative W4 – Recomissioning of Embrun/Marionville WTP and Watermain from Embrun Reservoir to 417 Industrial Park

7.2 WASTEWATER SYSTEM

In Section 5.5, the following issues/constraints were identified:

- The capacity of the Russell Lagoon Facility will be exceeded after 2026. A capacity expansion would be required before 2031.
- The capacity of SPS 1 in Russell would be exceeded sometime after 2026. A capacity expansion would be required before 2031.

- The capacity of SPS 1 and SPS 2 in Embrun would be exceeded sometime after 2026. A capacity expansion would be required before 2031.
- The capacity of SPS 3 and SPS 7 in Embrun are approaching their rated capacity. A capacity expansion would be required within the next five to 10 years.
- There are some sewers in the Russell collection system, particularly along Craig Street and Mill Street, that are reaching their hydraulic capacity (a hydraulic model and flow monitoring is required to confirm).
- There are some sewers in the Embrun collection system, particularly along Notre-Dame Street, that are reaching their hydraulic capacity (a hydraulic model and flow monitoring is required to confirm).
- The 417 Industrial Park is currently not connected to the municipal wastewater system.

Given these limitations/issues, three alternative strategies were identified for wastewater servicing.

Several alternatives specific to the servicing of the 417 Industrial Park were reviewed as part of a separate study (WSP, 2015). The preferred alternative amongst those considered was adopted for this evaluation.

7.2.1 WW1 – DO NOTHING

No infrastructure upgrades would be carried out to the wastewater systems. Both the Russell and Embrun Lagoon Facilities have the ability to service growth forecasted in the two communities. However, the capacity of some of the sewage pumping stations in Russell and some in Embrun would be a constraint to future development.

No municipal wastewater servicing would be available to the 417 Industrial Park as it would only allow only partial servicing within Embrun and Russell, and would not allow development of the Industrial Park.

This alternative does not address the Problem defined as part of this Master Plan.

7.2.2 WW2 – UPGRADES TO RUSSELL AND EMBRUN SYSTEMS ONLY

This alternative involves addressing capacity constraints within the Russell and Embrun collection systems, specifically by increasing the capacity of SPS 1, in Russell and SPS 1, SPS 2, SPS 3 and SPS 7 in Embrun. However, this alternative does not include the provision of infrastructure to service the Industrial Park.

This alternative does not address the Problem defined as part of this Master Plan as it would only allow servicing within Embrun and Russell, but would not allow development of the Industrial Park. Alternative WW2 is shown in Figure 7-4 below.

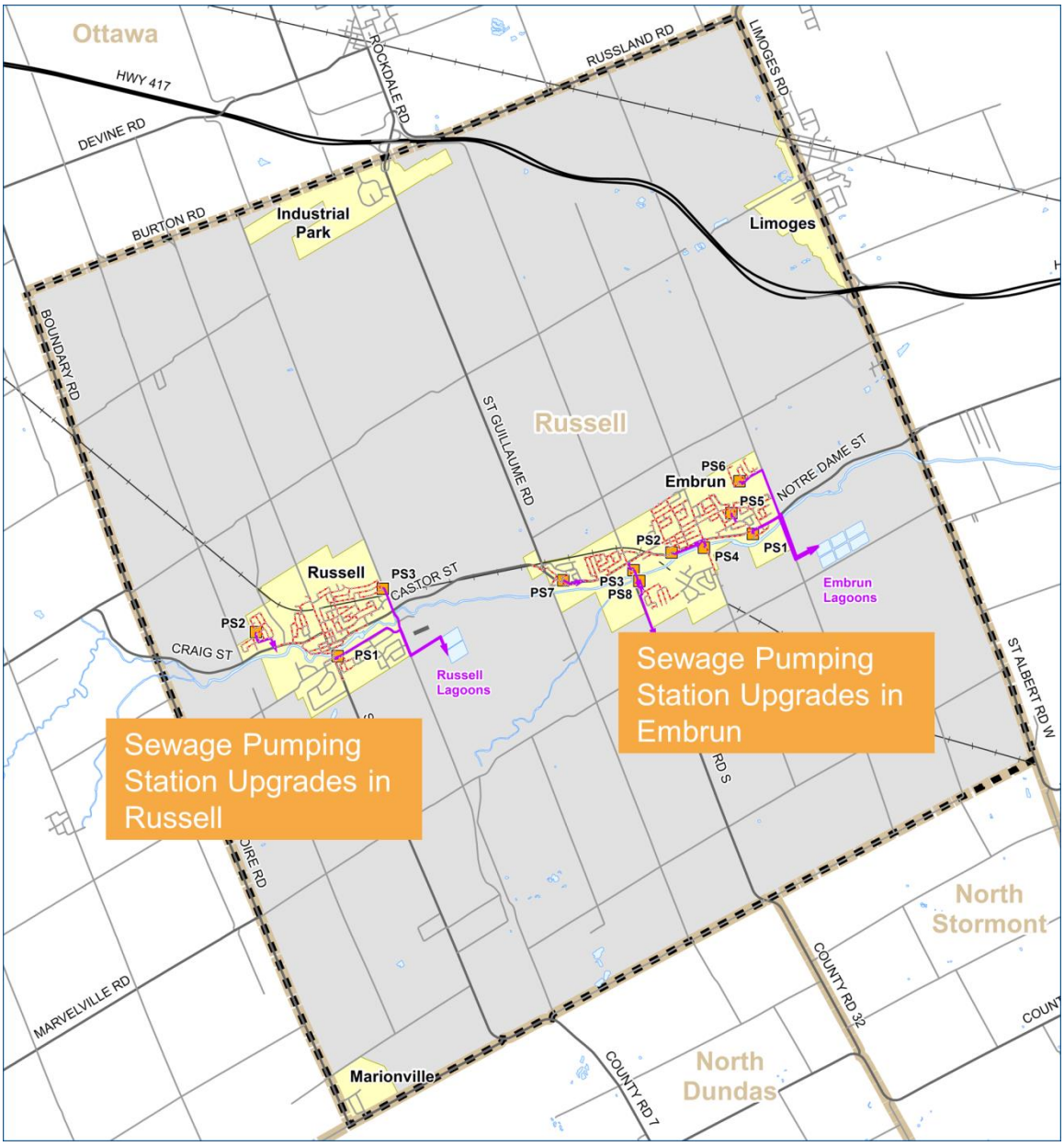


Figure 7-4 Alternative WW2 - Upgrades to Russell and Embrun Systems Only

7.2.3 WW3 – UPGRADES TO RUSSELL AND EMBRUN SYSTEMS AND PUMPING STATION AND FORCEMAIN FROM INDUSTRIAL PARK TO RUSSELL LAGOON FACILITY

This alternative involves constructing a new sewage pumping station near the 417 Industrial Park and a forcemain(s) discharging directly to the Russell Lagoons. The capacity constraints within the Russell and Embrun collection systems would be addressed, specifically by increasing the capacity of SPS 1, in Russell and SPS 1, SPS 2, SPS 3 and SPS 7 in Embrun.

This alternative would fully address the Problem defined as part of this Master Plan. Alternative WW3 is shown in Figure 7-5 below.

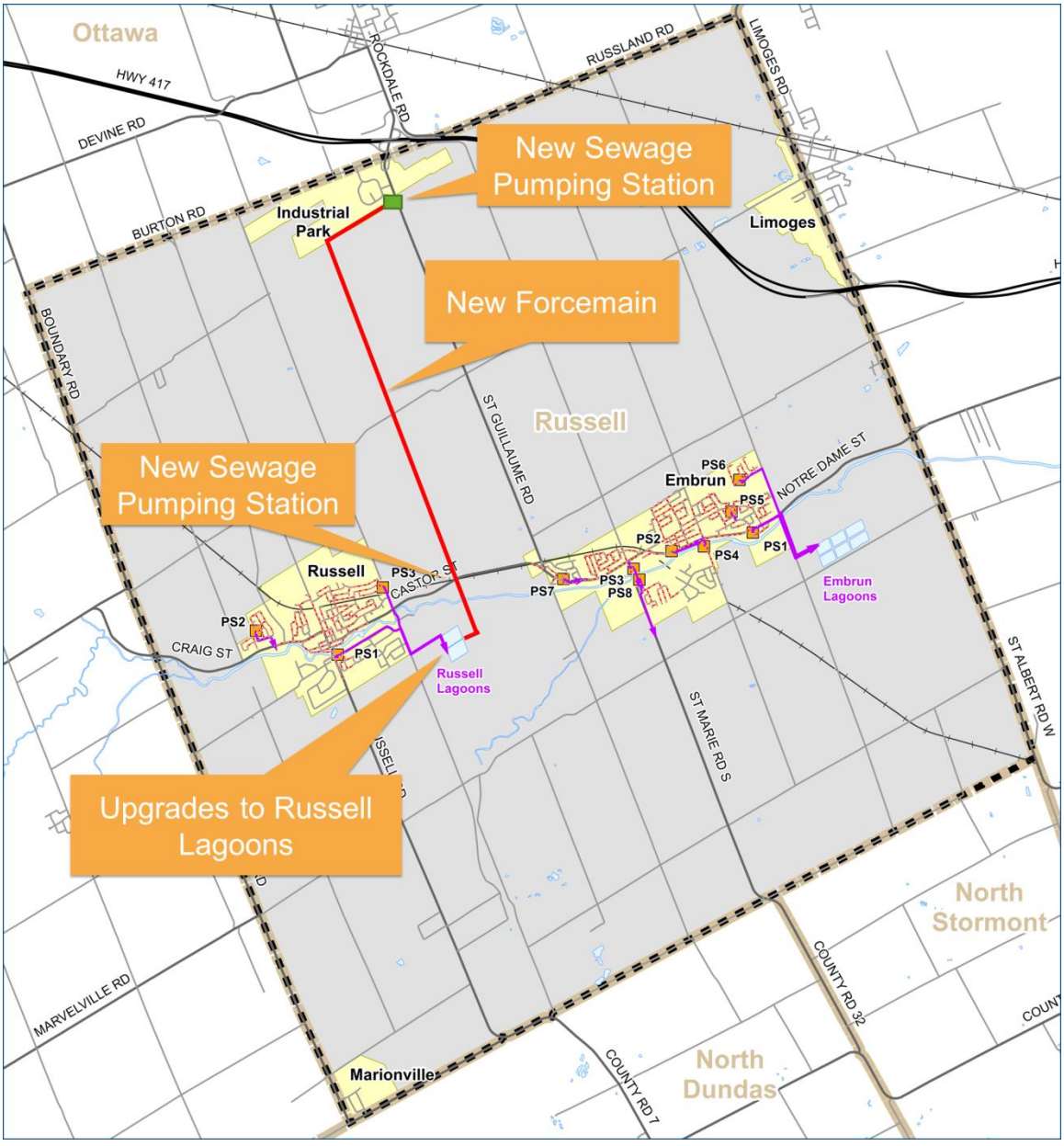


Figure 7-5 Alternative WW2 - Upgrades to Russell and Embrun Systems and Pumping Station and Forcemain from Industrial Park to Russell Lagoon Facility

8 EVALUATION OF ALTERNATIVES

8.1 EVALUATION APPROACH AND EVALUATION CRITERIA

The approach used to determine the preferred alternatives for Water and Wastewater Servicing of growth in the Township of Russell is explained below. A matrix was created to document the advantages and disadvantages of each alternatives, and to ultimately determine the preferred solution.

- **Define Evaluation Criteria** – Criteria were defined for the evaluation of the alternatives. The evaluation criteria for this project included (1) impact on the natural environment, (2) impact on the social and cultural heritage, (3) economic viability, and (4) technical and operational merit. The four evaluation criteria were considered to have equal importance in this evaluation.
- **Document Advantages, Disadvantages and Potential Impacts** – The impacts associated with each alternative were determined and documented. These impacts were categorized under one of the four evaluation criteria.
- **Compare Alternatives –** Each alternative's performance with respect to the evaluation criteria was compared to that of the other alternatives. Three ratings were used to describe an alternative's relative performance on a specific criterion: "most preferred", "less preferred" and "least preferred." This was represented visually by assigning colors, green for "most preferred", yellow for "less preferred" and orange for "least preferred."
- **Determine the Preferred Alternative –** The servicing alternative with the least overall impact was considered to be preferred and recommended for implementation.

The evaluation assessed the relative advantages and disadvantages of the alternative solutions in consideration of their net environmental effects. These are the residual effects to the environment once reasonable mitigation measures have been implemented. Net effects include the impacts associated of construction, operation, maintenance and decommissioning activities for each of the options as well as the social aspects of the environment (i.e. debt, changes in operation).

As explained above, the evaluation methodology involves the assessment of the impacts associated with the water and sewer servicing alternatives on four main evaluation criteria categories. Evaluation criteria for this project included impact on the natural environment, impact on the social and cultural environments, economic impact, and technical and operational merit. A more detailed breakdown of the impacts in their respective criterion category is provided in Table 3.1-1.

NATURAL ENVIRONMENT

- Surface water and groundwater impacts
- Watercourse crossings and fisheries
- Impact on natural heritage features / vegetation

SOCIAL AND CULTURAL HERITAGE

- Impact to built-up areas
- Impacts to private properties
- Compatibility with proposed land uses

TECHNICAL SUITABILITY

- Ease of construction and site access
- Soil/Ground conditions
- Impact on operations during construction
- Ease of integration with existing infrastructure
- Location and impacts to other utilities
- Road / Railway crossings
- Ease of operation
- Effect on ability to expand system
- Impact on vulnerability to future climate changes (I&I, pipe depth, flood-proofing facilities, etc.)

ECONOMIC VIABILITY

- Capital Costs
- Operation and Maintenance (including energy) Costs

8.2 WATER SYSTEM ALTERNATIVE EVALUATION

The evaluation of each of the four alternatives is presented in Table 8-1.

All water options were considered to be equivalent in terms of their impact to the environment given that there are no water crossings and no natural features in the proximity of the infrastructure associated with each alternative.

The Do Nothing alternative was considered to have a negative social impact given that it would not address the Problem identified as part of the Master Plan. Namely, it would not allow for servicing of the 417 Industrial Park. Furthermore, the lack of redundancy in the source of supply could have a negative impact in case of a break to the Russell Feedermain. Infrastructure related to the other alternatives would be constructed outside areas having archeological, heritage or cultural interest.

Table 8-1 Evaluation of Alternatives – Water System

	ALTERNATIVE W1 Do Nothing	ALTERNATIVE W2 Watermain from Eadie Road to Booster Station/Reservoir in 417 Industrial Park	ALTERNATIVE W3 Watermain from Eadie Rd. Metering Chamber to Booster Station/Reservoir and Feedermain from Embrun Reservoir	ALTERNATIVE W4 Recommissioning of Embrun/Marionville WTP and watermain from the Embrun Reservoir to 417 Industrial Park
NATURAL ENVIRONMENT				
Surface water and groundwater impacts	No construction involved. Therefore, no impacts on surface water/groundwater.	Construction limited to unopened road allowances. Private wells in Industrial Park to be decommissioned.	Construction limited to unopened road allowances. Private wells in Industrial Park to be decommissioned.	Construction limited to unopened road allowances. Private wells in Industrial Park to be decommissioned.
Watercourse crossings and impact on fisheries	No watercourse crossings.	No watercourse crossings.	No watercourse crossings.	No watercourse crossings.
Impact on natural heritage features/vegetation	No impact on natural heritage features.	No impact on natural heritage features.	No impact on natural heritage features.	No impact on natural heritage features.
SOCIAL AND CULTURAL HERITAGE				
Impact to built-up areas	No impact.	No impact.	No impact.	No impact.
Impacts to private properties	Industrial Park development would be limited due to lack of municipal water supply.	Municipal water supply would encourage development in 417 Industrial Park.	Municipal water supply would encourage development in 417 Industrial Park.	Municipal water supply would encourage development in 417 Industrial Park.
Compatibility with proposed land uses	Limited redundancy and security of supply.	Some redundancy and security of supply.	New booster station/reservoir to be designed to blend in with surrounding development. Good redundancy and security of supply.	Good redundancy and security of supply.
TECHNICAL SUITABILITY				
Ease of construction and site access	Not applicable given that no infrastructure would be constructed.	Construction to occur on undeveloped lands along unopened road allowances.	Construction to occur on undeveloped lands along unopened road allowances.	Construction to occur on undeveloped lands along unopened road allowances.
Soil/ground conditions	Status quo is sufficient to service growth within Russell, Embrun and Marionville. However, no ability to service Industrial Park.	New infrastructure to service Industrial Park could be constructed independently of the operation of the existing system.	New infrastructure to service Industrial Park could be constructed independently of the operation of the existing system.	New infrastructure to service Industrial Park could be constructed independently of the operation of the existing system.
Impact on operations during construction	Does not address the Problem identified in the Master Plan.	The supply to the Industrial Park would be independent of the supply to the rest of the system.	Connection from Industrial Park supply would provide flexibility in case of a temporary loss of supply from the City of Ottawa.	A new Permit to Take Water would be required for the Embrun/Marionville WTP.
Ease of integration with existing infrastructure	System vulnerable to a loss of supply from Ottawa.			Connection from Industrial Park supply would provide some flexibility in case of a loss of supply from the City of Ottawa.
Location and impacts to other utilities				
Road / Railway crossings				
Ease of operation				
Effect on ability to expand infrastructure				
Reduce vulnerabilities to future climate changes				
ECONOMIC VIABILITY				
Capital costs	$0	$2.5M-$5M	$5M-$7.5M	$7.5M - $10M
Relative operation and maintenance costs (incl. energy)	No additional O&M costs	Medium O&M Costs – Additional requirements to operate and maintain new Industrial Park facilities.	Medium O&M Costs – Additional requirements to operate and maintain new Industrial Park facilities.	High O&M Costs – Additional requirements to operate and maintain new Industrial Park facilities and the Embrun/Marionville WTP.
SUMMARY	**Least preferred**: does not address the Problem defined by the Master Plan.	**Less Preferred**	**Most Preferred**	**Less Preferred**

8.1 WASTEWATER SYSTEM ALTERNATIVE EVALUATION

Table 8-2 Evaluation of Alternatives – Wastewater System

	ALTERNATIVE WW1 Do Nothing	ALTERNATIVE WW2 Upgrades to Russell and Embrun Systems Only	ALTERNATIVE WW3 Upgrades to Russell and Embrun Systems and Pumping Station and Forcemain from Industrial Park to Russell Lagoons
NATURAL ENVIRONMENT			
Surface water and groundwater impacts Watercourse crossings and impact on fisheries Impact on natural heritage features/vegetation	There is potential for contamination of the groundwater from the existing septic tanks in the Industrial Park. No watercourse crossings. No impact on natural heritage features.	There is potential for contamination of the groundwater from the existing septic tanks in the Industrial Park. Upgrades to sewage pumping stations would generally be limited to replacement of pumps with larger capacity pumps. Upgrades to forcemains would be constructed along road allowances. Therefore, limited impact to natural environment. No watercourse crossings. No impact on natural heritage features.	Upgrades to sewage pumping stations would generally be limited to replacement of pumps with larger capacity pumps. Upgrades to forcemains would be constructed along road allowances. Therefore, limited impact to natural environment. Construction limited to unopened road allowances. Private septic tanks and wells in Industrial Park to be decommissioned. No watercourse crossings. No impact on natural heritage features.
SOCIAL AND CULTURAL HERITAGE			
Impact to built-up areas Impacts to private properties Compatibility with proposed land uses	No impact. Industrial Park development would be limited due to lack of municipal wastewater servicing.	Some impacts on traffic during construction due to transport of materials and equipment. Industrial Park development would be limited due to lack of municipal wastewater servicing.	Some impacts on traffic during construction due to transport of materials and equipment. Municipal wastewater servicing would encourage development in 417 Industrial Park. Sewage pumping station in Industrial Park to be designed to blend in with future development. Odour control would be implemented.
TECHNICAL SUITABILITY			
Ease of construction and site access Soil/ground conditions Impact on operations during construction Ease of integration with existing infrastructure Location and impacts to other utilities Road / Railway crossings Ease of operation Effect on ability to expand infrastructure Reduce vulnerabilities to future climate changes	Not applicable given that no infrastructure would be constructed. Status quo is sufficient to service some growth within Russell and Embrun. However, no ability to service Industrial Park. Does not address the Problem identified in the Master Plan.	A bypass plan to be developed for upgrades to pumping stations to be carried out without affecting operation. There is sufficient capacity to facilitate expansion of Russell Lagoons while maintaining the existing facility in operation. Forcemain construction may impact roadways. Traffic control plans to be implemented. The system would continue to operate as it does now. This alternative does fully address the Problem identified in the Master Plan.	A bypass plan to be developed for upgrades to pumping stations to be carried out without affecting operation. There is sufficient capacity to facilitate expansion of Russell Lagoons while maintaining the existing facility in operation. Forcemain construction may impact roadways. Traffic control plans to be implemented. The system would continue to operate as it does now. Design of new sewage pumping station in Industrial Park to be modular to allow for phased development in the Park.
ECONOMIC VIABILITY			
Capital costs Relative operation and maintenance costs (incl. energy)	$0 No additional O&M costs	$5M-$7.5M (However, capital costs to be recovered through development charges) Medium O&M Costs – Some additional requirements to operate and maintain larger capacity facilities.	$15M-$17.5M (However, capital costs to be recovered through development charges) Medium O&M Costs – Additional requirements to operate and maintain new Industrial Park facilities.
SUMMARY	**Least preferred**: does not address the Problem defined by the Master Plan.	**Less Preferred**	**Most Preferred**

9 PUBLIC AND AGENCY CONSULTATION

9.1 POINTS OF CONTACT

Consultation with the public (which includes stakeholders and interested parties) and government review agencies is a necessary and important component of the Municipal Class EA process. To meet the Class EA consultation requirements for this Master Plan, the Township issued notices on the local newspaper and on the Township's website to advise the public of the Study and provide the opportunity to provide input on the assessment and evaluation process for the alternatives identified in the Master Plan. The following sub sections provide a summary of the key points of contact that were established throughout the course of the Study.

9.1.1 NOTICE OF STUDY COMMENCEMENT

The Notice of Study Commencement was developed to target the ministries, organizations, agencies and other stakeholders that may be affected and/or interested in the Master Plan. The Notice of Study Commencement was published on the Township's website on August 25, 2014. The notice briefly outlined the purpose and justification for the Study and also indicated that a Public Information Centre would be held.

The Notice of Study Commencement can be found in **Appendix F**.

9.1.2 NOTICE OF PUBLIC INFORMATION CENTRE

A Notice of Public Information Centre (PIC) was developed and published on the Township's website on October 1, 2015 with the objective of informing the general public and other stakeholders of the Study. The notice briefly outlined the purpose and justification for the Study. It also indicated that a PIC would be held on October 13, 2015 to present the alternative water and wastewater servicing solutions, the evaluation of the alternatives and the preferred recommended solution.

9.1.3 PUBLIC INFORMATION CENTRE (PIC)

The Township of Russell Water and Wastewater Master Plan PIC was held on October 13, 2015 at the Municipal Town Hall, to present an overview of the Study, the water and wastewater servicing alternatives considered, the evaluation criteria and methodology that were used, and the preferred alternatives. The purpose of this Public Information Centre was to communicate the process used to carry out the Study and provide an opportunity to receive comments on both the approach followed and on the preferred recommended solution. A copy of the material presented at the PIC is included in **Appendix G**.

9.1.4 NOTICE OF STUDY COMPLETION

A Notice of Study Completion will be published on the Township's website and sent to key stakeholders upon filing of this Master Plan Report. This Notice is relevant for two reasons: it provides the public and relevant agencies with a final 30 day period to review the final conclusions of the Study, and it informs the general public of the outcome of the Study and the nature of the resulting projects.

The Notice was sent to the MOECC Environmental Approvals Branch and to the Ministry's Cornwall office. The Notice was also forwarded to the Counties of Prescott-Russell, the Nation Municipality, the Township of North Stormont, the Township of North Dundas, the City of Ottawa, and the South Nation Conservation Authority. No comments were received.

10 PREFERRED SOLUTION

As a result of the evaluation performed in the Section 8, preferred solutions have been identified to provide water and wastewater servicing to satisfy growth in the Study Area to the year 2031.

The preferred water servicing solution is Alternative W3, which consists of constructing a new watermain from the Eadie Road Metering Station to the 417 Industrial Park. A new reservoir/booster station would be constructed in the Industrial Park. The water received from Ottawa would be rechloraminated and pumped to service the Park. A watermain would be constructed from the reservoir/booster station to the Embrun Reservoir. This would provide an alternate feed to supply the Embrun and Russell systems. The preferred alternative is shown in Figure 10-1.

The preferred wastewater servicing solution is Alternative WW3, which involves upgrading the capacity of pumping stations in Russell and Embrun, the expansion of the Russell Lagoon Facility, and the construction of a new sewage pumping station in the 417 Industrial Park discharging directly to the Russell Lagoons. The preferred alternative is shown in Figure 10-2.

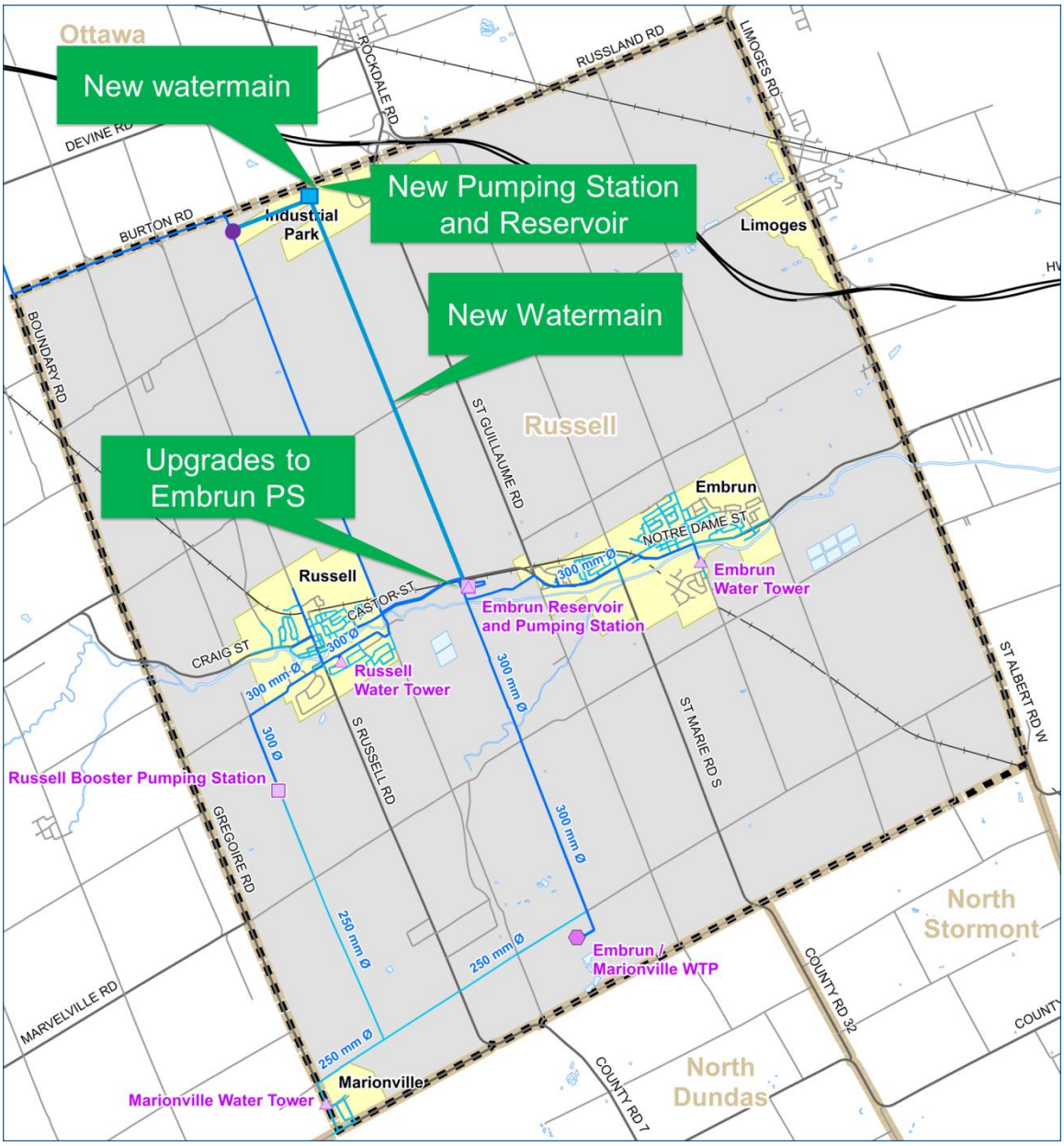


Figure 10-1 Preferred Water Servicing Alternative

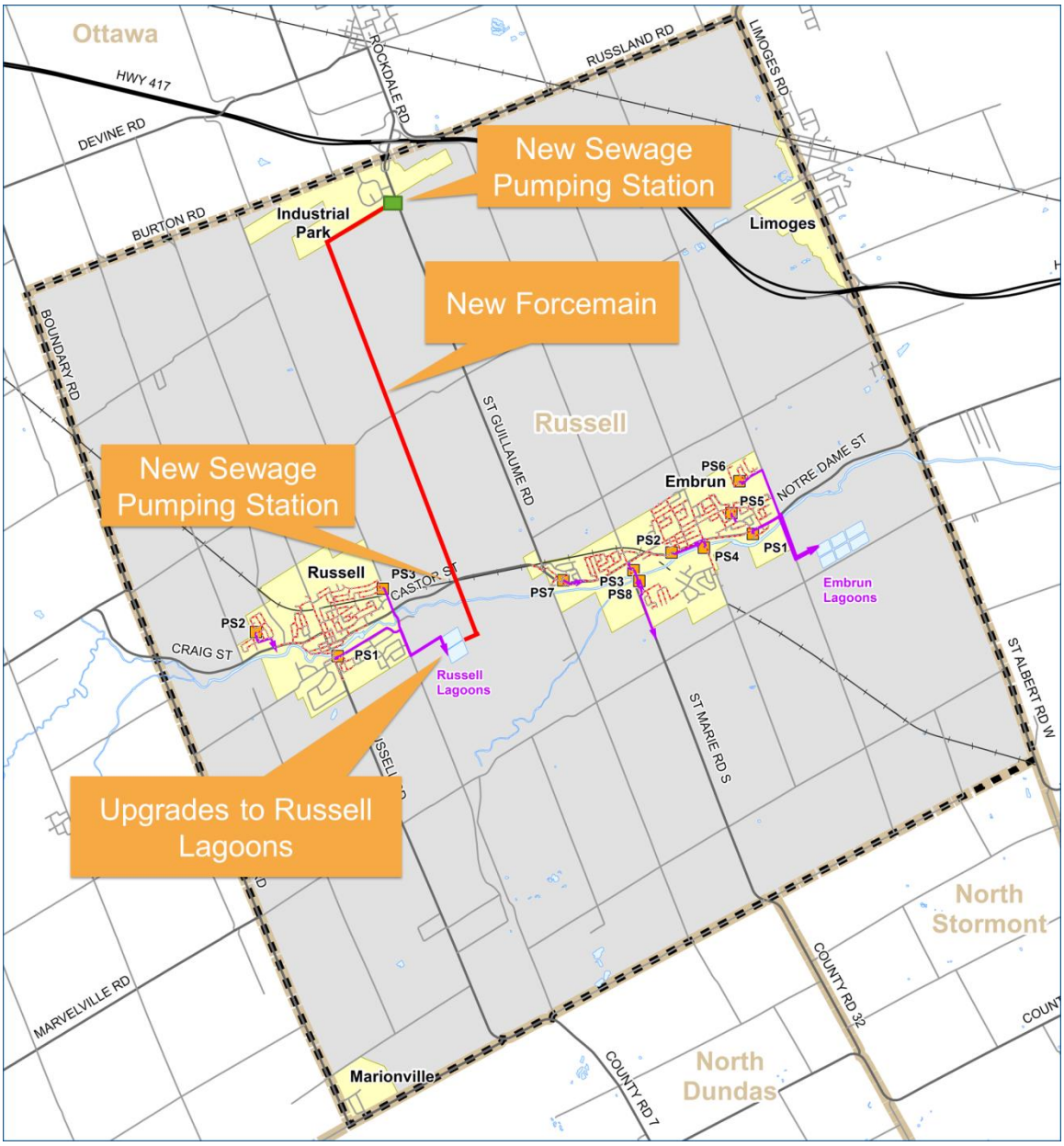


Figure 10-2 Preferred Wastewater Servicing Alternative

As explained above, this Master Plan report fulfills the requirements for Phase 1 and 2 of the Municipal Class EA process. However, additional planning and consultation is required for projects deemed to be Schedule B or Schedule C projects. Other projects (falling under the scope of Schedule A or A+ activity per the Municipal Class EA process) can proceed directly to implementation.

10.1 CAPITAL INVESTMENT PROGRAM

Planning level estimates were developed for the infrastructure upgrades identified as part of the preferred servicing alternatives.

These values are only to be used to provide an order of magnitude estimate to facilitate the initial decision making. These cost estimates will need to be further refined as the scope of specific works is further defined and the conceptual design of the required upgrades is carried forward. Furthermore, some of the projects will require additional study to satisfy the requirements of the Municipal Class EA process (Municipal Engineers Association, 2011).

Unit cost databases were used to estimate the total project costs. These databases have been developed based on recent experience with similar projects in Ontario. However, where applicable, the cost estimates have been refined based on unique aspects of the implementation or construction of a specific project. Allowances for planning, design, program management, contract administration, environmental monitoring during construction and contingencies were included as percentages of the capital cost where appropriate. The cost estimates were developed in 2015 dollars.

10.1.1 WATER SYSTEM

Table 10-1 below includes a description of each project recommended as part of the preferred servicing strategy including the year when the project needs to be completed and whether a Municipal Class EA (Schedule B or C) is required. This list can be used to develop a capital investment program for the Township's Water System. The project list below includes major infrastructure projects required to address existing system deficiencies or which provide additional capacity to service both existing and new development. Local distribution watermains specifically required to service new growth areas are not included in the list below as it is expected they will be included in the Agreements of Subdivision for the various developments.

These projects are aimed to ensuring adequate fire flows and system pressures and providing security of supply for the system overall, while some are specifically aimed to servicing new development areas.

As noted above, the timing of these projects is dependent on the order in which the various areas are developed. If the order of magnitude or the number of units developed varies from the phasing described in Section 5.2, the servicing requirements will need to be reviewed and updated. Table 10-1 should be read in conjunction with Figure 10-1.

It is recommended that the Township develop a community growth strategy that targets priority areas to be developed. After this has been defined, the collection system upgrades can be implemented in a logical order.

Table 10-1 Water System Projects (2016-2021)

PROJECT NO.	YEAR REQUIRED	PROJECT	DESCRIPTION	ESTIMATED COSTS (2015$)	CLASS EA SCHEDULE	TRIGGER
W-01	2016-2021	Secondary Watermain Loop	New watermain along Industrial Avenue	$230,000	Schedule A	Watermain required to provide security of supply and redundancy in the Embrun distribution system
W-02	2021-2031	Industrial Park Servicing	Booster station and reservoir in the Industrial Park and watermain to Embrun Reservoir	$4,855,500	Schedule B	To service the Industrial Park and to provide redundancy

10.1.2 WASTEWATER SYSTEM

Table 10-2 below includes a description of each project recommended as part of the preferred servicing strategy including the year when the project needs to be completed and whether a Municipal Class EA is required. This list can be used to develop a capital investment program for the Township's Wastewater Systems.

These projects are aimed to ensuring there is adequate conveyance capacity at the sewage pumping stations and the sewer system, and adequate treatment capacity at the lagoon facilities. Given that some of the upgrades required will involve additional investigation and the completion of a Municipal Class EA, capital cost estimates cannot be accurately determined as there are several alternative solutions to address the capacity deficit. The project list below only includes major infrastructure projects required to address existing system deficiencies or which provide additional capacity to service both existing and new development. Local sewers specifically required to service new growth areas are not included in the list below as it is expected they will be included in the Agreements of Subdivision for the various developments.

The timing of these projects is dependent on the order in which the various areas are developed. If the order of magnitude or the number of units developed varies from the phasing described in Section 5.2, the servicing requirements will need to be reviewed and updated.

It is recommended that the Township develop a community growth strategy that targets priority areas to be developed. After this has been defined, the collection system upgrades can be implemented in a logical order.

Table 10-2 should be read in conjunction with Figure 10-2.

Table 10-2 Wastewater System Projects (2016-2021)

PROJECT NO.	YEAR REQUIRED	PROJECT	DESCRIPTION	ESTIMATED COSTS (2015$)	CLASS EA SCHEDULE	TRIGGER
WW-01	2016-2021	Russell SPS 1 Upgrade	Capacity expansion	$270,000	Schedule B	To accommodate future growth from 2021 to 2031.
WW-02	2016-2021	Embrun SPS 3 Upgrade	Capacity expansion	$270,000	Schedule B	To accommodate future growth from 2021 to 2031.
WW-03	2021-2026	Embrun SPS 1 Upgrade	Capacity expansion	$670,000	Schedule B	To accommodate future growth from 2026 to 2031.
WW-04	2021-2026	Embrun SPS 2 Upgrade	Capacity expansion	$270,000	Schedule B	To accommodate future growth from 2026 to 2031.
WW-05	2021-2026	Embrun SPS 7 Upgrade	Capacity expansion	$270,000	Schedule B	To accommodate future growth from 2026 to 2031.
WW-06	2021-2026	Russell Lagoon Facility Expansion	Additional Aerated Cells and are for sludge removal	$3,750,000	Schedule C	To accommodate future growth from 2026 to 2031.
WW-07	2021-2031	Industrial Park Servicing	Sewage pumping station and forcemain discharging at the Russell Lagoon Facility	$8,444,135	Schedule B	To service the Industrial Park

10.2 POTENTIAL EFFECTS AND MITIGATING MEASURES

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

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

The infrastructure projects identified as part of the preferred water and wastewater servicing solution will have the potential for environmental impacts, and where these can be anticipated in the design stage, special provisions should be written into the construction specifications and/or incorporated in the design. The provisions will dictate the construction methods that are permitted and more importantly the construction methods that are not allowed during specific operations. Unforeseen problems that arise during construction will be addressed on site, and the proponent’s best judgment should be used to ensure that any resulting changes to the contract do not cause negative environmental impacts.

Staff responsible for inspecting the contractor’s work must be made aware of such provisions in order to ensure compliance during construction. It will be the responsibility of the proponent to ensure that inspectors enforce compliance with the environmental provisions, as well as the standard engineering provisions of the design.

10.2.1 NATURAL ENVIRONMENTAL IMPACTS

10.2.1.1 VEGETATION

Impacts to vegetation will, for the most part, be limited to some trees located within the working areas. Where possible and if required, mature trees will be protected with temporary construction fence to ensure that they are not damaged during construction.

10.2.1.2 WILDLIFE AND WILDLIFE HABITATS

Although rare wildlife species were not identified in the areas where the proposed infrastructure is envisioned, there may be some impact to wildlife inhabiting the working areas that may be displaced for the duration of construction. A detailed review of wildlife and wildlife habitats would be required for those projects requiring a Schedule B or Schedule C Class EA. However, since some of the facilities to be upgraded are surrounded by developed areas, the chances of at risk species existing in the vicinity are minimal. Once construction and subsequent restoration is complete, wildlife may introduce itself into the disturbed areas. A construction fence should be used to prevent wildlife from entering the working areas during the construction period.

10.2.2 SOCIAL, CULTURAL AND ECONOMIC IMPACTS

10.2.2.1 TRAFFIC

Impacts to traffic should be considered when defining the alignment of new forcemains/watermains. The watermain and forcemain(s) envisioned as part of the Industrial Park servicing are expected to

be constructed along an unopened road allowance. This will minimize the need for road closures. It is expected that there will be an increase in construction traffic for delivery of material and equipment during construction of the infrastructure. Construction signage will be posted on the impacted roads to make motorists aware of the construction entrances.

10.2.2.2 ARCHAEOLOGY AND HERITAGE FEATURES

An Archaeological Investigation was not carried out as part of this Master Plan. It is recommended that the Schedule B and Schedule C projects identified carry out a Stage 1 Archaeological Assessment on the proposed site(s), and if necessary a Stage 2 Assessment. This is recommended to avoid delays/extra costs given that in the event of a potential archaeological or heritage find during construction, all works would need to be suspended and the authorities contacted to investigate the site.

10.2.2.3 NOISE, DUST AND VIBRATION

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

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

10.2.2.4 ODOUR AND CORROSION

The preferred solution involves the construction of a new sewage pumping station to service the 417 Industrial Park. Consideration should be given during Class EA process to ensuring the formation of malodorous gases is minimized or reduced through adequate odour control technologies.

10.2.2.5 PUBLIC NOTIFICATION

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

11 CONCLUSIONS AND RECOMMENDATIONS

The following items summarize the key findings, conclusions and recommendations of the Water and Wastewater Master Plan:

- The available supply from the City of Ottawa (per the existing agreement to provide 11,860 m^3 over a 20 hour period) would be sufficient to service the projected growth in Russell, Embrun, Marionville and the 417 Industrial Park to the year 2031.
- The Township should however, negotiate with the City to get a 24-hour continuous supply.
- The Township would need to consult with the City of Ottawa to potentially increase the allocated capacity to accommodate growth beyond 2031.
- The available pumping and storage capacity within the water system overall is generally sufficient to meet MOE Guidelines and Fire Underwriters fire flow requirements. The exception is Marionville, which has a relatively large amount of emergency storage, but due to limited water usage in the community, is faced with issues of water quality. This in turn has led Township's operators to maintain the Marionville Water Tower half full, which leads to some vulnerability in case of a fire. Therefore, the need for additional fire pumping capacity for Marionville has been identified.
- The preferred water servicing alternative to accommodate growth to the year 2031 involves the construction of a new watermain from the Eadie Road Metering Station (which connects to the Russell Feedermain from Ottawa) to a new reservoir/booster station located in the vicinity of the 417 Industrial Park. A new watermain from this new reservoir/booster station to the Embrun Reservoir would also need to be constructed. This, along with some upgrades at the Embrun Reservoir, would allow for water from the Industrial Park facilities to be used to feed the Russell and Embrun systems and vice versa.
- The Russell Wastewater Collection System was deemed to generally have capacity to accommodate the forecasted growth. However, SPS 1 would need to be upgraded after 2026 to service the flows forecasted for 2031. Capacity limitations were identified in the Embrun Wastewater Collection System. SPS 1, SPS 2, SPS 3 and SPS 7 would need to be upgraded to service the flows forecasted for 2031.
- The preferred wastewater servicing alternative was to construct a new sewage pumping station at the or near the 417 Industrial Park which would discharge directly to the Russell Lagoon Facility.
- To accommodate flows from both growth in Russell and the 417 Industrial Park, the Russell Lagoons would need to be upgraded.
- A list of studies and capital projects associated with the preferred water and wastewater servicing solutions was provided. This can be used as the basis for an update to the Township's Development Charges By-law and to update the Township's Water and Wastewater Financial Plan.
- It is recommended that the Township develop a community growth strategy that targets priority areas to be developed. After this has been defined, the water system and collection system upgrades can be implemented in a logical order.
- It is recommended that the design criteria used for this Master Plan be reviewed annually to ensure they reflect the actual conditions of the water and wastewater systems. It is also recommended that the Master Plan be updated every five years after the completion of the Official Plan Amendment for the Township.

→ It is recommended that a sewer flow monitoring be implemented in the sewers identified to be approaching their capacity to determine whether the hydraulic model assumptions are correct and to more accurately assess upgrade requirements.

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Appendix A

HISTORICAL DATA WATER DEMANDS

APPENDIX A - HISTORICAL DATA WATER DEMANDS

	YEAR 1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
POPULATION																
Russell	3,099	3,177	3,450	3,537	3,561	3,579	3,621	3,636	3,642	3,718	3,910	3,898	4,242	4,501	4,776	5,102
Embrun	3,920	4,040	4,085	4,262	4,611	5,145	5,497	5,861	6,155	6,423	6,589	6,490	6,548	6,590	6,629	6,717
Marionville	383	346	349	349	349	349	349	349	352	341	341	341	343	360	363	362
Total	**7,402**	**7,563**	**7,884**	**8,148**	**8,521**	**9,073**	**9,467**	**9,846**	**10,149**	**10,482**	**10,840**	**10,729**	**11,133**	**11,451**	**11,768**	**12,181**
TOTAL ANNUAL WATER FLOW (m3)																
Russell	345,580	337,332	361,530	389,161	377,666	381,076	403,583	384,006	392,273	387,876	370,257	332,343	310,489	319,579	306,600	300,313
Embrun	479,888	448,390	487,185	486,891	543,615	589,062	607,248	611,150	650,921	653,995	639,407	589,818	576,853	574,605	555,548	590,648
Marionville	32,846	50,317	27,098	26,515	26,785	28,662	33,011	34,084	37,221	40,520	35,455	54,031	29,992	27,167	27,505	26,488
Total	**858,314**	**836,039**	**875,813**	**902,567**	**948,066**	**998,800**	**1,043,842**	**1,029,240**	**1,080,415**	**1,082,391**	**1,045,119**	**976,192**	**917,334**	**921,351**	**889,653**	**917,449**
AVERAGE DAILY FLOW (m3/d)																
Russell	943	921	989	1,065	1,035	1,041	1,105	1,051	1,074	1,060	1,015	910	849	873	840	823
Embrun	1,314	1,225	1,333	1,333	1,488	1,610	1,663	1,673	1,782	1,787	1,753	1,615	1,587	1,570	1,522	1,618
Marionville	90	74	77	73	73	78	90	94	102	111	97	147	81	74	75	73
Total	**2,347**	**2,220**	**2,399**	**2,471**	**2,596**	**2,729**	**2,858**	**2,818**	**2,958**	**2,958**	**2,865**	**2,672**	**2,517**	**2,517**	**2,437**	**2,514**
AVERAGE DAILY FLOW PER CAPITA (m3/d/c)																
Embrun	0.335	0.303	0.326	0.313	0.323	0.313	0.303	0.285	0.290	0.278	0.266	0.249	0.242	0.238	0.230	0.241
Russell	0.304	0.290	0.287	0.301	0.291	0.291	0.305	0.289	0.295	0.285	0.260	0.233	0.200	0.194	0.176	0.161
Marionville	0.235	0.214	0.221	0.209	0.209	0.223	0.258	0.269	0.290	0.326	0.284	0.431	0.236	0.206	0.207	0.202
Total	**0.291**	**0.269**	**0.278**	**0.274**	**0.274**	**0.276**	**0.289**	**0.281**	**0.291**	**0.296**	**0.270**	**0.304**	**0.226**	**0.213**	**0.204**	**0.201**
MAXIMUM DAY FLOW (m3/d)																
Combined												4,640	3,855	3,748	3,610	3,826
Max Day Factor												1.74	1.53	1.49	1.48	1.52

Design ADF per Capita	
Russell	0.183
Embrun	0.238
Marionville	0.212
	0.225
Max Day Factor	1.53

Appendix B

HISTORICAL DATA WASTEWATER FLOWS

APPENDIX B - HISTORICAL DATA WASTEWATER FLOWS

RUSSELL

YEAR 1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
POPULATION	2□2□□	2□□22	2□□□□	2□□□□	2□□□□	2□□□□	2□□□□	2□□□□	2□□□□	2□□□2	2□□□□	2□□□□	□□□□	□□□□2	□□□□	□□□2□
TOTAL ANNUAL FLOW (m3)	2□□□□□□	2□□□□□□	2□□□□□□	2□□□□□□	2□□□□□□	□□□□□□	□□□□□□	□□□□□□	□2□□□□	□□□□□□	□□□□□2	□2□□□□	□2□□□□	2□□□□□□	□□□□□□	□□□2□2
AVERAGE MONTHLY FLOW (m3/month)	2□□□□□	22□□□□	2□□□□□	22□□□□	2□□□□□	2□□□2	2□□□2	2□□□□□	2□□□□□	□□□2□	2□□□2	2□□□□□	2□□□2	2□□□□□	2□□□□□	2□□□□□
AVERAGE DAILY FLOW (m3/d)	□□□	□2□	□□□	□□2	□□□	□□□	□□□	□□□	□□□	□□2□	□□□	□□□	□□□	□□□	□□□	□□□
AVERAGE DAILY FLOW PER CAPITA (m3/cap/d)	0.315	0.299	0.266	0.283	0.310	0.320	0.351	0.353	0.328	0.368	0.307	0.294	0.282	0.214	0.235	0.219
HOUSING UNITS																

EMBRUN

YEAR 1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
POPULATION	□□□□□	□□□□□	□□□□2	□□□2□	□□□□□	□□□□2	□□□□□	□□□2□	□□□22	□□□□□	□□□□□	□□□□□	□□□2□	□□□□□	□2□□	□2□□
TOTAL ANNUAL FLOW (m3)	□□□□□□□	□□2□□□□	□□□□□□2	□□□□□□□	□□2□□□□	□□□□□□2	□2□□□□□	□□□□□□□	□□□□□□□	□□□□□□□	□□□□□□□	□□□□□□□	□□□□□□□	□□□□□□□	□□2□□□□	□2□□□□□
AVERAGE MONTHLY FLOW (m3/month)	□□2□□	□□2□□	□□2□□	□□□□□	□□2□□	□□□□□	□□□□□	□□□□2	□□□□□	□□□□2□	□□□□2□	□□2□□	□□□□□	□□□□□	□□2□□	□□□□□□
AVERAGE DAILY FLOW (m3/d)	□2□□	□□□2□	□□2□□	□□□□2	□□□□□	□□□□□	□□□□□	□□□□□	□□□□□	2□□□□	□□□2□	□□□□□	□□□□□	□□□□□	□□□□□	□□□□□
AVERAGE DAILY FLOW PER CAPITA (m3/cap/d)	0.354	0.355	0.343	0.350	0.355	0.354	0.337	0.333	0.316	0.338	0.298	0.275	0.238	0.218	0.240	0.229
HOUSING UNITS																

Design ADF per Capita

Russell	□2□□
Embrun	□2□□
Marionville	□
	0.235

□□□□□□□□

Appendix C

WATER SYSTEM ANALYSIS AND PROJECTIONS

APPENDIX C - WATER SYSTEM ANALYSIS AND PROJECTIONS

	YEAR 2011	2012	2013	2014	2016	2021	2026	2031	Build Out	Comments
POPULATION										
Russell	4,242	4,501	4,776	5,102	6,006	6,909	7,332	7,539	14,105	Service population for water is not the same as that for sewer system.
Embrun	6,548	6,590	6,629	6,717	7,972	9,807	11,915	14,408	22,009	
Marionville	343	360	363	362	370	428	428	428	428	
Total	**11,133**	**11,451**	**11,768**	**12,181**	**14,348**	**17,144**	**19,675**	**22,375**	**36,542**	All water servicing provided by the City of Ottawa.
HOUSING UNITS										
Russell	1,414	1,500	1,592	1,713	2,002	2,303	2,444	2,513	4,702	
Embrun	2,183	2,197	2,210	2,426	2,657	3,269	3,972	4,803	7,336	
Marionville	114	120	121	127	127	127	159	194	194	
Total	**3,711**	**3,817**	**3,923**	**4,266**	**4,786**	**5,699**	**6,574**	**7,509**	**12,232**	
INDUSTRIAL DEVELOPMENT										
427 Industrial Park - Area 1 (ha)						36.0	36.0	36.0	36.0	
427 Industrial Park - Area 2 (ha)						6.0	48.0	66.9	66.9	
427 Industrial Park - Area 3 (ha)								23.1	26.6	
427 Industrial Park - Area 4 (ha)									37.0	
Total					**0.0**	**42.0**	**84.0**	**126.0**	**166.5**	Values include only developed area (a 75% development density is assumed).
Average Day Residential Demand (m3/d) - Russell	849	873	840	823	1,381	1,589	1,686	1,734	3,244	
Average Day Residential Demand (m3/d) - Embrun	1,587	1,570	1,522	1,618	1,834	2,256	2,740	3,314	5,062	
Average Day Residential Demand (m3/d) - Marionville	81	74	75	73	85	98	98	98	98	
Average Day Residential Demand (m3/d)	2,517	2,517	2,437	2,514	3,300	3,943	4,525	5,146	8,405	
Average Day Industrial Demand (m3/d)					0	420	840	1,260	1,665	
Average Day Demand (m3/d)	**2,517**	**2,517**	**2,437**	**2,514**	**3,300**	**4,363**	**5,365**	**6,406**	**10,070**	
Max Day Residential Demand (m^3/d) - Russell					2,116	2,434	2,583	2,656	4,969	
Max Day Residential Demand (m^3/d) - Embrun					2,808	3,455	4,197	5,075	7,753	
Max Day Residential Demand (m^3/d) - Marionville					130	151	151	151	151	
Max Day Residential Demand (m^3/d)	3,855	3,748	3,610	3,826	5,054	6,039	6,931	7,882	12,872	
Max Day Industrial Demand (m^3/d)					0	840	1,680	2,520	3,330	
Maximum Day Demand (m^3/d)	**3,855**	**3,748**	**3,610**	**3,826**	**5,054**	**6,879**	**8,611**	**10,402**	**16,202**	
Peak Hour Residential Demand (m3/d) - Russell					3,937	4,529	4,806	4,942	9,246	
Peak Hour Residential Demand (m3/d) - Embrun					5,226	6,429	7,810	9,444	14,427	
Peak Hour Residential Demand (m3/d) - Marionville					243	281	281	281	281	
Peak Hour Residential Demand (m3/d)					9,405	11,238	12,897	14,667	23,953	
Peak Hour Industrial Demand (m3/d)					0	1,197	2,394	3,591	4,745	
Peak Hour Demand (m3/d)					**9,405**	**12,435**	**15,291**	**18,258**	**28,699**	

APPENDIX C - WATER SYSTEM ANALYSIS AND PROJECTIONS

DESIGN CRITERIA

Per Capita Average Day Demand (m3/cap/d)	0.230	Historical average over 2011-2014 period. 2010 not considered given it includes usage prior to implementation of metering (period of higher water usage).
Average Day Demand per ha - Industrial (m3/ha/d)	10	Vars Business Park Servicing Study – Functional Overview (Stantec, 2012)
Maximum Day Peak Factor - Residential	1.53	Historical maximum over 2010-2014 period.
Maximum Day Peak Factor - Industrial	2	Vars Business Park Servicing Study – Functional Overview (Stantec, 2012)
Peak Hour Factor - Residential	2.85	MOE Guidelines recommend a value of 2.85 for populations between 10,001 and 25,000.
Peak Hour Factor - Industrial	2.85	Vars Business Park Servicing Study – Functional Overview (Stantec, 2012) recommended a value of 2.7. For consistency with the criterion for residential uses, a value of 2.85 was adopted.
Persons per Unit	3	
Maximum Fire flow requirements (L/s)	133	Based on FUS requirements for contiguous buildings (8000 L/min).
Fire Duration (hrs)	2	Based on FUS requirements.
Design Fire Flow Requirements (L/s) - Industrial Park	100	Vars Industrial Park Servicing Memo (2015)

STORAGE AVAILABLE

Embrun Reservoir (m^3)	1,400		
Russell Elevated Tank (m^3)	2,300		2004 Master Plan (Stantec)
Embrun Elevated Tank (m^3)	2,300		2004 Master Plan (Stantec)
Marionville Elevated Tank (m^3)	568	1,135	2004 Master Plan (Stantec)
Total Storage (m^3)	**5,168**		

PUMPING AVAILABLE

Maximum Supply from Ottawa (m^3/d)	11,860	Maximum amount available over a 20 hour period. Black out period from 6-10 PM.
Maximum Supply from Ottawa (L/s)	137	Current setting at Embrun Reservoir fill valve is 110 L/s.
Embrun Reservoir - Russell Booster Pumping Station (L/s)	43	
Embrun Reservoir - Embrun Booster Pumping Station (L/s)	50	From Water Reserve Capacity Assessment (Stantec, 2011).
Marionville Booster Pumping Station (L/s)	7.45	Based on shop drawing provided by Township (September 2009). Two pumps (1 duty, 1 standby) 118 USGPM @ 121 ft TDH.

PUMPING CAPACITY CHECK

OVERALL	**2014**	**2016**	**2021**	**2026**	**2031**	**2048**
Available Capacity from Ottawa (m^3/d)	11,860	11,860	11,860	11,860	11,860	11,860
Average Day Demand (m^3/d)	2,514	3,300	4,363	5,365	6,406	10,070
Maximum Day Demand (m^3/d)	3,826	5,054	6,879	8,611	10,402	16,202

Assumed build-out to occur in 2048.

A combination of storage and pumping is required to supply the system beyond 2031.

RUSSELL	**2014**	**2016**	**2021**	**2026**	**2031**	**2048**
Embrun Reservoir - Russell Booster Pumping Station (m^3/d)	3,715	3,715	3,715	3,715	3,715	3,715
Average Day Demand (m^3/d)	823	1,381	1,589	1,686	1,734	3,244
Maximum Day Demand (m^3/d)	1,260	2,116	2,434	2,583	2,656	4,969
Peak Hour Demand (m^3/d)	2,346	3,937	4,529	4,806	4,942	9,246

APPENDIX C - WATER SYSTEM ANALYSIS AND PROJECTIONS

Fire Flow (m^3/d)	11,491	11,491	11,491	11,491	11,491	11,491
Maximum Day + Fire Demand (m^3/d)	12,752	13,607	13,925	14,074	14,147	16,460

A combination of storage and pumping is required to supply the system.

EMBRUN	**2014**	**2016**	**2021**	**2026**	**2031**	**2048**
Embrun Reservoir - Embrun Booster Pumping Station (m^3/d)	4,320	4,320	4,320	4,320	4,320	4,320
Average Day Demand (m^3/d)	1,618	1,834	2,256	2,740	3,314	5,062
Maximum Day Demand (m^3/d)	2,478	2,808	3,455	4,197	5,075	7,753
Peak Hour Demand (m^3/d)	4,611	5,226	6,429	7,810	9,444	14,427
Fire Flow (m^3/d)	11,491	11,491	11,491	11,491	11,491	11,491
Maximum Day + Fire Demand (m^3/d)	13,969	14,299	14,946	15,688	16,567	19,244

A combination of storage and pumping is required to supply the system.

MARIONVILLE	**2014**	**2016**	**2021**	**2026**	**2031**	**2048**
Marionville Booster Pumping Station (m^3/d)	644	644	644	644	644	644
Average Day Demand (m^3/d)	73	85	98	98	98	98
Maximum Day Demand (m^3/d)	112	130	151	151	151	151
Peak Hour Demand (m^3/d)	208	243	281	281	281	281
Fire Flow (m^3/d)	11,491	11,491	11,491	11,491	11,491	11,491
Maximum Day + Fire Demand (m^3/d)	11,603	11,622	11,642	11,642	11,642	11,642

A combination of storage and pumping is required to supply the system.

427 INDUSTRIAL PARK	**2014**	**2016**	**2021**	**2026**	**2031**	**2048**
Available Capacity from Ottawa (m^3/d)	11,860	11,860	11,860	11,860	11,860	11,860
Average Day Demand (m^3/d)	0	0	420	840	1,260	1,665
Maximum Day Demand (m^3/d)	0	0	840	1,680	2,520	3,330
Peak Hour Demand (m^3/d)	0	0	1,197	2,394	3,591	4,745
Fire Flow (m^3/d)	8,640	8,640	8,640	8,640	8,640	8,640
Maximum Day + Fire Demand (m^3/d)	8,640	8,640	9,480	10,320	11,160	11,970

A combination of storage and pumping is required to supply the system.

OVERALL STORAGE REQUIREMENTS

	Max Day Demand (m^3/d)	**Required Fire Flow (m^3/d)**	**Max Day + Fire (m^3/d)**	**Peak Hour (m^3/d)**	**A - Fire Storage (m^3)**	**B - Equalization Storage (m^3)**	**C - Emergency Storage (m^3)**	**A + B + C = Storage Required (m^3)**	**Storage Available (m^3)**	**Upgrade Required?**
2014	3,826	11,491	15,317	7,165	958	957	479	2,393	5,168	
2016	3,300	11,491	14,791	9,405	958	825	446	2,228	5,168	
2021	6,879	11,491	18,370	12,435	958	1,720	669	3,347	5,168	
2026	8,611	11,491	20,102	15,291	958	2,153	778	3,888	5,168	
2031	10,402	11,491	21,893	18,258	958	2,600	890	4,448	5,168	
2048	16,202	11,491	27,694	28,699	958	4,051	1,252	6,260	5,168	
Based on Capacity from Ottawa	11,860	11,491	23,351	22,069	958	2,965	981	4,903	5,168	

Peak hour flow estimated based on historical average day demands and MOE peaking factor.

STORAGE REQUIREMENTS - RUSSELL

	Max Day Demand (m^3/d)	**Required Fire Flow (m^3/d)**	**Max Day + Fire (m^3/d)**	**Peak Hour (m^3/d)**	**A - Fire Storage (m^3)**	**B - Equalization Storage (m^3)**	**C - Emergency Storage (m^3)**	**A + B + C = Storage Required (m^3)**	**Floating Storage Available (m^3)**	**Additional Pumping Capacity Required?**

APPENDIX C - WATER SYSTEM ANALYSIS AND PROJECTIONS

2014	1,260	11,491	12,752	2,346	958	315	318	1,591	2,300	No	Max day and peak hour demands estimated based on historical average day demands and design peaking factor.
2016	2,116	11,491	13,607	0	958	529	372	1,858	2,300	No	Minimum reserve of 700 m^3 to be maintained in case of emergency during black out period.
2021	2,434	11,491	13,925	0	958	608	392	1,958	2,300	No	Storage capacity sufficient for fire fighting and system supply.
2026	2,583	11,491	14,074	0	958	646	401	2,004	2,300	No	Storage capacity sufficient for fire fighting and system supply.
2031	2,656	11,491	14,147	0	958	664	405	2,027	2,300	No	Storage capacity sufficient for fire fighting and system supply.
2048	4,969	11,491	16,460	0	958	1,242	550	2,750	2,300	No	Storage capacity sufficient for fire fighting and system supply.

STORAGE REQUIREMENTS - EMBRUN

	Max Day Demand (m^3/d)	Required Fire Flow (m^3/d)	Max Day + Fire (m^3/d)	Peak Hour (m^3/d)	A - Fire Storage (m^3)	B - Equalization Storage (m^3)	C - Emergency Storage (m^3)	A + B + C = Storage Required (m^3)	Floating Storage Available (m^3)	Additional Pumping Capacity Required?	
2014	2,478	11,491	13,969	4,611	958	620	394	1,971	2,300	No	Max day and peak hour demands estimated based on historical average day demands and design peaking factor.
2016	2,808	11,491	14,299	5,226	958	702	415	2,075	2,300	No	Storage capacity sufficient for fire fighting and system supply.
2021	3,455	11,491	14,946	6,429	958	864	455	2,277	2,300	No	Storage and pumping capacity sufficient for fire fighting and system supply.
2026	4,197	11,491	15,688	7,810	958	1,049	502	2,509	2,300	No	Storage and pumping capacity sufficient for fire fighting and system supply.
2031	5,075	11,491	16,567	9,444	958	1,269	557	2,783	2,300	No	Storage and pumping capacity sufficient for fire fighting and system supply.
2048	7,753	11,491	19,244	14,427	958	1,938	724	3,620	2,300	Yes	Storage and pumping capacity sufficient for fire fighting and system supply.

STORAGE REQUIREMENTS - MARIONVILLE

	Max Day Demand (m^3/d)	Required Fire Flow (m^3/d)	Max Day + Fire (m^3/d)	Peak Hour (m^3/d)	A - Fire Storage (m^3)	B - Equalization Storage (m^3)	C - Emergency Storage (m^3)	A + B + C = Storage Required (m^3)	Floating Storage Available (m^3)	Additional Pumping Capacity Required?	Max day and peak hour demands estimated based on historical average day demands and design peaking factor.
2014	112	11,491	11,603	208	958	28	246	1,232	568	Yes	Storage and pumping capacity sufficient for fire fighting and system supply.
2016	130	11,491	11,622	243	958	33	248	1,238	568	Yes	Storage and pumping capacity sufficient for fire fighting and system supply.
2021	151	11,491	11,642	281	958	38	249	1,244	568	Yes	Storage and pumping capacity sufficient for fire fighting and system supply.
2026	151	11,491	11,642	281	958	38	249	1,244	568	Yes	Storage and pumping capacity sufficient for fire fighting and system supply.
2031	151	11,491	11,642	281	958	38	249	1,244	568	Yes	Storage and pumping capacity sufficient for fire fighting and system supply.
2048	151	11,491	11,642	281	958	38	249	1,244	568	Yes	Storage and pumping capacity sufficient for fire fighting and system supply.

STORAGE REQUIREMENTS - 427 Industrial Park

	Max Day Demand (m^3/d)	Required Fire Flow (m^3/d)	Max Day + Fire (m^3/d)	Peak Hour (m^3/d)	A - Fire Storage (m^3)	B - Equalization Storage (m^3)	C - Emergency Storage (m^3)	A + B + C = Storage Required (m^3)	
2014	0	8,640	8,640	0	720	0	180	900	
2016	0	8,640	8,640	0	720	0	180	900	
2021	840	8,640	9,480	1,197	720	210	233	1,163	
2026	1,680	8,640	10,320	2,394	720	420	285	1,425	
2031	2,520	8,640	11,160	3,591	720	630	338	1,688	
2048	3,330	8,640	11,970	4,745	720	833	388	1,941	A 1,940 m^3 storage tank/reservoir is required at the Industrial Park.

Appendix D

WASTEWATER SYSTEM ANALYSIS AND PROJECTIONS

APPENDIX D - WASTEWATER SYSTEM ANALYSIS AND PROJECTIONS

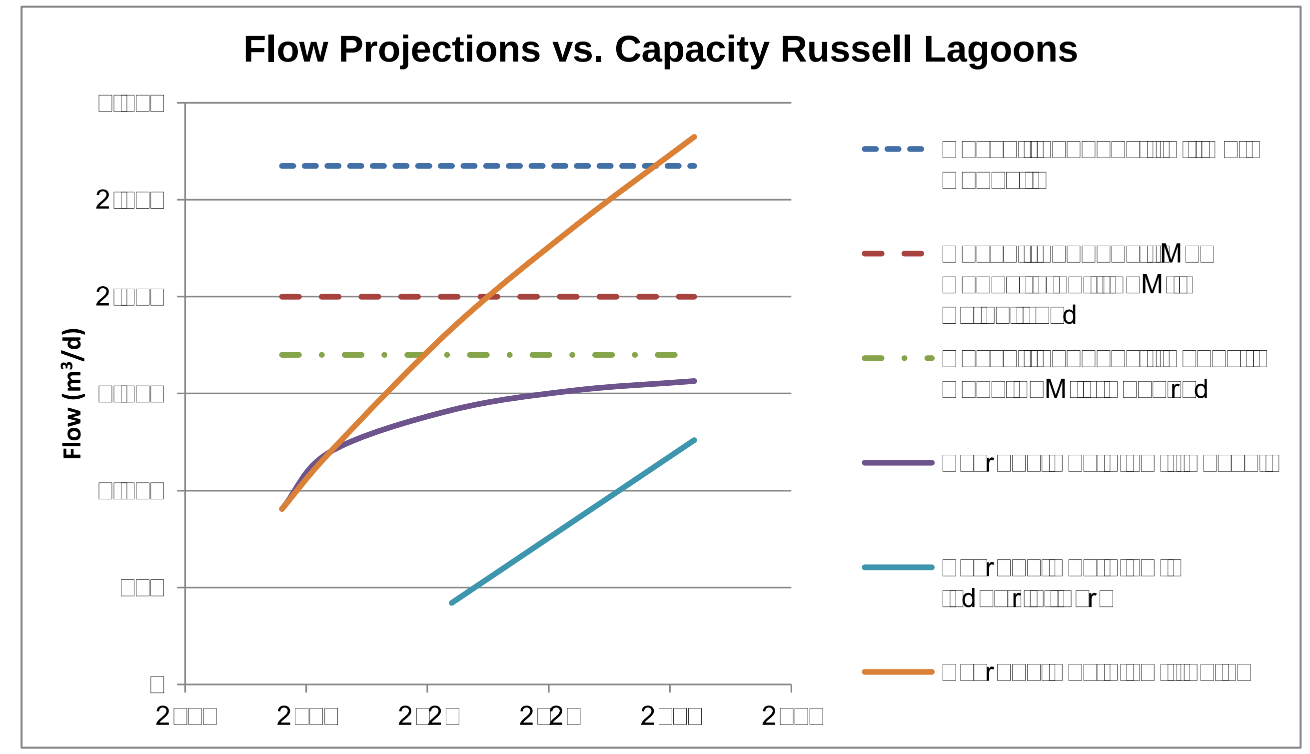
	YEAR 2011	2012	2013	2014	2016	2021	2026	2031	Build Out	Comments
POPULATION										
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Total	**9,266**	**9,787**	**10,070**	**10,387**	**11,527**	**14,265**	**16,796**	**19,496**	**33,663**	
HOUSING UNITS										
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Total	**3,089**	**3,262**	**3,357**	**3,322**	**3,842**	**4,755**	**5,599**	**6,499**	**11,221**	
INDUSTRIAL DEVELOPMENT										
[illegible]						[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]						[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]								[illegible]	[illegible]	
[illegible]									[illegible]	
Total					**0.0**	**42.0**	**84.0**	**126.0**	**166.5**	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]					[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Average Day Flow (m3/d) - Russell Lagoons	**886**	**770**	**908**	**905**	**1,200**	**1,835**	**2,356**	**2,825**	**4,791**	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Average Day Flow (m3/d) - Embrun Lagoons	**1,460**	**1,350**	**1,489**	**1,435**	**1,540**	**1,976**	**2,477**	**3,070**	**4,877**	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Average Day Flow (m3/d) - Marionville	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	
[illegible]					[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]					[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Max Day Flow (m3/d) - Russell Lagoons	**0**	**0**	**0**	**0**	**1,839**	**3,007**	**4,001**	**4,917**	**8,117**	
[illegible]					[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Max Day Flow (m3/d) - Embrun Lagoons	**0**	**0**	**0**	**0**	**2,358**	**3,026**	**3,794**	**4,701**	**7,469**	
[illegible]					[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Max Day Flow (m3/d) - Marionville	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	
DESIGN CRITERIA										
[illegible]	[illegible]									[illegible]
[illegible]	[illegible]									[illegible]
[illegible]	[illegible]									[illegible]
[illegible]	[illegible]									[illegible]
[illegible]	2									[illegible]
TREATMENT CAPACITY AVAILABLE										
[illegible]	[illegible]									[illegible]
[illegible]	[illegible]									[illegible]

APPENDIX D - WASTEWATER SYSTEM ANALYSIS AND PROJECTIONS

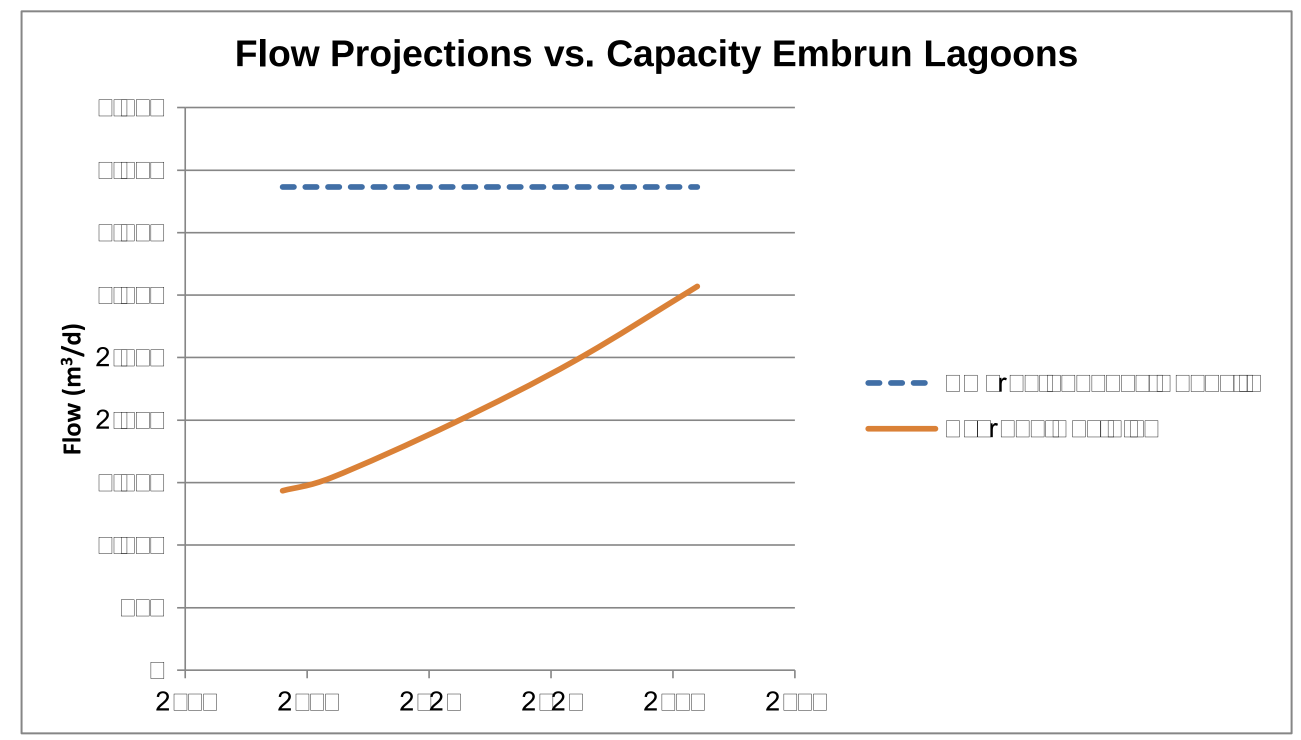
TREATMENT CAPACITY CHECK

RUSSELL	**2014**	**2016**	**2021**	**2026**	**2031**	**2048**
Russe [illegible]agoons [illegible] Capaci [illegible]	2[illegible]5	2[illegible]75	2[illegible]75	2[illegible]75	2[illegible]75	2[illegible]75
Russe [illegible]agoons [illegible]M[illegible]apaci y untl [illegible]M[illegible]d	2[illegible]0	2[illegible]00	2[illegible]00	2[illegible]00	2[illegible]00	2[illegible]00
Russe [illegible]agoons [illegible]apaci y [illegible]hen TPM[illegible]r[illegible]d	1 [illegible]0	1 [illegible]00	1 [illegible]00	1 [illegible]00	1 [illegible]00	1 [illegible]00
[illegible]	905	1 200	1 [illegible]15	1 [illegible]16	1 [illegible]65	3 [illegible]26
[illegible]			[illegible]20	840	1 260	1 [illegible]65
[illegible]	905	1 200	1 [illegible]35	2[illegible]56	2[illegible]25	4 [illegible]91
[illegible] 3 d)	61 [illegible]68	61 [illegible]68	61 [illegible]8	61 [illegible]68	61 [illegible]68	61 [illegible]68

[illegible]



EMBRUN	**2014**	**2016**	**2021**	**2026**	**2031**	**2048**
[illegible]r[illegible]agoons [illegible]	3 [illegible]5	3 [illegible]65	3 [illegible]65	3 [illegible]65	3 [illegible]65	3 [illegible]65
[illegible]r[illegible]	1 [illegible]5	1 [illegible]40	1 [illegible]76	2[illegible]77	3 [illegible]70	4 [illegible]77



PUMPING CAPACITY CHECK

RUSSELL	**Rated Capacity (L/s)**	**2014**	**2016**	**2021**	**2026**	**2031**
S[illegible]S [illegible]r[illegible]d[illegible]	80 [illegible]		89 [illegible]			101 [illegible]
S[illegible]S 2[illegible]r[illegible]d[illegible]	2[illegible]		[illegible]			[illegible]
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[illegible]r[illegible]r[illegible]d[illegible]

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2 33 [illegible]ew [illegible]nis [illegible]r[illegible]r[illegible]d[illegible]dr[illegible]r[illegible]

EMBRUN	**Rated Capacity (L/s)**	**2014**	**2016**	**2021**	**2026**	**2031**
S[illegible]S [illegible]r[illegible]d[illegible]	113 [illegible]		98 [illegible]			164 [illegible]
S[illegible]S 2[illegible]r[illegible]d[illegible]	56 [illegible]		45 [illegible]			78 [illegible]
S[illegible]S [illegible]r[illegible]d[illegible]	30 [illegible]		34 [illegible]			99 [illegible]2
[illegible]r[illegible]d[illegible]	10 [illegible]		4 [illegible]			8 [illegible]
S[illegible]S [illegible]r[illegible]d[illegible]	[illegible]		2[illegible]			2[illegible]
S[illegible]S [illegible]r[illegible]d[illegible]	[illegible]2 8 2		0 [illegible]			16 [illegible]
S[illegible]S [illegible]r[illegible]d[illegible]	8 [illegible]		6 [illegible]			2 7 [illegible]
S[illegible]S [illegible]r[illegible]d[illegible]	1 [illegible]2[illegible]	34 [illegible]				136 [illegible]2

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[illegible]r[illegible]r[illegible]d.
[illegible]r[illegible]d[illegible]d[illegible]r[illegible]6 [illegible]r[illegible]r[illegible]d[illegible]d[illegible]60 [illegible]nis [illegible]26 [illegible]nis [illegible]
dr[illegible]r[illegible].

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Appendix E

SANITARY SEWER CALCULATION SHEETS

APPENDIX E1 - SANITARY SEWER CALCULATION SHEET

Russell Sanitary Collection System

LOCATION			RESIDENTIAL AREA AND POPULATION														INDUSTRIAL			COMMERCIAL		INSTITUTIONAL		I+C+I	INFILTRATION						TOTAL EXISTING FLOW (l/s)	TOTAL FUTURE FLOW (l/s)	PIPE					
□□□□□□	□□□M M□□.	□□ M□□.	□□□□□□ AREA (ha)	□□□□□□ AREA (ha)	□□□□□□ POP.	□□□□□□ POP.	□□M□□□□□ □□□□□□□ □□□□□□□	□□□□□□ □□□□□□)	□□□□□□□ □□□□□□□ □□□□□□□	□□□□□□ □□□.	□□□□□□ P□P□	□□□□□□□ □□□□□□ P□P□	□□□□ □□□□□	□□□□□□ □□□□□ FLO□ □□)	□□□□□□ □□□□□□□□ □□)	□□□□□□□ □□□□□□□ □□□□□ □□□□ □□□	□□□□ □□□)	□□□□□ □□□□ □□□)	□□□□□ FA□TOR □□□rMOE)	□□□□ □□□)	□□□□□ AREA □□□)	□□□□ □□□)	□□□□□ AREA □□□)	□□□□ FLOW □□□)	□□□□□□□ AREA □□□)	ACCU □□ □□□□□□ AREA □□□□	□□□□□□□ □□□□□□ □□□□ □□□□	□□□□□□□ □□□□ □□□)	□□□□□ □□□□□□ □□□□ □□□)	□□□□□□ □□□□□ □□□□ □□□)			□□□□□□ □□)	□□□ □□ □)	□□□□□ □□)	□□□□ □□□□□□ □□□)	□□□□ □□□□□) □□ □□)	□□M□□□□□ C□P□ □□□)
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PS 3 Drainage Area																																						
Bo □ca·	267	266	0 □0	0 □0	0	□	0 □0	□□□	0 □□	□	□	□	4 □0	□□□	□□□	□□□		0 □0			0 □0		0 □0	0 □0	0	0 □0	0 □0	0 □0	□□0	0 □□	0.0	0.0	□□□	200	□□□	25 □	□□	25.6
Bo □ca·	266	265	0 □0	0 □0	0	□	0 □0	□□□	0 □□	□	□	□	4 □0	□□□	□□□	0 □0		0 □0			0 □0		0 □0	0 □0	□□□	□□0	0 □□	0 □0	□□0	0 □□	0.0	0.0	□□□	200	□□□	20 □	□□	20.6
Bo □ca·	265	199	0 □0	0 □0	0	□	0 □0	□□□	0 □□	□	□	□	4 □0	□□□	□□□	□□□		0 □0			0 □0		0 □0	0 □0	0 □□	0 □0	0 □□	0 □0	□□0	0 □□	0.0	0.0	□□□	200	□□□	21 □	□□	21.6
□□r□□r□□□□□	199	200	0 □0	□□□	0	□	0 □0	□□□	0 □□	□	□	□	4 □0	□□□	0 □0	0 □0		0 □0			0 □0		0 □0	□□□	□□□	□□0	0 □□	0 □0	□□0	0 □0	0.0	0.0	□□□	200	□□□	20 2	0 □	20.2
□□r□□r□□□□□	200	201	□□□	□□□	□	□	0 □□	□□□	0 □0	□	□	□	4 □0	□□□	0 □0	0 □0		0 □0			□□□		□□0	□□□	□□□	□□0	□□0	0 □□	0 □0	0 □□	0.0	0.0	□□□	250 □0	□□2	33 □	0 □	33.5
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Bo □ca·	267	268	0 □0	0 □0	0	□	0 □0	□□□	0 □0	□	□	□	4 □0	□□□	□□□	□□□		0 □0			0 □0		0 □0	0 □0	□□□	□□0	0 □□	0 □0	□□0	0 □□	0.0	0.0	□□□	200	□□□	20 □	□□	20.4
Bo □ca·	268	269	0 □0	□□□	□	□	0 □0	□□□	0 □0	□	□	□	4 □0	□□□	0 □0	0 □0		0 □0			□□□		□□0	□□□	□□□	□□0	0 □□	0 □0	0 □0	0 □0	0.0	0.0	□□□	250	0 29	□2□	0 □	32.1
Bo □ca·	269	270	□□□	□□□	□	□	0 □0	□□□	0 □0	□	□	0	4 □0	0 □0	0 □0	0 □0		0 □0			□□□		□□0	□□□	□□□	0 □0	0 □0	0 □0	0 □0	0 □0	0.0	0.0	10 □0	250	0 29	31 □	0 □	31.8
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Bo □ca·	271	2□2	0 □0	□□□	0	□	0 □0	□□□	0 □□	□	□	□	4 □0	□□□	0 □0	0 □0		0 □0			0 □0		0 □0	□□□	□□□	□□0	0 □□	0 □0	□□0	0 □0	0.0	0.0	□□□	250	□2□	31 □	0 □	31.8
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□ □□r□□□ □r□	2□□	2□□	□□□	□□□	□	□	□□□	□□□	□□□	□	□□□	□□□	□□□	□□□	□□□	□□□		□□□			□□□		□□□	□□□	□□□	□□□	□□□	□□□	□□□	□□□	0.0	7.5	□□□	□□□	□□□	□□□2	□□	93.7
□ □□r□□□ □r□	2□□	2□□	□□□	□□□	□	□	□□□	□□□	□□□	□	□□□	□□□	□□□	□□□	□□□	□□□		□□□			□□□		□□□	□□□	□□□	□□□	□□□	□□□	□□□	□□□	0.0	7.5	□2□□	□□□	□□2	□□□	□□	89.8
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□ □□□□□□r□□	2□□	2□2	□□□	□□□	□	□	□□□	□□□	□□□	□	□	□	□□□	□□□	□□□	□□□		□□□			□□□		□□□	□□□	□□□	□□□	□□□	□□□	□□□	□□□	0.0	0.0	□□□	2□□	□□□	2□□	□□	26.5
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□ □□□□□□r□□	2□□	2□□	□□□	□□□	□	□	□□□	□□□	□□□	□	□	□	□□□	□□□	□□□	□□□		□□□			□□□		□□□	□□□	□□□	□□□	□□□	□□□	□□□	□□□	0.0	0.0	□□□	2□□	□□□	2□□	□□	20.7
□ □□□□□□r□□	2□□	2□□	□□□	□□□	□	□	□□□	□□□	□□□	□	□	□	□□□	□□□	□□□	□□□		□□□			□□□		□□□	□□□	□□□	□□□	□□□	□□□	□□□	□□□	0.0	0.0	□□□	2□□	□2□	□□□	□□	31.5
□ □□□□□□r□□	2□□	2□□	□□□	□□□	□	□	□□□	□□□	□□□	□	□	□	□□□	□□□	□□□	□□□		□□□			□□□		□□□	□□□	□□□	□□□	□□□	□□□	□□□	□□□	0.0	0.0	□□□	2□□	□2□	□□□	□□	31.3
□ □□□□□□r□□	2□□	2□□	□□□	□□□	□	□	□□□	□□□	□□□	□	□	□	□□□	□□□	□□□	□□□		□□□			□□□		□□□	□□□	□□□	□□□	□□□	□□□	□□□	□□□	0.0	0.0	□□□	2□□	□2□	□□□	□□	31.4
□ □□□□□□r□□	2□□	2□□	□□□	□□□	□	□	□□□	□□□	□□□	□	□	□	□□□	□□□	□□□	□□□		□□□			□□□		□□□	□□□	□□□	□□□	□□□	□□□	□□□	□□□	0.0	0.0	□□□	2□□	□2□	□□2	□□	31.2
□ □□□□□□r□□	2□□	2□□	□□□	□□□	□	□	□□□	□□□	□□□	□	□	□	□□□	□□□	□□□	□□□		□□□			□□□		□□□	□□□	□□□	□□□	□□□	□□□	□□□	□□□	0.0	0.0	□□□	2□□	□2□	□□□	□□	31.4
□ □□r□□□ □r□	2□□	2□□	□□□	□□□	□	□	□□□	□□□	□□□	□	□□□	□□□	□□□	□□□	□□□	□□□		□□□			□□□		□□□	□□□	□□□	□□□	□□□	□□□	□□□	□□□	0.0	7.5	□□□	□□□	□2□	□2□□	□□	121.4
□□□□□r	2□□	□□□	□□□	□□□	□	□	□□□	□□□	□□□	□	□	□	□□□	□□□	□□□	□□□		□□□			□□□		□□□	□□□	□□□	□□□	□□□	□□□	□□□	□□□	0.0	0.0	□□□	2□□	□□□	2□□	□□	26.6
□□□□□r	□□□	□□□	□□□	□□□	□	□	□□□	□□□	□□□	□	□	□	□□□	□□□	□□□	□□□		□□□			□□□		□□□	□□□	□□□	□□□	□□□	□□□	□□□	□□□	0.0	0.0	□2□□	2□□	□□□	2□□	□□	20.7
□□□□□r	□□□	□□2	□□□	□□□	□	□	□□□	□□□	□□□	□	□	□	□□□	□□□	□□□	□□□		□□□			□□□		□□□	□□□	□□□	□□□	□□□	□□□	□□□	□□□	0.0	0.0	□□□	2□□	□2□	□□□	□□	31.7
□□□□□r	□□2	□□□	□□□	□□□	□	□	□□□	□□□	□□□	□	□	□	□□□	□□□	□□□	□□□		□□□			□□□		□□□	□□□	□□□	□□□	□□□	□□□	□□□	□□□	0.0	0.0	□□□	2□□	□2□	□□□	□□	31.3
□□□□□r	□□□	□2□	□□□	□□□	□	□	□□□	□□□	□□□	□	□	□	□□□	□□□	□□□	□□□		□□□			□□□		□□□	□□□	□□□	□□□	□□□	□□□	□□□	□□□	0.0	0.0	□□□	2□□	□2□	□□2	□□	31.2
□□□□□r	□2□	2□□	□□□	□□□	□	□	□□□	□□□	□□□	□	□	□	□□□	□□□	□□□	□□□		□□□			□□□		□□□	□□□	□□□	□□□	□□□	□□□	□□□	□□□	0.0	0.0	□2□□	2□□	□2□	□□□	□□	31.7
□ □□r□□□ □r□	2□□	2□□	□□□	□□□	□	□	□□□	□2□	□2□	□	□□□	□□□	□□□	□□□	□□□	□□□		□□□			□□□		□□□	□□□	□□□	□□□	□□□	□□□	□2□	□□□	0.0	7.6	2□□□	□□□	□□□	□□□	□□	110.8
□ □□r□□□ □r□	2□□	□□□□□	□□□	□□□	□	□	□□□	□2□	□2□	□	□□□	□□□	□□□	□□□	□□□	□□□		□□□			□□□		□□□	□□□	□□□	□□□	□□□	□□□	□2□	□□□	0.0	7.6	□□□	□□□	2□2□	□□□□2	□□	1423.6
PS 2 Drainage Area																																						
□d□□□□□□□□□□	2□□	2□□	□□□	□□□	□□	□	□□□	□□□	□□□	□□	□	□□	□□□	□2□	□□□	□2□					□□□		□□□	□□□	□□□	□□□	□2□	□□□	□□□	□□□	0.4	0.4	□□□	2□□	□□□	2□□	□□	22.6

APPENDIX E1 - SANITARY SEWER CALCULATION SHEET

Russell Sanitary Collection System

LOCATION			RESIDENTIAL AREA AND POPULATION														INDUSTRIAL			COMMERCIAL		INSTITUTIONAL		I+C+I	INFILTRATION						TOTAL EXISTING FLOW (l/s)	TOTAL FUTURE FLOW (l/s)	PIPE					
□□□□□□	□□□M M□.	□□ M□.	□□□□□□ AREA (ha)	□□□□□□ AREA (ha)	□□□□□□ POP.	□□□□□□ POP.	□□M□□□□□ □□□□□□ □□□□□□	□□□□□□ □□□□□)	□□□□□□ □□□□□□ □□□□□□	□□□□□ □□.	□□□□□ P□P□	□□□□□□ □□□□□ P□P□	□□□□ □□□□□	□□□□□□ □□□□□ FLO□ □□)	□□□□□□ □□□□□□ □□)	□□□□□□ □□□□□□ □□□□□ □□□□ □□□	□□□□ □□)	□□□□□ □□□□ □□)	□□□□□ FA□TOR □□rMOE)	□□□□ □□)	□□□□□ AREA □□)	□□□□ □□)	□□□□□ AREA □□)	□□□□ FLOW □□)	□□□□□□ AREA □□)	ACCU □ □□□□□□ AREA □□□	□□□□□□ □□□□□ □□□□ □□□	□□□□□□ □□□□ □□)	□□□□□ □□□□□□ □□□□ □□)	□□□□□□ □□□□□ □□□□ □□)			□□□□□ □□)	□□□ □□ □)	□□□□ □□)	□□□□ □□□□ □□)	□□□□ □□□□) □□ □)	□□M□□□□□ C□P□ □□)
□d□owne □ve	214	215	0 □0	0 □0	21	0	1 □0	□□□	1 □0	□□	□	□□	□□0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 □0	1 □0	0 □9	0 □0	0 □0	0 □0	0.9	0.9	□2□□	2□□	□□□	2□□	□□	22.2
□d□□□□□ve	215	216	0 □0	0 □0	27	0	2□20	□□□	2□20	□□	□	□□	□□0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 □0	2□20	0 □4	0 □0	0 □0	0 □0	1.6	1.6	□□□□	200	□□□	2□□	□□	21.5
□d□□□□□ve	216	217	0 □0	0 □0	21	0	2□0	0 □0	2□0	□□	□	□□	4 □0	□□□	□□□	□□□					0 □0		□□□	0 □0	0 □0	2□0	1 □0	0 □0	0 □0	0 □0	2.1	2.1	□□□□	200	□□□	2□□	□□	20.9
□d□□□□□ve	217	218	0 □0	0 □0	18	0	3 □0	0 □0	3 □0	□□□	□	□□□	4 □0	□□□	□□□	□□□					0 □0		□□□	0 □0	0 □0	3 □0	1 □3	0 □0	0 □0	0 □0	2.5	2.5	□□□□	200	□□□	23 2	□□	20.7
□d□owne □ve	221	220	0 20	0 □0	6	□	0 20	□□□	0 20	□	□	□	4 □0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 20	0 20	0 □8	0 □0	0 □0	0 □□	0.1	0.1	□□□□	200	□□□	68 □	2□2	68.5
□d□owne □ve	220	219	0 □0	0 □0	27	□	1 □0	□□□	1 □□	□□	□	□□	4 □0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 □0	1 □0	0 □2	0 □0	0 □0	0 □□	0.8	0.8	□2□□	200	□□□	23 □	□□	22.4
□d□owne □ve	219	218	1 20	0 □0	36	□	2□0	□□□	2□0	□□	□	□□	4 □0	□□□	□□□	□□□					0 □0		0 □0	0 □0	1 20	2□0	0 □7	0 □0	0 □0	0 □□	1.6	1.6	□□□□□	2□□	□□□	27 □	□□	25.9
□□□□□ □□□□d□□ □□□□□	218	230	0 □0	0 □0	18	0	6 □0	0 □0	6 □0	1 □2	0	1 □2	4 □0	2□2	0 □0	2□2					0 □0		0 □0	0 □0	0 □0	6 □0	2□3	0 □0	0 □0	0 □□	4.5	4.5	88 20	2□□	0 □0	□2□	0 □	37.5
□d□owne □ve	224	225	0 □0	0 □0	18	0	0 □0	□□□	0 □0	□□	□	□□	□□0	□2□	□□□	□2□					0 □0		0 □0	0 □0	0 □0	0 □0	0 23	0 □0	0 □0	0 □0	0.4	0.4	□□2□	200	□□□	2□□	□□	20.4
□□ □□M□□	226	225	0 □0	0 □0	18	0	0 □0	□□□	0 □0	□□	□	□□	□□0	□□□	□□□	□□□					0 □0		□□□	0 □0	0 □0	0 □0	0 23	0 □0	0 □0	0 □0	0.6	0.6	□□2□	200	□2□	□□□	□2	35.9
□d□owne □ve	225	227	0 □0	0 □0	18	0	1 □0	0 □0	1 □0	□2	0	□2	4 □0	0 □9	0 □0	0 □9					0 □0		0 □0	0 □0	0 □0	1 □0	0 □8	0 □0	0 □0	0 □0	1.5	1.5	99 □0	200	0 □0	2□□	0 □	21.8
□r□□□rd	227	228	0 □0	0 □0	15	□	2□0	□□□	2□0	□□	□	□□	□□0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 □0	2□0	0 □7	0 □0	0 □0	0 □0	1.8	1.8	□2□□	2□□	□□□	23 □	□□	21.2
□r□□□rd	228	230	0 □0	0 □0	15	0	2□0	□□□	2□0	□□2	□	□□2	□□0	□□2	□□□	□□2					0 □0		0 □0	0 □0	0 □0	2□0	1 □6	0 □0	0 □0	0 □0	2.2	2.2	□□□□	200	□□□	2□□	□□	21.2
□d□□□□□ve	224	223	0 □0	0 □0	15	0	0 □0	0 □0	0 □0	□□	□	□□	4 □0	□□□	□□□	□□□					0 □0		□□□	0 □0	0 □0	0 □0	0 □9	0 □0	0 □0	0 □0	0.4	0.4	□□□□	200	□□□	□2□	□□	32.4
□d□□□□□ve	223	222	0 □0	0 □0	15	0	1 □0	0 □0	1 □0	□□	□	□□	4 □0	□□□	□□□	□□□					0 □0		□□□	0 □0	0 □0	1 □0	0 □8	0 □0	0 □0	0 □0	0.7	0.7	□□□□□	200	□□□	23 □	□□	22.5
□d□owne □ve	221	222	0 □0	0 □0	15	□	0 □0	□□□	0 □0	□□	□	□□	4 □0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 □0	0 □0	0 □9	0 □0	0 □0	0 □□	0.4	0.4	□□□□	2□□	□□□	21 □	□□	21.5
Cobb □s □ne	222	229	0 □0	0 □0	15	0	2□0	0 □0	2□0	60	0	60	□□0	0 □6	0 □0	0 □6					0 □0		0 □0	0 □0	0 □0	2□0	0 □6	0 □0	0 □0	0 □0	1.4	1.4	86 □0	200	0 □0	2□□	0 □	21.7
□□□□□□□□□	229	230	0 □0	0 □0	15	0	2□0	□□□	2□0	□□	□	□□	□□0	□□□	□□□	□□□					0 □0		□□□	0 □0	0 □0	2□0	0 □5	0 □0	0 □0	0 □0	1.8	1.8	□□□□□	200	□□□	2□2	□□	21.5
Cobb □s □ne	230	231	2□4	0 □1	0	36	13 □5	0 □1	14 □6	369	36	405	4 □0	4 □7	0 □0	4 □6					0 □0		0 □0	0 □0	2□4	13 □5	5 26	0 □1	0 □1	0 27	9.3	10.0	85 □0	200	0 □0	20 □	0 □	10.6
□ □□□□□□	234	235	0 20	0 □0	6	□	0 20	□□□	0 2□	□	□	□	4 □0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 20	0 20	0 □8	0 □0	□□0	0 □□	0.1	0.1	2□□□	200	□□□	□2□	□□	32.3
□ □□□□□□	236	235	0 □0	□□□	24	□	0 □0	□□□	0 □□	2□	□	2□	4 □0	□2□	□□□	□2□					0 □0		0 □0	0 □0	0 □0	0 □0	0 □0	0 □0	0 □0	0 □□	0.6	0.6	□□□□	200	□□□	28 □	□□	28.0
Cobb □s □ne	235	233	0 □0	0 □0	□2	0	1 □0	0 □0	1 □□	□2	0	□2	4 □0	0 □6	0 □0	0 □6					0 □0		0 □0	0 □0	0 □0	1 □0	0 □3	0 □0	0 □0	0 □□	1.0	1.0	67 □0	200	0 □2	23 □	0 □	22.7
□ □□□□□□□□□	233	2□2	0 □0	0 □0	24	□	2□20	□□□	2□20	□□	□	□□	4 □0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 □0	2□20	0 □4	0 □0	0 □0	0 □□	1.6	1.6	□□□□	200	□□□	23 2	□□	21.7
□ □□□□□□□□□	2□2	231	0 □0	0 □0	15	□	2□0	□□□	2□□	□□	□	□□	4 □0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 □0	2□0	1 □3	0 □0	0 □0	0 □□	1.9	1.9	□2□□	200	□□□	23 □	□□	21.1
□ □□□□□□ □□	231	239	0 □0	0 □0	□2	0	16 □5	0 □1	17 □6	4 □2	36	498	□□8	5 □6	0 □9	5 □5					0 □0		0 □0	0 □0	0 □0	16 □5	6 □4	0 □0	0 □1	0 27	11.5	12.2	67 □0	200	0 □0	20 □	0 □	8.6
□□□□□□□ □□	236	238	0 □0	0 □0	15	0	0 □0	□□□	0 □0	□□	□	□□	□□0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 □0	0 □0	0 □9	0 □0	0 □0	0 □0	0.4	0.4	□□□□	200	□□□	2□□	□□	28.4
□□□□□□□ □□	238	239	0 □0	0 □0	18	0	1 □0	0 □0	1 □0	□□	□	□□	4 □0	□□□	□□□	□□□					0 □0		□□□	0 □0	0 □0	1 □0	0 □2	0 □0	0 □0	0 □□	0.8	0.8	□□□□	200	□□□	23 □	□□	22.5
□ □□□□□□ □□	239	240	0 □0	0 □0	18	0	18 □5	0 □1	19 □6	513	36	549	3 □5	5 □9	0 □9	5 □8					0 □0		0 □0	0 □0	0 □0	18 □5	7 □9	0 □0	0 □1	0 2□	12.7	13.3	78 □0	2□□	0 □0	20 □	0 □	7.3
□ □□□□□□	236	237	0 20	0 □0	6	□	0 20	□□□	0 20	□	□	□	4 □0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 20	0 20	0 □8	0 □0	0 □0	0 □□	0.1	0.1	□□□□	200	□□□	20 □	□□	20.5
□r□□d□□□□ve	256	243	0 □0	0 □0	0	□	0 □0	□□□	0 □□	□	□	□	4 □0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 □0	0 □0	0 □0	0 □0	□□0	0 □□	0.0	0.0	□□□□	250	□2□	30 □	□□	30.0
□r□□d□□□□ve	243	244	0 □0	0 □0	9	□	0 □0	□□□	0 □□	□	□	□	4 □0	□□□	□□□	0 □0					0 □0		0 □0	0 □0	□□□	□□0	0 □□	0 □0	□□0	0 □□	0.2	0.2	□□□□	250	□2□	28 □	□□	28.2
Abbe □□r□□	250	249	0 □0	0 □0	9	□	0 □0	□□□	0 □□	□	□	□	4 □0	□□□	□□□	0 □0					0 □0		0 □0	0 □0	□□□	□□0	0 □□	0 □0	□□0	0 □□	0.2	0.2	□□□□	200	□□□	20 □	□□	20.5
Abbe □□r□□	249	248	0 20	□□□	6	□	0 □0	□□□	0 □□	□□	□	□□	4 □0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 20	0 □0	0 □9	0 □0	□□0	0 □□	0.4	0.4	□□□□	250	□2□	28 □	□□	28.5
Abbe □□r□□	248	247	0 20	0 □0	6	□	0 □0	□□□	0 □□	2□	□	2□	4 □0	□2□	□□□	□2□					0 □0		0 □0	0 □0	0 20	0 □0	0 27	0 □0	0 □0	0 □□	0.5	0.5	□□□□	250	□2□	29 2	□□	28.7
Abbe □□r□□	247	246	0 20	0 □0	6	□	0 □0	□□□	0 □□	2□	□	2□	4 □0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 20	□□0	0 □□	0 □0	□□0	0 □□	0.6	0.6	□□□□	250	□2□	29 □	□□	28.7
Abbe □□r□□	246	245	0 20	0 □0	6	□	1 □0	□□□	1 □□	□□	□	□□	4 □0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 20	1 □0	0 □2	0 □0	□□0	0 □□	0.8	0.8	□□□	250	□□□	22□	□□	21.7
Abbe □□r□□	245	244	0 20	0 □0	6	□	1 □0	□□□	1 □□	□□	□	□□	4 □0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 20	1 □0	0 □9	0 □0	0 □0	0 □□	0.9	0.9	□□□□	250	□2□	29 2	□□	28.3
Abbe □□r□□	250	251	0 20	0 □0	6	□	0 20	□□□	0 20	□	□	□	4 □0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 20	0 20	0 □8	0 □0	0 □0	0 □□	0.1	0.1	□□□□	200	□□□	20 □	□□	20.7
Abbe □□r□□	251	2□2	0 20	0 □0	6	□	0 □0	□□□	0 □□	□2	□	□2	4 □0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 20	0 □0	0 □5	0 □0	□□0	0 □□	0.3	0.3	□□□□	250	□2□	27 □	□□	27.1
Abbe □□r□□	2□2	253	0 20	0 □0	6	□	0 □0	□□□	0 □□	□□	□	□□	4 □0	□2□	□□□	□2□					0 □0		0 □0	0 □0	0 20	0 □0	0 23	0 □0	0 □0	0 □□	0.4	0.4	□□□□	250	□2□	29 □	□□	29.0
Abbe □□r□□	253	254	0 20	0 □0	6	□	0 □0	□□□	0 □□	2□	□	2□	4 □0	□2□	□□□	□2□					0 □0		0 □0	0 □0	0 20	0 □0	0 □0	0 □0	0 □0	0 □□	0.6	0.6	□□□□	250	□2□	28 □	□□	28.4
Abbe □□r□□	254	255	0 20	0 □0	6	□	1 □0	□□□	1 □0	□□	□	□□	4 □0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 20	1 □0	0 □8	0 □0	0 □0	0 □□	0.7	0.7	□2□□□	2□□	□2□	29 2	□□	28.5
□□□□□□□r□□	255	244	0 20	0 □0	6	0	1 20	□□□	1 20	□□	□	□□	□□0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 20	1 20	0 □6	0 □0	□□0	0 □□	0.9	0.9	□□2□	250	□2□	28 □	□□	27.8
Gasl □ht	244	59	0 20	0 □0	6	0	3 □0	0 □0	3 □□	90	0	90	4 □0	0 □9	0 □0	0 □9					0 □0		0 □0	0 □0	0 20	3 □0	1 □4	0 □0	□□0	0 □□	2.1	2.1	55 □0	250	0 □6	23 □	0 □	21.8
□ □□□□□□	59	237	0 20	0 □0	6	□	3 20	□□□	3 2□	□□	□	□□	4 □0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 20	3 20	1 22	0 □0	0 □0	0 □□	2.3	2.3	□□2□	200	□□□	23 □	□□	20.8
□ □□□□□□ □□	237	2□2	0 20	0 □0	6	0	3 □0	0 □0	3 □□	108	0	108	4 □0	1 □9	0 □0	1 □9					0 □0		0 □0	0 □0	0 20	3 □0	1 □7	0 □0	0 □0	0 □□	2.6	2.6	□2□0	200	0 □0	20 □	0 □	18.2
□ □□□□□□ □□	2□2	241	0 20	0 □0	6	□	3 □0	□□□	3 □0	□□□	□	□□□	4 □0	□2□	□□□	□2□					0 □0		0 □0	0 □0	0 20	3 □0	1 □4	0 □0	0 □0	0 □□	2.7	2.7	□□2□	200	□□□	20 □	□□	18.2
□ □□□□□□ □□	241	240	0 □6	0 □5	0	2□	3 □6	□□□	4 □□	□□□	2□	□□□	4 □0	□2□	□□□	□□□					0 □0		0 □0	0 □0	0 □6	3 □6	1 □1	0 □5	0 □5	0 □□	2.8	3.1	□□□□	200	□□□	□2□	□□	29.8
□ □□□□□□ □□	240	STA □2	0 20	0 □0	6	0	22□1	0 □6	23 □□	633	63	696	3 □0	6 □9	0 □8	7 □7					0 □0		0 □0	0 □0	0 20	22□1	8 □7	0 □0	0 □6	0 □□	15.5	16.5	31 □0	200	0 □9	14 □	0 □	-2.2
PS 1 Drainage Area																																						
Con □e □s □n	154	155	0 □3	0 □0	15	□	0 □3	□□□	0 □3	□□	□	□□	4 □0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 □3	0 □3	0 28	0 □0	0 □0	0 □□	0.4	0.4	□□□□	2□□	□2□	31 □	□□	31.0
□ □□□□□□□□□	155	156	0 □4	0 □0	9	0	1 □7	□□□	1 □7	2□	□	2□	4 □0	□2□	□□□	□2□					0 □0		0 □0	0 □0	0 □4	1 □7	0 □4	0 □0	□□0	0 □□	0.7	0.7	□□□□	250	□2□	31 □	□□	30.8

APPENDIX E1 - SANITARY SEWER CALCULATION SHEET

Russell Sanitary Collection System

LOCATION			RESIDENTIAL AREA AND POPULATION														INDUSTRIAL			COMMERCIAL		INSTITUTIONAL		I+C+I	INFILTRATION						TOTAL EXISTING FLOW (l/s)	TOTAL FUTURE FLOW (l/s)	PIPE					
□□□□□□	□□□M M□.	□□ M□.	□□□□□□ AREA (ha)	□□□□□□ AREA (ha)	□□□□□□ POP.	□□□□□□ POP.	□□M□□□□□□ □□□□□□□ □□□□□□□	□□□□□□ □□□□□□)	□□□□□□□ □□□□□□□ □□□□□□□	□□□□□□ □□□.	□□□□□□ P□P□	□□□□□□□ □□□□□□ P□P□	□□□□ □□□□□	□□□□□□ □□□□□ FLO□ (□□)	□□□□□□ □□□□□□□□ (□□)	□□□□□□□ □□□□□□□ □□□□□ □□□□ □□□	□□□□ (□□)	□□□□□ □□□□ (□□)	□□□□□ FA□TOR (□□rMOE)	□□□□ (□□)	□□□□□ AREA (□□)	□□□□ (□□)	□□□□□ AREA (□□)	□□□□ FLOW (□□)	□□□□□□□ AREA (□□)	ACCU □ □□□□□□ AREA □□□	□□□□□□□ □□□□□ □□□□ □□□	□□□□□□ □□□□ (□□)	□□□□□ □□□□□□ □□□□ (□□)	□□□□□□ □□□□□ □□□□ (□□)			□□□□□ □□)	□□□ □□ □)	□□□□□ □□)	□□□□ □□□□□□ (□□)	□□□□ □□□□□) □□ □)	□□M□□□□□□ C□P□ (□□)
Con□e□s□n	156	157	0 □9	0 □0	66	0	1 □6	□□□	1 □6	□□	□	□□	□□0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 □9	1 □6	0 □7	0 □0	0 □0	0 □0	1.7	1.7	□□□□□	2□□	□2□	□□□	□□	30.2
□□□□□□□□□□	157	158	0 □0	0 □0	0	0	1 □6	□□□	1 □6	□□	□	□□	□□0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 □0	1 □6	0 □7	0 □0	0 □0	0 □0	1.7	1.7	□2□□□	2□□	□2□	□□□	□□	29.4
□□□□□□□□□□	158	159	0 □0	0 □0	0	0	1 □6	□□□	1 □6	□□	□	□□	□□0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 □0	1 □6	0 □7	0 □0	0 □0	0 □0	1.7	1.7	□□□□□	250	□2□	□□□	□□	29.8
□□□□□□□□□□	159	160	0 □5	0 □0	3	0	1 □0	□□□	1 □0	□□	□	□□	□□0	□□2	□□□	□□2					0 □0		0 □0	0 □0	0 □5	1 □0	0 □2	0 □0	0 □0	0 □0	1.7	1.7	□□□□□	250	□2□	□□□	□□	29.7
Con□e□s□n	160	161	0 □4	0 □0	9	□	2□4	□□□	2□4	□□2	□	□□2	4 □0	□□2	□□□	□□2					0 □0		0 □0	0 □0	0 □4	2□4	0 □9	0 □0	0 □0	0 □□	2.0	2.0	□□2□	2□□	□□□	20 □	□□	18.8
Con□e□s□n	161	1□2	0 □9	0 □0	□2	0	2□3	□□□	2□3	□□□	□	□□□	□□0	□2□	□□□	□2□					0 □0		0 □0	0 □0	0 □9	2□3	1 □1	0 □0	0 □0	0 □0	2.4	2.4	□□□□□	2□□	□□□	20 □	□□	18.5
□□□□□□□□□□	1□2	163	1 □2	0 □0	21	0	3 □5	□□□	3 □5	□□□	□	□□□	□□0	□□□	□□□	□□□					0 □0		0 □0	0 □0	1 □2	3 □5	1 □0	0 □0	0 □0	0 □0	3.0	3.0	□□□□□	200	□□□	2□□	□□	17.8
□□□ □□□□□□□r□	194	195	1 □2	0 □0	21	0	1 □2	0 □0	1 □2	2□	□	2□	4 □0	□2□	□□□	□2□					0 □0		□□□	0 □0	1 □2	1 □2	0 □9	0 □0	0 □0	0 □0	0.6	0.6	□□□□□	250	□2□	31 □	□□	30.8
Campbe□□□□r□	195	196	2□3	0 □0	54	□	3 □6	□□□	3 □□	□□	□	□□	4 □0	□□□	□□□	□□□					0 □0		0 □0	0 □0	2□3	3 □6	1 □9	0 □0	0 □0	0 □□	2.2	2.2	□2□□□□	250	□□□	35 □	□□	33.6
Campbe□□□□r□	198	196	1 □7	0 □0	24	0	1 □7	□□□	1 □7	2□	□	2□	□□0	□2□	□□□	□2□					0 □0		0 □0	0 □0	1 □7	1 □7	0 □4	0 □0	0 □0	0 □0	0.7	0.7	□□□□□	2□□	□2□	31 □	□□	30.6
□□□□□ □□□□ □□□ □□□□□□r□	196	197	0 □0	0 □0	0	0	4 □3	0 □0	4 □□	99	0	99	4 □0	1 □9	0 □0	1 □9					0 □0		0 □0	0 □0	0 □0	4 □3	1 □3	0 □0	0 □0	0 □□	2.9	2.9	86 □0	250	0 28	31 □	0 □	28.4
Leg□n	197	1□2	0 29	0 □0	6	□	5 □2	□□□	5 □2	□□□	□	□□□	4 □0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 29	5 □2	1 □5	0 □0	0 □0	0 □□	3.1	3.1	□□□□□	250	□□□2	9 □	□2	5.9
Twe□d	151	1□2	1 □0	0 □0	39	□	1 □0	□□□	1 □0	□□	□	□□	4 □0	□□□	□□□	□□□					0 □0		0 □0	0 □0	1 □0	1 □0	0 □2	0 □0	0 □0	0 □□	1.2	1.2	□22□□□	2□□	□□□	44 □	□□	43.5
Twe□d	1□2	1□2	0 29	0 □0	6	□	2□9	□□□	2□9	□□	□	□□	4 □0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 29	2□9	0 □3	0 □0	0 □0	0 □□	1.3	1.3	□□□□□	2□□	□2□	27 □	□□	26.2
Twe□d	1□2	141	0 □0	0 □0	0	0	7 □2	0 □0	7 □2	150	0	150	4 □0	1 □5	0 □0	1 □5					0 □0		0 □0	0 □0	0 □0	7 □2	2□8	0 □0	0 □0	0 □□	4.4	4.4	9 □0	2□□	0 □3	□□□	0 □	29.9
Twe□d	151	150	1 □2	0 □0	27	0	1 □2	□□□	1 □2	2□	□	2□	□□0	□□□	□□□	□□□					0 □0		0 □0	0 □0	1 □2	1 □2	0 □0	0 □0	0 □0	0 □0	0.8	0.8	□□□□□□	200	□□□	2□□	□□	20.0
□□□□d	149	150	1 □6	0 □0	30	0	1 □6	0 □0	1 □6	□□	□	□□	4 □0	□□□	□□□	□□□					0 □0		□□□	0 □0	1 □6	1 □6	0 □6	0 □0	0 □0	0 □0	0.9	0.9	2□□□□	200	□2□	□□□	□□	16.7
Eas □men □□□□□d	150	146	0 □0	0 □0	0	0	2□8	0 □0	2□8	57	0	57	4 □0	0 □3	0 □0	0 □3					0 □0		0 □0	0 □0	0 □0	2□8	1 □6	0 □0	0 □0	0 □0	1.7	1.7	48 20	200	0 27	17 □	0 □	15.3
Ea □emen □□□□□d	146	145	0 29	0 □0	6	□	3 □7	□□□	3 □7	□□	□	□□	4 □0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 29	3 □7	1 □7	0 □0	0 □0	0 □□	1.9	1.9	□□□□□	200	□□□	22□	□□	20.3
Ma □Douga □	144	145	1 □2	0 □0	21	□	1 □2	□□□	1 □2	2□	□	2□	4 □0	□2□	□□□	□2□					0 □0		0 □0	0 □0	1 □2	1 □2	0 □9	0 □0	0 □0	0 □0	0.6	0.6	□2□□□□	2□□	□□□	19 □	□□	19.1
MacDouga □	145	147	0 □9	0 □0	□2	0	4 □8	0 □0	4 □8	96	0	96	□□0	1 □6	0 □0	1 □6					0 □0		0 □0	0 □0	0 □9	4 □8	1 □8	0 □0	0 □0	0 □0	2.8	2.8	18 □0	200	0 □3	2□□	0 □	18.8
M□□□ □□□□□	148	147	1 □2	0 □0	27	0	1 □2	0 □0	1 □2	□2□	□	□2□	4 □0	□□□	□□□	□□□					0 □0		□□□	0 □0	1 □2	1 □2	0 □0	0 □0	0 □0	0 □0	1.9	1.9	□□□□□	200	□□□	18 □	□□	16.9
Easemen □□□□□d	147	137	0 □5	0 □0	3	0	6 □5	0 □0	6 □□	222	0	222	4 □0	2□5	0 □0	2□5					0 □0		0 □0	0 □0	0 □5	6 □5	2□4	0 □0	0 □0	0 □□	4.8	4.8	88 □0	200	0 □3	21 □	0 □	16.7
Ma □Douga □	144	143	1 □6	0 □0	30	0	1 □6	□□□	1 □6	2□2	□	2□2	□□0	2□□	□□□	2□□					0 □0		0 □0	0 □0	1 □6	1 □6	0 □6	0 □0	0 □0	0 □0	3.3	3.3	□□□□□	2□□	□□□	21 □	□□	18.2
M□□□ □□□□□	143	141	0 □3	0 □0	15	0	2□9	□□□	2□9	2□□	□	2□□	□□0	2□□	□□□	2□□					0 □0		0 □0	0 □0	0 □3	2□9	0 □3	0 □0	0 □0	0 □0	3.8	3.8	□□□□□	200	□□□	□□□	□□	15.0
Twe□d	141	140	1 □2	0 □0	21	0	10 □4	0 □0	10 □4	438	0	438	4 □0	4 □3	0 □0	4 □3					0 □0		0 □0	0 □0	1 □2	10 □4	4 □0	0 □0	0 □0	0 □0	8.8	8.8	80 □0	250	0 □0	□2□	0 □	23.7
Twe□d	140	139	0 □4	0 □0	9	□	10 □7	□□□	10 □□	□□□	□	□□□	4 □0	□□2	□□□	□□2					0 □0		0 □0	0 □0	0 □4	10 □7	4 □7	0 □0	0 □0	0 □□	9.1	9.1	□□□□□	250	□□□	48 □	□□	39.8
Twe□d	139	138	1 □2	0 □0	27	0	□2□29	□□□	□2□29	□□□	□	□□□	□□9	□2□	□□□	□2□					0 □0		0 □0	0 □0	1 □2	□2□29	4 □7	0 □0	0 □0	0 □0	9.9	9.9	□2□□□□	250	□2□	2□□	□□	19.7
□□r□□□d	138	134	1 □2	0 □0	21	0	13 □2	0 □0	13 □2	495	□	□□□	3 □8	□□2	□□□	□□2					0 □0		□□□	0 □0	1 □2	13 □2	5 □6	0 □0	0 □0	0 □0	10.5	10.5	□□□□□	250	□2□	30 □	□□	19.5
□□r□□□d	134	133	0 □3	0 □0	□□	0	14 □5	0 □0	14 □5	510	0	510	3 □7	□□□	□□□	□□□					0 □0		□□□	0 □0	0 □3	□□□□□	□□□□	□□□□	0 □0	0 □□	10.9	10.9	□□□□□	250	□2□	28 2	□□	17.3
□□r□□□d	133	1□2	1 □2	0 □0	21	□	15 □7	□□□	15 □7	□□□	□	□□□	□□6	□□□	□□□	□□□					0 □0		0 □0	0 □0	1 □2	15 □7	5 □3	0 □0	0 □0	0 □0	11.5	11.5	□□□2□	2□□	□2□	□□□	□□	19.8
□□r□□□d	1□2	131	0 □3	0 □0	15	0	15 □0	0 □0	15 □0	□□□	□	□□□	3 □5	□□□	□□□	□□□					0 □0		□□□	0 □0	0 □3	15 □0	6 □0	0 □0	0 □0	0 □0	12.0	12.0	□2□□□	250	□□□	□2□	□□	20.8
□□□□d	138	137	1 □7	0 □0	24	0	1 □7	0 □0	1 □7	24	□	2□	4 □0	□2□	□□□	□2□					0 □0		□□□	0 □0	1 □7	□□□□	0 □4	0 □0	0 □0	0 □0	0.7	0.7	□□□□□	200	□□□	19 □	□□	18.4
Twe□d	137	136	1 □2	0 □0	27	0	8 □3	0 □0	8 □3	273	0	273	4 □0	3 □1	0 □0	3 □1					0 □0		0 □0	0 □0	1 □2	8 □3	3 28	0 □0	0 □0	0 □□	6.3	6.3	91 □0	200	0 □7	20 □	0 □	13.7
Twe□d	136	135	0 □8	0 □0	18	□	9 □1	□□□	9 □1	2□□	□	2□□	4 □0	□2□	□□□	□2□					0 □0		0 □0	0 □0	0 □8	9 □1	3 □1	0 □0	0 □0	0 □□	6.8	6.8	□□□□□	200	□□□	19 2	□□	12.3
Twe□d	135	131	0 □3	0 □0	15	0	10 24	□□□	10 24	□□□	□	□□□	4 □0	□□□	□□□	□□□					0 □0		□□□	0 □0	0 □3	10 24	3 □9	0 □0	0 □0	0 □0	7.3	7.3	□□□□□	200	□□□	2□□	□□	20.1
□□r□□□d	131	□27	0 □9	0 □0	□2	0	26 □3	0 □0	26 □3	864	0	864	3 □4	9 □4	0 □0	9 □4					0 □0		0 □0	0 □0	0 □9	26 □3	10 □2	0 □0	0 □0	0 □0	19.3	19.3	103 □0	250	0 □0	□2□	0 □	13.3
□r□□	2□2	130	0 □0	0 □0	0	0	22□1	0 □6	23 □7	633	63	696	3 □0	6 □9	0 □8	7 □7					0 □0		0 □0	0 □0	0 □0	22□1	8 □7	0 □0	□□6	0 □□	15.5	16.5	65 □0	250	0 □2	46 □	1 □	30.2
□r□□	130	□29	0 29	0 □0	4	□□□	22□0	□□□	23 □□	□□□	□□□	□2□□	3 □5	□□□	□□□	□2□□					0 □0		0 □0	0 □0	0 29	23 □0	8 □8	0 □0	0 □6	0 □□	15.4	21.6	□□□□□	200	□□□	19 2	□□	-2.4
□r□□	□29	□28	0 29	0 □0	6	□	23 20	□□□	24 □□	□□□	□□□	□2□□	3 □4	□□□	□□□	□2□□					0 □0		0 □0	0 □0	0 29	23 □0	8 □9	0 □0	0 □6	0 □□	15.5	21.7	□2□□□□	200	□□□	41 □	□□	19.6
□r□□	□28	□27	0 □9	0 □0	□2	□	23 □8	□□□	24 □4	□□□	□□□	□22□	□□4	□□□	□□□	□2□□					0 □0		0 □0	0 □0	0 □9	23 □8	9 □1	0 □0	0 □6	0 □□	15.9	22.1	□□□□□	2□□	□□□	19 2	□□	-2.8
□r□□	□27	□26	0 □5	0 □0	3	0	50 □6	0 □6	51 □2	1 22	570	20 2	□□7	14 □7	5 □1	20 □8					0 □0		0 □0	0 □0	0 □5	50 □6	19 29	0 □0	□□6	0 □□	34.3	40.2	29 20	250	0 27	31 □	0 □	-9.1
□r□□	□26	□25	0 29	0 □□	6	□	50 □5	□□□	51 □□	□□2□	□□□	2□□□	3 □7	□□□2	□□□	2□□□					0 □0		0 □0	0 □0	0 29	51 □5	19 □0	0 □0	□□6	0 □□	34.4	40.4	□2□□□	200	□□□	20 □	□□	-19.8
□r□□	□25	□24	0 29	0 □□	6	□	51 □4	□□□	□2□□	□□□□	□□□	2□□□	3 □7	□□□□	□□□	2□□□					0 □0		0 □0	0 □0	0 29	51 □4	19 □1	0 □0	□□6	0 □□	34.6	40.5	□□□□□	200	□□□	19 □	□□	-21.0
□r□□	□21	□22	1 □7	0 □□	24	□	1 □7	□□□	1 □□	2□	□	2□	4 □0	□2□	□□□	□2□					0 □0		0 □0	0 □0	1 □7	1 □7	0 □4	0 □0	0 □0	0 □□	0.7	0.7	□□□□□□	200	□□□	20 □	□□	19.8
□r□□	□22	□23	0 □9	0 □0	□2	□	1 □6	□□□	1 □6	□□	□	□□	4 □0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 □9	1 □6	0 □7	0 □0	0 □0	0 □□	1.1	1.1	□□□□□□	200	□□□	20 □	□□	19.5
□r□□	□23	□24	0 □0	0 28	0	□□	1 □6	□2□	2□□	□□	□□	□□	4 □0	□□□	□□□	0 □6					0 □0		0 □0	0 □0	□□□□	1 □6	0 □□	0 28	□28	0 □□	1.1	1.3	□□□□□	200	□□□	41 2	□□	39.9
M□□	□24	118	0 29	0 □0	60	0	53 □9	1 □4	54 □□	1630	585	2215	3 □5	15 □4	5 □2	21 □7					0 □0		0 □0	0 □0	0 29	53 □9	20 29	0 □0	1 □4	0 □□	36.2	42.4	61 □1	250	0 28	31 □	0 □	-11.1
M□□	118	117	0 □0	0 □0	0	□	53 □9	□□□	54 □□	□□□□	□□□	22□□	3 □5	□□□□	□□2	2□□□					0 □0		0 □0	0 □0	0 □0	53 □9	20 29	0 □0	1 □4	0 □□	36.2	42.4	□□□□□	250	□2□	31 □	□□	-10.6
M□□	117	108	0 □4	0 □0	9	□	53 □3	□□□	54 □□	□□□□	□□□	222□	3 □5	□□□□	□□2	2□□□					0 □0		0 □0	0 □0	0 □4	53 □3	20 □6	0 □0	□□4	0 □□	36.5	42.6	□□2□□□	250	□2□	31 □	□□	-11.2
□ □□□□r	110	109	0 □8	□□□	18	□	0 □8	□□□	0 □□	□□	□	□□	4 □0	□2□	□□□	□2□					0 □0		0 □0	0 □0	0 □8	0 □8	0 □3	0 □0	0 □0	0 □□	0.5	0.5	□□□□□	200	□□□	24 □	□□	23.9
□ □□□□r	109	108	0 29	0 □0	6	□	1 □7	□□□	1 □□	2□	□	2□	4 □0	□2□	□□□	□2□					0 □0		0 □0	0 □0	0 29	1 □7	0 □4	0 □0	0 □0	0 □□	0.7	0.7	□□□□□	200	□□□	25 □	□□	24.9

APPENDIX E1 - SANITARY SEWER CALCULATION SHEET

Russell Sanitary Collection System

LOCATION			RESIDENTIAL AREA AND POPULATION														INDUSTRIAL			COMMERCIAL		INSTITUTIONAL		I+C+I	INFILTRATION						TOTAL EXISTING	TOTAL FUTURE	PIPE					
							□□M□□□□□																															
□□□□□□	□□□M M□□.	□□ M□□.	□□□□□□ AREA (ha)	□□□□□□ AREA (ha)	□□□□□□ POP.	□□□□□□ POP.	□□□□□□□ □□□□□□□	□□□□□□ □□□□□□)	□□□□□□□ □□□□□□□ □□□□□□□	□□□□□□ □□□.	□□□□□□ P□P□	□□□□□□□ □□□□□□ P□P□	□□□□ □□□□□	□□□□□□ □□□□□ FLO□ (□□)	□□□□□□ □□□□□□□□ (□□)	□□□□□□□ □□□□□□□ □□□□□ □□□□	□□□□ (□□)	□□□□□ □□□□ (□□)	□□□□□ FA□TOR (□□rMOE)	□□□□ (□□)	□□□□□ AREA (□□)	□□□□ (□□)	□□□□□ AREA (□□)	□□□□ FLOW (□□)	□□□□□□ AREA (□□)	ACCU □ □□□□□□ AREA □□□	□□□□□□□ □□□□□ □□□□ □□□	□□□□□□ □□□□ (□□)	□□□□□ □□□□□□ □□□□ (□□)	□□□□□□ □□□□□ □□□□ (□□)	FLOW (l/s)	FLOW (l/s)	□□□□□ (□□)	□□□□ (□□ □)	□□□□□ (□□)	□□□□ □□□□□ (□□)	□□□□ (□□□) (□□ □)	□□M□□□□□ C□P□ (□□)
M□□	108	107	0 □4	0 □0	7	0	55 24	1 □4	56 □8	1670	585	2255	□□4	16 □1	5 □1	22□2					0 □0		0 □0	0 □0	0 □4	55 □4	21 □7	0 □0	1 □4	0 □□	37.4	43.5	60 26	2□□	0 □0	□2□	0 □	-10.8
M□□	107	106	0 29	0 □0	6	□	55 □3	□□□	56 □7	□□□□	□□□	22□□	□□4	□□□□	□□□	22□□					0 □0		0 □0	0 □0	0 29	55 □3	21 □8	0 □0	1 □4	0 □□	37.5	43.7	□□□□	2□□	□2□	31 □	□□	-12.0
M□□	106	105	0 □4	0 □0	9	□	55 □7	□□□	57 □1	□□□□	□□□	22□□	□□4	□□□□	□□□	22□□					0 □0		0 □0	0 □0	0 □4	56 □7	21 □5	0 □0	1 □4	0 □□	37.8	43.9	□□□□	25□	□2□	29 □	□□	-14.1
M□□	105	1 □2	0 29	0 □0	6	□	56 26	□□□	57 □0	□□□□	□□□	22□□	3 □4	□□□□	□□□	22□2□					0 □0		0 □0	0 □0	0 29	56 □6	21 □6	0 □0	1 □4	0 □□	38.0	44.1	□□□□	250	□2□	31 □	□□	-12.7
M□□	116	115	0 □9	0 □0	6	□	0 □9	□□□	0 □□	□	□	□	4 □0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 □9	0 □9	0 22	0 □0	□□0	0 □□	0.3	0.3	□□□□	200	□□□	20 □	□□	19.8
M□□□	115	114	0 □9	□□□	□2	□	1 □7	□□□	1 □□	□□	□	□□	4 □0	□2□	□□□	□2□					0 □0		0 □0	0 □0	0 □9	1 □7	0 □4	0 □0	0 □0	0 □□	0.6	0.6	□□□□	200	□□□	21 □	□□	20.4
□□r□□□	114	111	0 □4	0 □0	7	□	1 □1	□□□	1 □□	2□	□	2□	4 □0	□2□	□□□	□2□					0 □0		0 □0	0 □0	0 □4	1 □1	0 □1	0 □0	0 □0	0 □□	0.9	0.9	□2□□	200	□□□	20 □	□□	19.8
□□□□r	113	1 □2	0 □3	0 □0	15	□	0 □3	□□□	0 □□	□□	□	□□	4 □0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 □3	0 □3	0 28	0 □0	0 □0	0 □□	0.4	0.4	□□□□	200	□□□	20 □	□□	20.4
□□□□r	1 □2	111	0 □3	0 □0	15	□	1 □6	□□□	1 □□	□□	□	□□	4 □0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 □3	1 □6	0 □6	0 □0	0 □0	0 □□	0.9	0.9	□□□□	200	□□□	28 □	□□	27.4
□□r□□□	111	1 □2	0 □4	0 □0	9	0	3 □1	0 □0	3 □1	64	0	64	4 □0	0 □1	0 □0	0 □1					0 □0		0 □0	0 □0	0 □4	3 □1	1 □3	0 □0	0 □0	0 □□	2.0	2.0	71 □1	2□□	0 □1	20 □	0 □	18.9
M□□	104	103	0 29	0 □0	4	□	0 29	□□□	0 29	□	□	□	4 □0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 29	0 29	0 □1	0 □0	0 □0	0 □□	0.2	0.2	□□□□	300	□□□	57 □	□□	57.4
M□□	103	1 □2	0 □5	0 □0	3	□	0 □4	□□□	0 □□	□	□	□	4 □0	□□□	□□□	0 □8					0 □0		0 □0	0 □0	□□□	□□4	0 □□	0 □0	□□0	0 □□	0.2	0.2	□□□□	200	□□□	29 □	□□	29.3
□□□r□asement	1 □2	101	0 □0	0 □0	0	0	60 22	1 □4	61 □□	17 □2	585	2347	3 □3	17 □4	5 □9	22□3					0 □0		0 □0	0 □0	0 □0	60 □2	22□6	0 □0	1 □4	0 □□	40.1	46.2	16 □3	300	0 □4	83 □	1 2	37.1
□□□r□a□ement	101	100	0 29	0 □0	6	□	60 □1	□□□	61 □□	□□□□	□□□	2□□□	3 □3	□□□□	□□□	22□□					0 □0		0 □0	0 □0	0 29	60 □1	23 □7	0 □0	1 □4	0 □□	40.3	46.4	□□2□	300	□□□	95 □	□□	49.0
□□□r□a□ement	100	99	0 □3	0 □0	11	□	61 24	□□□	□2□□	□□□□	□□□	2□□□	3 □3	□□2□	□□□	22□□					0 □0		0 □0	0 □0	0 □3	61 □4	23 □5	0 □0	1 □4	0 □□	40.6	46.8	□□□2	300	□2□	49 □	□□	2.6
□□□r□a□ement	99	97	0 □0	0 □0	0	□	61 24	□□□	□2□□	□□□□	□□□	2□□□	3 □3	□□2□	□□□	22□□					0 □0		0 □0	0 □0	0 □0	61 □4	23 □5	0 □0	1 □4	0 □□	40.6	46.8	□□□□	300	□22	45 □	□□	-1.7
□r□□	□20	119	0 □8	□□□	18	□	0 □8	□□□	0 □□	□□	□	□□	4 □0	□2□	□□□	□2□					0 □0		0 □0	0 □0	0 □8	0 □8	0 □3	0 □0	0 □0	0 □□	0.5	0.5	□2□□	200	□□□	20 □	□□	20.0
□r□□	119	163	0 □9	0 □0	□2	□	1 □6	□□□	1 □6	□□	□	□□	4 □0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 □9	1 □6	0 □6	0 □0	0 □0	0 □□	0.9	0.9	□□□□	200	□□2	21 2	□□	20.3
Concess □n	163	164	0 □5	0 □0	3	0	5 □6	0 □0	5 □6	168	0	168	4 □0	1 □5	0 □0	1 □5					0 □0		0 □0	0 □0	0 □5	5 □6	2□1	0 □0	0 □0	0 □□	4.0	4.0	21 □8	200	0 □9	20 □	0 □	16.5
Con □e □s □n	165	164	1 □2	0 □0	21	□	1 □2	□□□	1 □2	2□	□	2□	□□0	□2□	□□□	□2□					0 □0		0 □0	0 □0	1 □2	1 □2	0 □9	0 □0	□□0	0 □□	0.6	0.6	□□□□	200	□□□	20 □	□□	20.2
Leg □n	164	20	0 29	0 □0	□	0	6 □□	0 □0	6 □8	195	0	195	4 □0	2□5	0 □0	2□5					0 □0		0 □0	0 □0	0 29	□□8	2□□	0 □0	□□0	0 □□	4.8	4.8	80 □1	200	0 □9	29 □	0 □	24.4
□r□□□ve	25	24	□□□	□□□	22	□	1 □7	□□□	1 □7	22	□	22	4 □0	□2□	□□□	0 24					0 □0		0 □0	0 □0	□□□	□□7	0 □□	0 □0	□□0	0 □□	0.7	0.7	□□□□	200	□□□	20 □	□□	20.0
□r□□□ve	24	22	0 □8	□□□	18	□	2□5	□□□	2□□	□□	□	□□	4 □0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 □8	2□5	0 □8	0 □0	□□0	0 □□	1.2	1.2	□□□□	200	□□□	10 □	□□	9.5
M□□□	23	22	0 □5	□□□	□	□	0 □5	□□□	0 □5	□	□	□	4 □0	□□□	0 □0	0 □3					0 □0		0 □0	□□□	□□□	□□5	0 □□	0 □0	□□0	0 □□	0.1	0.1	2□□□	200	□□□	19 □	0 □	19.7
F□rst □ve	22	21	1 □2	0 □0	2□	0	3 22	0 □0	3 22	64	0	64	4 □0	0 □1	0 □0	0 □1					0 □0		0 □0	0 □0	1 □2	□22	1 22	0 □0	□□0	0 □□	1.9	1.9	□2□5	200	0 □9	20 □	0 □	18.7
□r□□□ve	21	20	1 □2	□□□	19	□	4 24	□□□	4 2□	□□	□	□□	4 □0	□□□	□□□	□□□					0 □0		0 □0	0 □0	1 □2	4 24	1 □1	0 □0	□□0	0 □□	2.5	2.5	□□□□	200	□□□	20 □	□□	18.2
F□rst □ve	20	18	0 □8	0 □0	18	0	□2□0	0 □0	□2□0	296	0	296	4 □0	3 26	0 □0	3 26					0 □0		0 □0	0 □0	0 □8	□2□0	4 □6	0 □0	0 □0	0 □□	7.8	7.8	104 □5	2□□	0 □0	20 □	0 □	12.9
□r□□□□	19	18	0 □5	0 □0	3	□	0 □5	□□□	0 □5	□	□	□	4 □0	□□□	□□□	□□□					0 □0		0 □0	0 □0	□□□	□□5	0 □□	0 □0	□□0	0 □0	0.1	0.1	□□□□	200	□□□	19 □	0 □	19.7
F□rst □□	18	14	0 □9	0 □0	□2	0	□2□3	0 □0	□2□□	311	0	311	4 □0	3 □3	0 □0	3 □3					0 □0		0 □0	0 □0	0 □9	□2□3	4 □4	0 □0	□□0	0 □□	8.3	8.3	63 □4	200	0 □9	20 □	0 □	12.2
□□□□□d	15	14	1 □2	0 □0	17	□	1 □2	□□□	1 □2	□□	□	□□	4 □0	□□□	□□□	□□□					0 □0		0 □0	0 □0	1 □2	1 □2	0 □0	0 □0	0 □0	0 □□	0.7	0.7	□□□□	200	□□□	20 □	□□	20.1
Seco □d	14	13	0 29	0 □0	6	0	14 □4	0 □0	14 □4	334	0	334	□□0	3 □8	0 □0	3 □8					0 □0		0 □0	0 □0	0 29	14 □4	5 □5	0 □0	0 □0	0 □0	9.1	9.1	59 □0	200	0 □1	2□□	0 □	11.9
□□□□□d	13	11	0 □3	0 □0	15	0	15 □7	0 □0	15 □7	□□□	□	□□□	4 □0	□□□	□□□	□□□					0 □0		0 □0	0 □0	□□□	□□□7	5 □□	0 □0	□□0	0 □□	9.6	9.6	□□□□	200	□□□	20 □	□□	11.0
Con □e □s □n	166	167	0 □9	□□□	□	□	0 □9	□□□	0 □9	□	□	□	4 □0	□□□	0 □0	0 □4					0 □0		0 □0	□□□	□□□	□□9	0 22	0 □0	□□0	0 □0	0.3	0.3	□□□□	200	□□□	20 □	0 □	20.6
Con □e □s □n	167	168	□□□	□□□	□	□	1 □2	□□□	1 □2	□	□	□	4 □0	0 □8	0 □0	0 □8					□□□		0 □0	□□□	□□□	□□2	0 □□	0 □□	0 □0	0 □0	0.5	0.5	□□□□	200	□□□	20 □	0 □	20.1
Con □e □s □n	□□□	□□□	□□□	□□□	□	□	0 □□	□□□	0 □9	□	□	□	4 □0	0 □4	0 □0	0 □4					□□□		0 □0	□□□	□□□	□□9	0 22	0 □0	0 □0	0 □0	0.3	0.3	□□□□	200	0 □0	20 □	0 □	20.5
□□□□r	168	□2	0 29	0 □0	2	0	1 □0	0 □0	1 □0	13	0	13	4 □0	0 □4	0 □0	0 □4					0 □0		0 □0	0 □0	0 29	□□0	0 □2	0 □0	□□0	0 □□	0.9	0.9	77 □2	200	0 □0	20 □	0 □	19.8
□r□□□ve	17	□2	0 □3	0 □0	15	□	0 □3	□□□	0 □□	□□	□	□□	4 □0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 □3	0 □3	0 28	0 □0	0 □0	0 □□	0.4	0.4	□□□□	200	□□□	19 □	□□	19.4
□□□□r	□2	11	0 29	0 □0	4	0	2□3	0 □0	2□□	□2	0	□2	4 □0	0 □5	0 □0	0 □5					0 □0		0 □0	0 □0	0 29	2□3	1 □1	0 □0	0 □0	0 □□	1.5	1.5	63 □9	200	0 □8	22□	0 □	21.2
□□□□r	11	10	0 □9	0 □0	□2	0	18 □8	0 □0	18 □8	393	0	393	□□0	4 □3	0 □0	4 □3					0 □0		0 □0	0 □0	0 □9	18 □8	7 □6	0 □0	0 □0	0 □0	11.4	11.4	96 □1	250	0 27	□□□	0 □	19.7
□□□□r	10	9	1 □2	0 □0	21	0	19 □1	0 □0	19 □1	□□□	□	□□□	4 □0	□□□	□□□	4 □6					0 □0		0 □0	0 □0	□□2	□□□1	7 □□	0 □0	□□0	0 □□	12.0	12.0	□□□□	250	□□□	74 2	□□	62.2
□□□□□ □□□ane	203	204	0 □4	0 □□	9	□	0 □4	□□□	0 □□	□	□	□	4 □0	□□□	0 □0	0 □0					0 □0		0 □0	0 □0	□□□	□□4	0 □□	0 □0	□□0	0 □0	0.3	0.3	□□□□	200	□□□	20 □	□□	20.7
□□□□□ □□□ane	204	205	0 29	□□□	□	□	0 □3	□□□	0 □3	□□	□	□□	4 □0	□□□	□□□	0 □7					0 □0		0 □0	0 □0	□2□	□□3	0 2□	0 □0	□□0	0 □□	0.4	0.4	□□□□	250	□□2	47 □	□□	46.6
□□□□□ □□□ane	205	206	0 29	0 □□	6	□	1 □2	□□□	1 □2	2□	□	2□	4 □0	□2□	□□□	□2□					0 □0		0 □0	0 □0	0 29	1 □2	0 □9	0 □0	□□0	0 □□	0.6	0.6	□2□□	250	□□□	37 □	□□	37.0
□□□□□ □□□ane	263	2□2	0 29	0 □0	6	□	0 29	□□□	0 2□	□	□	□	4 □0	□□□	0 □0	0 □7					0 □0		0 □0	0 □0	□2□	□□2	0 □□	0 □0	□□0	0 □□	0.6	0.6	□□□□□	250	□□□	49 □	□□	49.2
□□□□□ □□□ane	2□2	206	0 29	□□□	□	□	0 □9	□□□	0 □9	□2	□	□2	4 □0	□□□	□□□	0 □3					0 □0		0 □0	0 □0	□2□	□□1	0 □□	0 □0	□□0	0 □□	0.7	0.7	□□□□□	250	□□□	36 □	□□	36.0
□□□□□ □□□□□□□□□ □r□□	206	207	0 29	0 □0	6	0	1 □0	0 □0	1 □□	39	0	39	4 □0	0 □3	0 □0	0 □3					0 □0		0 □0	0 □0	0 29	2□3	1 □1	0 □0	0 □0	0 □□	1.5	1.5	87 □0	250	0 25	29 □	0 □	28.4
□□□□□□r□□	211	210	0 □4	0 □0	9	□	0 □4	□□□	0 □4	□	□	□	4 □0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 □4	0 □4	0 □7	0 □0	0 □0	0 □□	0.3	0.3	□□□□	200	□□□	20 □	□□	19.8
□□□□□□r□□	210	209	0 □4	0 □0	9	□	0 □8	□□□	0 □□	□□	□	□□	4 □0	□2□	□□□	□2□					0 □0		0 □0	0 □0	0 □4	0 □8	0 □3	0 □0	0 □0	0 □□	0.5	0.5	□□□□	200	□□2	18 □	□□	18.1
□□□□□□r□□	209	208	0 □4	0 □0	9	□	1 □2	□□□	1 □2	2□	□	2□	4 □0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 □4	1 □2	0 □0	0 □0	0 □0	0 □□	0.8	0.8	□□□□	2□□	□□□	60 □	□2	60.1
□□□□□□r□□	208	207	0 □4	0 □0	9	□	1 □6	□□□	1 □6	□□	□	□□	4 □0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 □4	1 □6	0 □7	0 □0	0 □0	0 □□	1.1	1.1	□□□□	2□□	□2□	29 □	□□	28.8
□□□□□□r□□	261	260	0 □4	0 □0	9	0	0 □4	□□□	0 □4	□	□	□	4 □0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 □4	0 □4	0 □7	0 □0	0 □0	0 □□	0.3	0.3	□□□□	250	□2□	29 □	□□	29.0
□□□□□□r□□	260	259	0 □4	0 □0	9	□	0 □8	□□□	0 □8	□□	□	□□	4 □0	□2□	□□□	□2□					0 □0		0 □0	0 □0	0 □4	0 □8	0 □3	0 □0	0 □0	0 □□	0.5	0.5	□□□□□	2□□	□2□	29 □	□□	28.5

APPENDIX E1 - SANITARY SEWER CALCULATION SHEET

Russell Sanitary Collection System

LOCATION			RESIDENTIAL AREA AND POPULATION														INDUSTRIAL			COMMERCIAL		INSTITUTIONAL		I+C+I	INFILTRATION						TOTAL EXISTING	TOTAL FUTURE	PIPE					
							□□M□□□□□□																															
□□□□□□	□□□M M□.	□□ M□.	□□□□□□ AREA (ha)	□□□□□□ AREA (ha)	□□□□□□ POP.	□□□□□□ POP.	□□□□□□□ □□□□□□□	□□□□□□ □□□□□□)	□□□□□□□ □□□□□□□ □□□□□□□	□□□□□□ □□□.	□□□□□□ P□P□	□□□□□□□□ □□□□□□ P□P□	□□□□ □□□□□	□□□□□□ □□□□□ FLO□ □□)	□□□□□□ □□□□□□□□ □□)	□□□□□□□□ □□□□□□□ □□□□□ □□□□ □□□	□□□□ □□)	□□□□□ □□□□ □□)	□□□□□ FA□TOR (□□rMOE)	□□□□ □□)	□□□□□ AREA □□)	□□□□ □□)	□□□□□ AREA □□)	□□□□ FLOW □□)	□□□□□□□ AREA □□)	ACCU □ □□□□□□ AREA □□□	□□□□□□□ □□□□□ □□□□ □□□	□□□□□□ □□□□ □□)	□□□□□ □□□□□□ □□□□ □□)	□□□□□□ □□□□□ □□□□ □□)	FLOW (l/s)	FLOW (l/s)	□□□□□ □□)	□□□ □□ □)	□□□□ □□)	□□□□ □□□□□ □□)	□□□□ □□□□) □□ □)	□□M□□□□ C□P□ □□)
□□□□□□r□□	259	258	0 □4	0 □0	9	□	1 □2	□□□	1 □2	2□	□	2□	4 □0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 □4	1 □2	0 □0	0 □0	0 □0	0 □□	0.8	0.8	□□□□	2□□	□2□	29 □	□□	28.6
□□□□□□r□□	258	207	0 □4	0 □0	9	□	1 □6	□□□	1 □6	□□	□	□□	4 □0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 □4	1 □6	0 □7	0 □0	0 □0	0 □□	1.1	1.1	□□□□□	2□□	□2□	30 □	□□	29.3
Eas □men □□□□□□	207	257	0 □0	0 □0	18	147	5 □1	0 □0	5 □1	□29	147	276	4 □0	1 □2	1 □2	3 □4					0 □0		0 □0	0 □0	0 □0	3 □1	1 □3	0 □0	0 □0	0 □□	2.8	4.4	43 □0	2□□	0 □1	20 2	0 □	15.8
Ea □emen □□□□□□	257	38	0 □4	0 □0	9	□	5 □5	□□□	5 □□	□□□	□□□	2□□	4 □0	□□2	□□2	□□□					0 □0		0 □0	0 □0	0 □4	3 □5	1 □0	0 □0	0 □0	0 □□	3.0	4.6	□□□□	250	□□□	□2□	□□	27.9
Dun □p	43	41	0 □8	0 □0	18	0	0 □8	□□□	0 □8	□□	□	□□	□□0	□2□	□□□	□2□					0 □0		0 □0	0 □0	0 □8	0 □8	0 □3	0 □0	0 □0	0 □0	0.5	0.5	□□□□	2□□	□□2	□2□	□□	42.4
□□□□□	41	38	0 □3	0 □0	15	0	1 □1	□□□	1 □1	□□	□	□□	□□0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 □3	1 □1	0 □1	0 □0	0 □0	0 □0	1.0	1.0	□□□2	250	□□□	□□□	□□	36.1
□□□□□	36	37	1 □2	0 □0	27	0	1 □2	0 □0	1 □2	2□	□	2□	4 □0	□□□	□□□	□□□					0 □0		□□□	0 □0	1 □2	1 □2	0 □0	0 □0	0 □0	0 □0	0.8	0.8	□□□2	250	□□□	□□□	□□	39.3
□□□□□	37	38	1 □2	0 □0	21	0	2□4	0 □0	2□4	□□	□	□□	4 □0	□□□	□□□	□□□					0 □0		□□□	0 □0	1 □2	2□4	0 □9	0 □0	0 □0	0 □0	1.4	1.4	□2□□	250	□□□	37 □	□□	36.2
Oak	38	40	0 29	0 □0	6	0	10 □0	0 □0	10 □□	225	147	3 □2	4 □0	2□8	1 □2	4 □0					0 □0		0 □0	0 □0	0 29	4 24	1 □1	0 □0	0 □0	0 □□	4.1	5.7	77 □1	250	0 29	31 □	0 □	26.2
Oak	40	29	0 29	0 □0	6	□	10 □9	□□□	10 □9	2□□	□□□	□□□	4 □0	2□□	□□2	□□□					0 □0		0 □0	0 □0	0 29	4 □4	1 □2	0 □0	0 □0	0 □□	4.3	5.9	□2□□	250	□□□	□2□	□□	36.5
M□□□	34	33	0 □9	0 □0	□2	□	0 □9	□□□	0 □9	□2	□	□2	4 □0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 □9	0 □9	0 22	0 □0	0 □0	0 □□	0.4	0.4	□□□□	2□□	□□□	27 □	□□	27.1
M□□□	33	□2	0 □3	0 □0	15	0	1 □2	□□□	1 □2	2□	□	2□	□□0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 □3	1 □2	0 □0	0 □0	0 □0	0 □0	0.8	0.8	□□□□	250	□□□	34 □	□□	33.2
M□□□	□2	31	0 □8	0 □0	18	□	2□9	□□□	2□□	□□	□	□□	4 □0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 □8	2□9	0 □3	0 □0	0 □0	0 □□	1.3	1.3	□□□2	250	□□□	41 □	□□	40.5
M□□□	31	30	1 □2	0 □0	21	□	3 22	□□□	3 22	□□	□	□□	4 □0	□□□	□□□	□□□					0 □0		0 □0	0 □0	1 □2	3 22	1 22	0 □0	0 □0	0 □□	2.0	2.0	□□□□□	2□□	□□□	39 □	□□	37.4
M□□□	30	29	1 □7	0 □0	24	0	4 □9	□□□	4 □9	□□	□	□□	□□0	□□□	□□□	□□□					0 □0		0 □0	0 □0	1 □7	4 □9	1 □7	0 □0	0 □0	0 □0	2.7	2.7	□□□□□	250	□□□	□□□	□□	33.3
M□□□	29	28	0 29	0 □0	6	0	15 □7	0 □0	15 □7	□27	147	474	□□9	3 □9	1 □1	5 20					0 □0		0 □0	0 □0	0 29	9 22	3 □0	0 □0	0 □0	0 □0	7.1	8.7	60 □5	250	0 □2	33 □	0 □	24.8
Dun □p	44	45	1 □7	□□□	24	□	1 □7	□□□	1 □□	2□	□	2□	4 □0	□2□	□□□	□2□					0 □0		0 □0	0 □0	1 □7	1 □7	0 □4	0 □0	0 □0	0 □□	0.7	0.7	□□□□	250	□□□	39 □	□□	38.3
Dun □p	45	26	0 □8	0 □0	18	□	2□5	□□□	2□5	□2	□	□2	4 □0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 □8	2□5	0 □8	0 □0	0 □0	0 □□	1.2	1.2	□□□□	250	□□□	35 □	□□	34.2
M□□□	26	27	0 □4	0 □0	9	□	2□9	□□□	2□9	□□	□	□□	4 □0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 □4	2□9	0 □5	0 □0	0 □0	0 □□	1.5	1.5	□□□□	250	□□□	36 □	□□	34.9
Gra □e	□2	27	0 □8	0 □0	18	□	0 □8	□□□	0 □8	□□	□	□□	□□0	□2□	□□□	□2□					0 □0		0 □0	0 □0	0 □8	0 □8	0 □3	0 □0	□□0	0 □□	0.5	0.5	□□2□	200	□□□	24 □	□□	23.8
M□□□	27	28	0 □4	0 □0	□	0	3 □0	0 □0	3 □0	78	0	78	4 □0	0 □6	0 □0	0 □6					0 □0		0 □0	0 □0	0 □4	□□0	1 □□	0 □0	□□0	0 □□	2.3	2.3	33 □8	250	0 □7	40 □	0 □	38.3
□□□□□□ □□□□ □ □□d M□□□	28	54	0 □5	0 □0	3	0	19 □2	0 □0	19 □2	408	147	555	3 □5	4 □4	1 □0	6 □4					0 □0		0 □0	0 □0	0 □5	13 □7	5 □0	0 □0	0 □0	0 □□	9.4	11.0	41 □5	250	0 □1	□2□	0 □	31.6
Ea □emen□ □ □□d M□□□	54	55	0 □4	0 □0	9	□	19 □6	□□□	19 □6	□□□	□□□	□□□	3 □5	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 □4	13 □1	5 □7	0 □0	0 □0	0 □□	9.7	11.3	□□□□	250	□□□	49 □	□□	38.3
□ □□d	55	53	0 □3	0 □0	15	□	20 □9	□□□	20 □9	□□2	□□□	□□□	3 □4	□□□	□□□	□2□					0 □0		0 □0	0 □0	0 □3	14 □4	5 □5	0 □0	0 □0	0 □□	10.1	11.7	□□□2	2□□	□□□	24 □	□□	13.2
□ □□d	53	□2	0 □8	0 □0	18	0	21 □7	□□□	21 □7	□□□	□□□	□□□	□□3	□□□	□□□	□□□					0 □0		□□□	0 □0	0 □8	15 22	5 □8	0 □0	0 □0	0 □0	10.7	12.3	□□□□□	250	□□□	□□□	□□	24.7
□□□	46	47	0 □8	0 □0	18	0	0 □8	0 □0	0 □8	□□	□	□□	4 □0	□2□	□□□	□2□					0 □0		□□□	0 □0	0 □8	0 □8	0 □3	0 □0	0 □0	0 □0	0.5	0.5	□□2□	200	□□2	2□□	□□	23.0
□ □□d	56	47	0 □4	0 □0	9	□	0 □4	□□□	0 □4	□	□	□	4 □0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 □4	0 □4	0 □7	0 □0	0 □0	0 □□	0.3	0.3	□2□□	200	□□□	26 □	□□	26.3
□□□	47	48	1 □2	0 □0	21	0	2□4	0 □0	2□4	48	0	48	4 □0	0 □3	0 □0	0 □3					0 □0		0 □0	0 □0	1 □2	2□4	0 □9	0 □0	0 □0	0 □□	1.4	1.4	70 □0	2□□	0 □2	23 □	0 □	22.2
□□□	48	49	0 □9	0 □0	□2	0	2□3	□□□	2□3	□□	□	□□	□□0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 □9	2□3	1 □1	0 □0	0 □0	0 □0	1.8	1.8	□□□□	250	□2□	2□□	□□	27.3
□ □□r□□□□	49	50	0 □4	0 □0	9	0	3 □7	0 □0	3 □7	□□	□	□□	4 □0	□□□	□□□	□□□					0 □0		□□□	0 □0	0 □4	3 □7	1 28	0 □0	0 □0	0 □0	2.0	2.0	□□□□	250	□□□	37 □	□□	35.6
□r□□	51	50	0 □8	0 □0	18	0	0 □8	□□□	0 □8	□□	□	□□	□□0	□2□	□□□	□2□					0 □0		0 □0	0 □0	0 □8	0 □8	0 □3	0 □0	0 □0	0 □0	0.5	0.5	□□□□	2□□	□□□	2□□	□□	26.0
Ge □rges □	50	□2	0 □5	0 □0	3	0	4 □9	0 □0	4 □9	90	0	90	□□0	0 □9	0 □0	0 □9					0 □0		0 □0	0 □0	0 □5	4 □9	1 □7	0 □0	0 □0	0 □0	2.7	2.7	47 24	250	0 □7	□□□	1 2	56.0
Ge □rges □	□2	57	0 □4	0 □0	9	0	25 □0	0 □0	25 □0	549	147	696	3 □0	5 □9	1 □8	7 □7					0 □0		0 □0	0 □0	0 □4	20 □5	7 □2	0 □0	0 □0	0 □0	13.5	15.1	43 28	250	0 □0	□□□	0 □	22.6
□ □□r□□□□	57	58	0 □0	0 □0	0	0	25 □0	0 □0	25 □0	549	□□□	□□□	3 □0	□□□	□□□	□□□					0 □0		□□□	0 □0	0 □0	20 □5	7 □2	0 □0	0 □0	0 □0	13.5	15.1	□2□□	2□□	□□□	37 □	□□	22.7
□□□□□rd	76	77	1 □2	0 □0	27	0	1 □2	□□□	1 □2	2□	□	2□	□□0	□□□	□□□	□□□					0 □0		0 □0	0 □0	1 □2	1 □2	0 □0	0 □0	0 □0	0 □0	0.8	0.8	□□2□	200	□2□	□□□	□□	16.6
□□□□□rd	77	78	0 □9	0 □0	□2	0	1 □0	0 □0	1 □0	□□	□	□□	4 □0	□□□	□□□	□□□					0 □0		□□□	0 □0	0 □9	1 □0	0 □2	0 □0	0 □0	0 □0	1.2	1.2	□□□□	200	□□□	19 2	□□	18.0
Loucks	79	78	1 □2	0 □0	21	0	1 □2	0 □0	1 □2	21	□	2□	4 □0	□2□	□□□	□2□					0 □0		□□□	0 □0	1 □2	□□2	0 □9	0 □0	0 □0	0 □0	0.6	0.6	□□□2	200	□□2	18 □	□□	17.9
Loucks	78	80	0 □9	0 □0	□2	0	3 □1	0 □0	3 □1	□2	0	□2	4 □0	0 □9	0 □0	0 □9					0 □0		0 □0	0 □0	0 □9	3 □1	1 □3	0 □0	0 □0	0 □0	2.1	2.1	108 □1	250	0 □9	37 2	0 □	35.0
Loucks	80	81	0 □3	0 □0	15	0	4 24	□□□	4 24	□□	□	□□	□□0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 □3	4 24	1 □1	0 □0	0 □0	0 □0	2.6	2.6	□□□2	250	□□□	□□□	□□	36.9
M□□□	35	81	0 □8	0 □0	18	0	0 □8	0 □0	0 □8	□□	□	□□	4 □0	□2□	□□□	□2□					0 □0		□□□	0 □0	0 □8	0 □8	0 □3	0 □0	0 □0	0 □0	0.5	0.5	□□□□	200	□□2	39 □	□2	38.5
Loucks	81	□2	0 □4	0 □0	9	0	5 □6	0 □0	5 □6	114	0	114	4 □0	1 26	0 □0	1 26					0 □0		0 □0	0 □0	0 □4	5 □6	2□1	0 □0	0 □0	0 □0	3.4	3.4	□2□7	250	0 29	□2 2	0 □	28.8
Loucks	□2	83	0 □8	0 □0	18	0	6 □4	0 □0	6 □4	1 □2	0	□□2	4 □0	□□□	□□□	□□□					0 □0		□□□	0 □0	0 □8	□□□	2□5	0 □0	0 □0	0 □□	3.9	3.9	□□□□	250	□□□	35 □	□□	31.7
Pha □r	90	89	1 □7	0 □0	24	0	1 □7	□□□	1 □7	2□	□	2□	□□0	□2□	□□□	□2□					0 □0		0 □0	0 □0	1 □7	1 □7	0 □4	0 □0	0 □0	0 □0	0.7	0.7	□□□□	2□□	□□□	22□	□□	21.9
□□□r□	87	88	0 □9	0 □0	□2	0	0 □9	0 □0	0 □9	□2	□	□2	4 □0	□□□	□□□	□□□					0 □0		□□□	0 □0	0 □9	0 □9	0 22	0 □0	0 □0	0 □0	0.4	0.4	□□□□	200	□□□	2□2	□□	27.8
□□□r	88	89	1 □2	0 □0	21	0	1 □1	0 □0	1 □1	33	□	□□	4 □0	□□□	□□□	□□□					0 □0		□□□	0 □0	1 □2	1 □1	0 □1	0 □0	0 □0	0 □0	1.0	1.0	□2□□	200	□□□	22□	□□	21.9
Eas □men □□ □□r	89	84	0 29	0 □0	6	0	3 □7	0 □0	3 □7	63	0	63	4 □0	0 □9	0 □0	0 □9					0 □0		0 □0	0 □0	0 29	3 □7	1 □7	0 □0	0 □0	0 □□	1.9	1.9	81 □8	200	0 □5	22□	0 □	20.1
Loucks	86	85	0 □8	0 □0	18	□	0 □8	□□□	0 □8	□□	□	□□	4 □0	□2□	□□□	□2□					0 □0		0 □0	0 □0	0 □8	0 □8	0 □3	0 □0	0 □0	0 □□	0.5	0.5	□□□□	2□□	□□□	25 □	□□	24.9
Loucks	85	84	0 □8	0 □0	18	0	1 □6	□□□	1 □6	□□	□	□□	□□0	□□□	□□□	□□□					0 □0		□□0	0 □0	0 □8	1 □6	0 □7	0 □0	0 □0	0 □0	1.1	1.1	□□□□	200	□□□	2□□	□□	24.3
□□□	84	83	0 □3	0 □0	15	0	5 □6	0 □0	5 □6	114	0	114	4 □0	1 26	0 □0	1 26					0 □0		0 □0	0 □0	0 □3	5 □6	2□1	0 □0	0 □0	0 □0	3.4	3.4	85 □4	250	0 □0	37 □	0 □	34.2
Hay	83	63	0 □4	0 □0	9	0	□2□4	0 □0	□2□4	255	0	255	4 □0	2□1	0 □0	2□1					0 □0		0 □0	0 □0	0 □4	□2□4	4 □3	0 □0	0 □0	0 □□	7.5	7.5	□2□6	250	0 □0	□2□	0 □	25.3
□□□□□rd	75	74	0 □8	0 □0	18	□	0 □8	□□□	0 □8	□□	□	□□	4 □0	□2□	□□□	□2□					0 □0		0 □0	0 □0	0 □8	0 □8	0 □3	0 □0	0 □0	0 □□	0.5	0.5	□2□□	200	□□□	27 □	□□	26.9

APPENDIX E1 - SANITARY SEWER CALCULATION SHEET

Russell Sanitary Collection System

LOCATION			RESIDENTIAL AREA AND POPULATION														INDUSTRIAL			COMMERCIAL		INSTITUTIONAL		I+C+I	INFILTRATION						TOTAL EXISTING FLOW (l/s)	TOTAL FUTURE FLOW (l/s)	PIPE					
□□□□□□□	□□□M M□.	□□ M□.	□□□□□□ AREA (ha)	□□□□□□ AREA (ha)	□□□□□□ POP.	□□□□□□ POP.	□□M□□□□□□ □□□□□□□□ □□□□□□□□	□□□□□□ □□□□□□)	□□□□□□ □□□□□□□ □□□□□□□	□□□□□□ □□□.	□□□□□□ P□P□	□□□□□□□□ □□□□□□ P□P□	□□□□ □□□□□	□□□□□□□ □□□□□ FLO□ (□□)	□□□□□□ □□□□□□□□ (□□)	□□□□□□□□ □□□□□□□ □□□□□ □□□□ □□□	□□□□ (□□)	□□□□□ □□□□ (□□)	□□□□□ FA□TOR (□□rMOE)	□□□□ (□□)	□□□□□ AREA (□□)	□□□□ (□□)	□□□□□ AREA (□□)	□□□□ FLOW (□□)	□□□□□□□ AREA (□□)	ACCU □ □□□□□□ AREA □□□	□□□□□□□ □□□□□ □□□□ □□□	□□□□□□ □□□□ (□□)	□□□□□ □□□□□□ □□□□ (□□)	□□□□□□ □□□□□ □□□□ (□□)	FLOW (l/s)	FLOW (l/s)	□□□□□□ (□□)	□□□ (□□ □)	□□□□□ (□□)	□□□□ □□□□□□ (□□)	□□□□ (□□□□) (□□ □)	□□M□□□□□ C□P□ (□□)
□□□□□rd	74	□2	1 □2	0 □0	21	0	1 □0	□□□	1 □0	□□	□	□□	□□0	□□□	□□□	□□□					0 □0		0 □0	0 □0	1 □2	1 □0	0 □2	0 □0	0 □0	0 □0	1.2	1.2	□□□2	2□□	□□□	□□□	□□	17.8
□□□r□□□□	73	□2	0 □9	0 □0	□2	0	0 □9	□□□	0 □9	□2	□	□2	□□0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 □9	0 □9	0 22	0 □0	0 □0	0 □0	0.4	0.4	2□□□	200	□□□	2□□	□□	28.2
Ge □rges □	□2	71	0 □8	0 □0	18	0	3 □7	0 □0	3 □7	69	0	69	4 □0	0 □6	0 □0	0 □6					0 □0		0 □0	0 □0	0 □8	3 □7	1 28	0 □0	0 □0	0 □0	2.0	2.0	79 □5	250	0 □8	□□□	0 □	34.4
□□□r□□□□	71	69	0 □9	0 □0	□2	0	3 □5	0 □0	3 □5	□□	□	□□	4 □0	□□□	□□□	□□□					0 □0		□□□	0 □0	0 □9	3 □5	1 □0	0 □0	0 □0	0 □0	2.4	2.4	□□□□	250	□22	27 □	□□	25.5
Degu re	70	69	1 □2	0 □0	27	0	1 □2	□□□	1 □2	2□	□	2□	□□0	□□□	□□□	□□□					0 □0		0 □0	0 □0	1 □2	1 □2	0 □0	0 □0	0 □0	0 □0	0.8	0.8	□□□□	2□□	□□□	25 2	□□	24.4
Ge □rges □	69	68	0 □4	0 □0	9	0	5 □1	0 □0	5 □1	117	0	117	□□0	1 29	0 □0	1 29					0 □0		0 □0	0 □0	0 □4	5 □1	2□7	0 □0	0 □0	0 □0	3.5	3.5	57 □1	2□□	0 □0	37 □	0 □	34.0
□□□r□□□□	68	67	0 □4	0 □0	9	0	6 □5	□□□	6 □5	□2□	□	□2□	□□0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 □4	6 □5	2□4	0 □0	0 □0	0 □0	3.7	3.7	□□□□	2□□	□□2	□2□	□□	39.1
□□□r□□□□	67	64	0 □8	0 □0	18	0	7 □2	□□□	7 □2	□□□	□	□□□	□□0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 □8	7 □2	2□7	0 □0	0 □0	0 □0	4.3	4.3	□□□□	250	□□□	33 2	□□	28.9
E □don	66	64	1 □2	0 □0	21	□	1 □2	□□□	1 □2	2□	□	2□	4 □0	□2□	□□□	□2□					0 □0		0 □0	0 □0	1 □2	1 □2	0 □9	0 □0	0 □0	0 □□	0.6	0.6	□□□□	200	□□□	20 □	□□	20.3
Ge □rges □	64	63	0 □9	0 □0	□2	0	8 □3	0 □0	8 □3	177	0	177	□□0	1 □5	0 □0	1 □5					0 □0		0 □0	0 □0	0 □9	8 □3	3 28	0 □0	0 □0	0 □0	5.2	5.2	41 □6	2□□	0 26	30 □	0 □	25.3
Ge □rges □	63	□2	0 29	0 □0	6	0	21 □6	0 □0	21 □6	438	0	438	□□0	4 □3	0 □0	4 □3					0 □0		0 □0	0 □0	0 29	21 □6	8 □2	0 □0	0 □0	0 □0	12.9	12.9	44 20	250	0 □8	□□□	0 □	28.4
□□□r□□□□	□2	61	0 □4	0 □0	9	0	21 □0	□□□	21 □0	□□□	□	□□□	4 □0	□□2	□□□	□□2					0 □0		□□□	0 □0	0 □4	21 □0	8 28	0 □0	0 □0	0 □0	13.2	13.2	□□□□	250	□□2	33 □	□□	20.5
□□□r□□□□	61	60	0 □8	0 □0	18	□	22□8	□□□	22□□	□□□	□	□□□	3 □9	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 □8	22□8	8 □2	0 □0	0 □0	0 □□	13.7	13.7	□□□□	250	□□□	34 □	□□	21.2
□□□r□□□□	60	58	0 □3	0 □0	15	0	23 □1	□□□	23 □1	□□□	□	□□□	□□8	□2□	□□□	□2□					0 □0		□□□	0 □0	0 □3	23 □1	8 □0	0 □0	0 □0	0 □0	14.2	14.2	□□□□□	250	□2□	□2□	□□	17.8
□ □r□□r	58	6	0 □4	0 □0	9	0	49 □5	0 □0	49 □5	1038	147	1185	□□5	10 □3	1 □2	□2 24					0 □0		0 □0	0 □0	0 □4	43 □0	16 □8	0 □0	0 □0	0 □0	27.4	28.9	103 □8	250	0 □7	□□□	0 □	7.1
□□□□r	1	2	1 □2	0 □0	21	0	1 □2	□□□	1 □2	2□	□	2□	□□0	□2□	□□□	□2□					0 □0		0 □0	0 □0	1 □2	1 □2	0 □9	0 □0	0 □0	0 □0	0.6	0.6	□□□□	200	□□□	20 □	□□	19.5
□□□□r	2	3	□2□	□□□	□	□	1 □2	□□□	1 □2	2□	□	2□	4 □0	□□□	□□□	0 □0					0 □0		0 □0	0 □0	□2□	□□2	0 □□	0 □0	□□0	0 □□	0.8	0.8	□□□□	200	□□□	19 □	□□	18.8
□□□□r	3	4	□□□	□□□	□	□	1 □□	□□□	1 □6	□□	□	□□	4 □0	□□□	□□□	0 □0					0 □0		0 □0	0 □0	□□□	□□6	0 □□	0 □0	□□0	0 □□	1.1	1.1	□□□□	200	□□□	20 □	□□	19.5
□□□□r	4	□	□□□	□□□	□	□	1 □□	□□□	1 □0	□□	□	□□	4 □0	□□□	0 □0	0 □3					0 □0		0 □0	□□□	□□□	□□0	0 □2	0 □0	□□0	0 □0	1.2	1.2	□□2□□	200	□□□	21 □	□□	19.9
□□□□r	□	□	□□□	□□□	□	□	1 □□	□□□	1 □0	□□	□	□□	4 □0	0 □3	0 □0	0 □3					0 □0		0 □0	□□□	□□□	□□0	0 □2	0 □□	□□0	0 □□	1.2	1.2	22□□	200	□□□	21 □	□□	20.3
□□□□r	6	7	0 □5	0 □0	□	0	51 □□	0 □0	51 □0	1080	147	□227	3 □4	11 □3	1 □1	□2□4					0 □0		0 □0	0 □0	0 □5	□□□4	17 □□	0 □0	□□0	0 □□	28.6	30.1	80 □7	250	0 □0	□2□	0 □	2.2
□□□□r	□	□	□2□	□□□	□	□	□2□9	□□□	□2□9	□□□□	□□□	□2□□	3 □4	□□□□	1 □1	□2□0					□□□		0 □0	□□□	□2□	□□24	17 □□	0 □□	0 □0	0 □0	28.8	30.3	□□□□	250	□2□	29 □	0 □	-0.9
□□□□r	□	□	□□□	□□□	□	□	□2□3	□□□	□2□3	□□□□	□□□	□2□2	3 □4	11 27	1 □1	□2□9					□□□		0 □0	□□□	□□□	□□□8	17 □□	0 □0	0 □0	0 □0	29.0	30.5	□□2□	250	0 23	28 □	0 □	-1.9
M□□	9	91	0 □9	0 □0	□2	0	□2□2	0 □0	□2□2	1 21	147	1668	3 □5	15 27	1 □8	16 □5					0 □0		0 □0	0 □0	0 □9	□□□7	25 □□	0 □0	□□0	0 □□	40.7	42.2	50 □4	300	0 24	47 □	0 □	4.9
M□□	□□	□2	□2□	□□□	□	□	73 □□	□□□	73 □1	□□2□	□□□	□□□□	3 □4	□□□□	1 □8	16 □1					0 □0		0 □0	□□□	□2□	□□□6	25 □2	0 □0	□□0	0 □0	40.9	42.3	2□□□	300	□2□	47 □	0 □	4.8
M□□	□2	□□	□□□	□□□	□	□	73 □□	□□□	73 □6	□□□□	□□□	□□□□	3 □4	□□□□	1 □8	16 □3					0 □0		0 □0	□□□	□□□	□□□1	25 □□	0 □0	□□0	0 □0	40.9	42.4	□□□□	300	□□□	□2□	0 □	0.2
M□□	□□	□□	□□□	□□□	□	□	73 □0	□□□	73 □0	□□□□	□□□	□□□□	3 □4	□□□2	1 □8	16 □0					0 □0		0 □0	□□□	□□□	□□□5	25 □□	0 □□	0 □0	0 □0	41.2	42.6	□□□□	300	□2□	44 □	0 □	1.8
M□□	□□	□□	□2□	□□□	2	□	0 29	□□□	0 29	2	□	2	4 □0	0 □2	0 □0	0 □2					□□□		0 □0	□□□	□2□	□29	0 □□	0 □0	□□0	0 □0	0.1	0.1	□□□□	200	□□□	39 □	1 □	39.7
□□r□□□□ot	94	95	0 □5	0 □0	□	0	74 □□	0 □0	74 □□	1540	147	1687	3 □4	15 □5	1 □7	16 □2					0 □0		0 □0	0 □0	0 □5	□□□9	25 □□	0 □0	□□0	0 □□	41.4	42.8	28 □3	300	0 □5	57 □	0 □	14.6
□□r□□□□ot	95	96	0 □0	□□□	0	□	74 □4	□□□	74 □□	□□□□	□□□	□□□□	3 □4	□□□□	□□□	□□□2					0 □0		0 □0	0 □0	□□□	□8 □9	25 □□	0 □0	□□0	0 □□	41.4	42.8	□2□□	300	□2□	50 □	□□	7.5
□□r□□□□ot	96	97	0 □5	□□□	1	□	74 □8	□□□	74 □□	□□□□	□□□	□□□□	3 □4	□□□□	□□□	□□□□					0 □0		0 □0	0 □0	□□□	□8 □3	25 □□	0 □0	□□0	0 □□	41.4	42.9	□□□□	300	□□□	27 □	□□	-15.0
Concess □n	97	170	0 □0	0 □0	0	0	135 □2	1 □4	136 □□	3 20	7 2	40 2	3 □3	30 □4	6 □1	37 □5					0 □0		0 □0	0 □0	0 □0	□2□□7	49 □□	0 □0	□□4	0 □□	79.8	86.9	51 □1	300	1 20	106 □	1 □	19.2
Con □e □s □n	170	171	0 □5	□□□	□	□	135 □7	□□□	136 □□	□□2□	□□2	□□□□	3 □3	□□□□	□□□	□□□□					0 □0		0 □0	0 □0	□□□	□2□□2	49 □□	0 □0	□□4	0 □□	79.8	87.0	□□□	450	□□□	197 □	□2	110.9
Con □e □s □n	171	1 2	0 □5	0 □0	3	□	135 □2	□□□	136 □□	□□2□	□□2	□□□□	3 □3	□□□□	□□□	□□2□					0 □0		0 □0	0 □0	0 □5	130 □6	49 □2	0 □0	□□4	0 □□	79.9	87.1	□□□□	450	□□□	204 2	□□	117.1
Bank	178	177	0 □4	9 □7	9	□	0 □4	□□□	9 □□	□	□	□	4 □0	□□□	0 □0	0 □0					0 □0		0 □0	0 □0	□□□	□□4	0 □□	9 □7	□□7	3 □□	0.3	3.8	□□□2	200	□□2	45 □	□□	41.7
Bank	177	176	0 □8	□□□	18	□	1 □2	□□□	10 □□	2□	□	2□	4 □0	□□□	□□□	0 □0					0 □0		0 □0	0 □0	□□□	□□2	0 □□	0 □0	□□7	3 □□	0.8	4.3	2□2□	200	□□□	61 □	2□□	57.1
Bank	176	175	0 □9	0 □0	□2	□	1 □0	□□□	11 □□	□□	□	□□	4 □0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 □9	1 □0	0 □2	0 □0	9 □7	3 □□	1.2	4.6	□□2□	200	□□□	68 □	2 2	63.5
Bank	175	174	0 29	0 □0	6	□	2□9	□□□	11 □7	□□	□	□□	4 □0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 29	2□9	0 □3	0 □0	9 □7	3 □□	1.3	4.8	□□□□	200	□□□	20 2	□□	15.4
Bank	174	1 2	0 □5	0 □0	1	□	2□4	□□□	11 □1	□□	□	□□	4 □0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 □5	2□4	0 □9	0 □0	9 □7	3 □□	1.4	4.9	□□□□	2□□	□□□	27 □	□□	22.5
Conc □ss □n	1 2	173	0 □0	0 □0	0	0	138 □6	10 □1	148 □7	33 2	7 2	4104	□□2	30 □7	6 □0	37 □7					0 □0		0 □0	0 □0	0 □0	□□2□1	50 □□	0 □0	□□□1	3 □2	81.2	91.8	□2□0	450	0 □7	196 □	1 2	104.2
Sou □□□ □□□□□□d	186	185	□□□	□□□	□2	□	0 □9	□□□	0 □9	□2	□	□2	4 □0	□□□	□□□	0 □3					0 □0		0 □0	0 □0	□□□	□□9	0 22	0 □0	□□0	0 □□	0.4	0.4	□□□□	200	□□□	23 □	□□	23.0
Sou □□□ □□□□□□d	185	184	0 29	0 □0	6	□	0 □8	□□□	0 □□	□□	□	□□	4 □0	□2□	□□□	□2□					0 □0		0 □0	0 □0	0 29	0 □8	0 □3	0 □0	□□0	0 □□	0.5	0.5	□□□□	200	□□□	23 □	□□	22.8
Sou □□□ □□□□□□d	184	183	0 □4	0 □0	9	□	1 □2	□□□	1 □2	2□	□	2□	4 □0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 □4	1 □2	0 □0	0 □0	0 □0	0 □□	0.8	0.8	□□□□	200	□□□	23 □	□□	22.5
Sou □□□ □□□□□□d	183	1 2	0 □9	0 □0	□2	□	1 □0	□□□	1 □0	□□	□	□□	4 □0	□□□	0 □0	0 □3					0 □0		0 □0	0 □0	□□□	□□0	0 □2	0 □0	□□0	0 □□	1.2	1.2	□□□□	200	□□□	23 2	□□	22.1
Sou □□□ □□□□□□d	1 2	305	0 □8	□□□	18	□	2□8	□□□	2□□	□□	□	□□	4 □0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 □8	2□8	1 □6	0 □0	□□0	0 □□	1.7	1.7	□□□□	200	□□□	23 □	□□	21.4
Sou □□□ □□□□□□d	305	304	0 □3	0 □0	15	□	3 □1	□□□	3 □□	□2	□	□2	4 □0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 □3	3 □1	1 □3	0 □0	0 □0	0 □□	2.1	2.1	□□□□	200	□□□	41 □	□□	39.1
De □□□□□	313	3 2	0 □0	0 □0	0	□	0 □0	□□□	0 □0	□	□	□	4 □0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 □0	0 □0	0 □0	0 □0	0 □0	0 □□	0.0	0.0	□□□□	200	□□□	□2□	□□	32.5
De □□□□□	317	311	1 □2	0 □0	27	□	1 □2	□□□	1 □2	2□	□	2□	4 □0	□□□	□□□	0 □0					0 □0		0 □0	0 □0	□□2	□□2	0 □□	0 □0	□□0	0 □□	0.8	0.8	□2 2□	200	□□□	20 □	□□	20.0
De □□□□□	311	3 2	1 □2	□□□	27	□	2□3	□□□	2□□	□□	□	□□	4 □0	□□□	□□□	□□□					0 □0		0 □0	0 □0	1 □2	2□3	1 □0	0 □0	0 □0	0 □□	1.6	1.6	□□□□	200	□□□	20 □	□□	19.2
□□□□r	3 2	314	0 □0	0 □0	0	0	2□3	0 □0	2□□	54	0	54	4 □0	0 □0	0 □0	0 □0					0 □0		0 □0	0 □0	0 □0	2□3	1 □0	0 □0	0 □0	0 □□	1.6	1.6	14 □0	200	0 □1	21 □	0 □	19.4
□□□□r	314	315	0 □0	0 □0	0	□	2□3	□□□	2□□	□□	□	□□	4 □0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 □0	2□3	1 □0	0 □0	0 □0	0 □□	1.6	1.6	□□2□	200	□□□	21 □	□□	19.5
□□□□r	315	193	0 □5	0 □0	3	□	2□8	□□□	2□8	□□	□	□□	4 □0	□□□	0 □0	0 □3					0 □0		0 □0	0 □0	□□□	2□8	1 □□	0 □0	□□0	0 □□	1.7	1.7	□□2□	200	□□□	20 □	□□	19.0

APPENDIX E1 - SANITARY SEWER CALCULATION SHEET

Russell Sanitary Collection System

LOCATION			RESIDENTIAL AREA AND POPULATION														INDUSTRIAL			COMMERCIAL		INSTITUTIONAL		I+C+I	INFILTRATION						TOTAL EXISTING FLOW (l/s)	TOTAL FUTURE FLOW (l/s)	PIPE					
□□□□□□	□□□M M□□.	□□ M□□.	□□□□□□ AREA (ha)	□□□□□□ AREA (ha)	□□□□□□ POP.	□□□□□□ POP.	□□M□□□□□□						□□□□ □□□□□	□□□□□□ □□□□□ FLO□ □□)	□□□□□□ □□□□□□□□ □□)	□□□□□□□ □□□□□□□ □□□□□ □□□□ □□□	□□□□ □□)	□□□□□ □□□□ □□)	□□□□□ FA□TOR □□□rMOE)	□□□□ □□)	□□□□□ AREA □□)	□□□□ □□)	□□□□□ AREA □□)	□□□□ FLOW □□)	□□□□□□□ AREA □□)	ACCU □□ □□□□□□ AREA □□□	□□□□□□□ □□□□□ □□□□ □□□	□□□□□□ □□□□ □□)	□□□□□ □□□□□□ □□□□ □□)	□□□□□□ □□□□□ □□□□ □□)			□□□□□ □□)	□□□ □□ □)	□□□ □□ □□)	□□□□ □□□□□ □□)	□□□□ □□□□) □□ □)	□□M□□□□□ C□P□ □□)
							□□□□□□□ □□□□□□□	□□□□□□ □□□□□□)	□□□□□□□ □□□□□□□ □□□□□□□	□□□□□□ □□□.	□□□□□□ P□P□	□□□□□□□□ □□□□□□ P□P□																										
□□□□r	193	1 □2	1 □2	0 □0	21	0	3 □0	□□□	3 □0	□□	□	□□	□□0	□□□	□□□	□□□					0 □0		0 □0	0 □0	1 □2	3 □0	1 □5	0 □0	0 □0	0 □0	2.3	2.3	□□□□	2□□	□□□	2□□□	□□	19.4
□□□□r	1 □2	191	1 □6	0 □0	36	0	5 □6	□□□	5 □6	□□□	□	□□□	□□0	□2□	□□□	□2□					0 □0		0 □0	0 □0	1 □6	5 □6	2□1	0 □0	0 □0	0 □0	3.4	3.4	□□□□	200	□□□	2□□□	□□	17.1
D□s □□□□	317	309	1 □7	0 □0	24	0	1 □7	0 □0	1 □7	2□	□	2□	4 □0	□2□	□□□	□2□					0 □0		□□□	0 □0	1 □7	1 □7	0 □4	0 □0	0 □0	0 □0	0.7	0.7	□□□□	200	□2□	□□□□	□2	35.4
D□s □□□□	307	308	0 □0	0 □0	0	0	0 □0	0 □0	0 □0	□	□	□	□□0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 □0	0 □0	0 □0	0 □0	0 □0	0 □0	0.0	0.0	□□□□	200	□□□	2□□□	□□	20.3
De □□□□	308	309	1 □7	0 □0	24	0	1 □7	□□□	1 □7	2□	□	2□	□□0	□2□	□□□	□2□					0 □0		0 □0	0 □0	1 □7	1 □7	0 □4	0 □0	0 □0	0 □0	0.7	0.7	□□□□	2□□	□□□	20 □	□□	19.9
M□□d□□□r□	309	310	0 □0	0 □0	0	0	2□4	0 □0	2□4	48	0	48	□□0	0 □3	0 □0	0 □3					0 □0		0 □0	0 □0	0 □0	2□4	0 □9	0 □0	0 □0	0 □0	1.4	1.4	70 □0	2□□	0 □1	21 □	0 □	19.6
M□□d□□□r□	310	190	0 29	0 □0	6	0	2□3	□□□	2□3	□□	□	□□	□□0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 29	2□3	1 □0	0 □0	0 □0	0 □0	1.6	1.6	□2□□	2□□	□□□	2□□□	□□	19.9
□□□□r	307	187	0 29	0 □0	6	0	0 29	□□□	0 29	□	□	□	4 □0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 29	0 29	0 □1	0 □0	0 □0	0 □□	0.2	0.2	□□□□	200	□2□	16 2	□□	16.0
□□□□r	187	188	0 □8	0 □0	18	□	1 □7	□□□	1 □□	2□	□	2□	4 □0	□2□	□□□	□2□					0 □0		0 □0	0 □0	0 □8	1 □7	0 □4	0 □0	0 □0	0 □□	0.7	0.7	□□□□	200	□□□	20 2	□□	19.4
□□□□r	188	189	0 29	0 □0	6	□	1 □6	□□□	1 □6	□□	□	□□	4 □0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 29	1 □6	0 □6	0 □0	0 □0	0 □□	0.9	0.9	□□□□	2□□	□□□	22□	□□	21.2
□□□□r	189	190	1 □2	0 □0	21	0	2□9	□□□	2□9	□□	□	□□	□□0	□□□	□□□	□□□					0 □0		0 □0	0 □0	1 □2	2□9	0 □5	0 □0	0 □0	0 □0	1.5	1.5	□□□□	2□□	□22	□□2	□2	34.7
□□□□r	190	191	0 29	0 □0	6	0	5 □1	0 □0	5 □1	111	0	111	□□0	1 22	0 □0	1 22					0 □0		0 □0	0 □0	0 29	5 □1	2□6	0 □0	0 □0	0 □0	3.3	3.3	□2□0	200	0 □5	26 □	0 □	23.1
Easemen □□□□□r	191	316	0 □5	0 29	3	36	11 □3	0 29	11 □□	228	36	264	4 □0	2□1	0 □0	2□0					0 □0		0 □0	0 □0	0 □5	11 □3	4 □4	0 29	0 29	0 □□	6.8	7.4	46 □0	200	0 □9	20 □	0 □	13.2
Ea □emen □□□□□r	316	181	0 □5	0 □0	3	□	11 □7	□2□	11 □6	2□□	□□	2□□	4 □0	2□□	□□□	2□□					0 □0		0 □0	0 □0	0 □5	11 □7	4 □0	0 □0	0 29	0 □□	6.9	7.4	□□□□	2□□	□□□	20 □	□□	13.4
□□□r□□	180	181	0 □0	0 □1	0	□□	0 □0	□□□	0 □□	□	□□	□□	4 □0	□□□	□□□	□□□					0 □0		0 □0	0 □0	0 □0	0 □0	0 □0	0 □1	0 □1	0 □□	0.0	0.9	□□□□	200	□2□	17 □	□□	16.4
Ch □rch	181	179	0 □4	0 □0	9	0	11 □7	□2□7	23 □□	240	1 □2	3 □2	4 □0	2□4	1 □2	3 □6					0 □0		0 □0	0 □0	0 □4	□2□1	4 □6	0 □0	0 □9	0 □□	7.2	8.6	57 20	200	0 □5	22□	0 □	13.5
□□□r□□	179	304	0 □4	□□□	9	□	□2□1	□2□□	24 □□	2□□	□□2	□□□	4 □0	2□□	□□2	3 □6					0 □0		0 □0	0 □0	□□□	□2□5	4 □□	0 □0	□□9	0 □□	7.5	8.9	□□□□□	200	□□□	20 □	□□	12.0
Sou □□□□□□□□d	304	173	0 □0	0 □0	0	0	15 □2	□2□7	27 □□	□21	1 □2	□23	4 □0	3 □3	1 □2	4 □6					0 □0		0 □0	0 □0	0 □0	□□□6	6 □□	0 □0	□□9	0 □□	9.6	11.0	47 □0	300	0 □1	61 □	0 □	50.7
Concess □n	173	STA □	0 □0	0 □0	□	0	153 □□	22□7	176 2□	3693	834	4 □27	3 28	33 □1	7 □5	40 □6					0 □0		0 □0	0 □0	0 □0	□□□□7	56 □□	0 □0	□□□0	4 22	89.8	101.6	8 □0	450	0 □8	197 □	1 2	96.4

DESIGN PARAMETERS

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APPENDIX E2 - SANITARY SEWER CALCULATION SHEET

Embrun Sanitary Collection System

LOCATION			RESIDENTIAL AREA AND POPULATION												INDUSTRIAL			COMMERCIAL		INSTITUTIONAL		I+C+I	INFILTRATION						TOTAL EXISTING	TOTAL FUTURE	PIPE				
																													FLOW (l/s)	FLOW (l/s)					
PS3 Drainage Area																																		
																													28.10						20.22
																													35.96						-1.43
																													36.40						3.49
																													43.82						-12.65
																													60.81						-27.94
																													61.88						-28.81
																													70.94						-39.38
																													80.94						-47.03
																													81.95						-51.38
																													82.65						-46.74
																													86.02						-56.30
																													94.86						-63.89
																													98.69						-67.92
																													99.21						-56.90
PS8 Drainage Area																																		
																													25.88						-7.37
																													27.68						-10.19
																													31.25						-0.96
																													31.25						-2.28
																													31.25						-2.82
																																			-2.50
																													0.00						18.60
																													0.00						18.60
																													0.00						18.43
																													31.25						11.00
																													31.25						10.91
																													31.25						10.91
																													0.00						18.40
																													0.00						18.84
																													0.00						19.34
																													0.00						18.57
																													0.00						19.91
																													0.00						17.85
																													0.00						18.36
																													0.00						18.47
																													0.00						19.26
																													0.00						18.57
																													0.00						28.76
																													31.25						24.29
																													5.18						43.76
																													39.69						48.37
																													136.18						-46.86
PS 7 Drainage Area																																		
																													18.83						12.34
																													18.83						12.56
																													18.83						12.48
																													18.83						12.73
																													18.83						12.58
																													18.83						13.34
																													18.83						12.58
																													18.83						13.25
																													18.83						11.89
																													0.00						23.12
																													0.00						23.14
																													18.83						13.09
																													18.83						12.54

APPENDIX E2 - SANITARY SEWER CALCULATION SHEET

Embrun Sanitary Collection System

LOCATION	TOTAL FUTURE FLOW (l/s)	PIPE ([illegible])
[illegible]	0.24	29.04
[illegible]	2.95	15.44
[illegible]	3.86	13.19
[illegible]	4.16	18.08
[illegible]	4.31	13.76
[illegible]	4.31	28.49
[illegible]	19.18	28.72
[illegible]	24.42	29.38
[illegible]	2.29	18.51
[illegible]	2.29	18.46
[illegible]	2.29	39.20
[illegible]	27.45	43.17
PS6 Drainage Area		
[illegible]	13.48	5.78
[illegible]	13.48	5.08
[illegible]	13.48	4.87
[illegible]	13.48	4.83
[illegible]	13.48	5.46
[illegible]	13.48	5.06
[illegible]	0.00	25.44
[illegible]	13.48	4.84
[illegible]	13.48	8.32
[illegible]	13.48	8.05
[illegible]	0.00	23.35
[illegible]	0.00	23.19
[illegible]	0.00	23.19
[illegible]	13.48	15.37
[illegible]	0.00	25.38
[illegible]	0.00	24.54
[illegible]	0.00	25.37
[illegible]	0.00	25.28
[illegible]	0.00	25.41
[illegible]	13.48	28.35
[illegible]	13.48	28.56
[illegible]	0.01	25.30
[illegible]	0.01	25.35
[illegible]	0.01	18.46
[illegible]	3.05	22.44
[illegible]	3.05	22.44
[illegible]	3.05	155.43
[illegible]	16.05	194.64
[illegible]	16.05	236.49
PS4 Drainage Area		
[illegible]	1.51	29.17
[illegible]	2.18	31.22
[illegible]	3.51	28.38
[illegible]	5.44	36.16
[illegible]	8.46	67.29
[illegible]	8.52	22.55
[illegible]	8.52	37.55
PS5 Drainage Area		
[illegible]	0.19	20.63
[illegible]	0.32	19.89
[illegible]	0.51	24.86
[illegible]	1.29	19.37
[illegible]	1.99	18.86
[illegible]	2.38	18.47

APPENDIX E2 - SANITARY SEWER CALCULATION SHEET

Embrun Sanitary Collection System

TWP □dent

LOCATION			RESIDENTIAL AREA AND POPULATION														INDUSTRIAL			COMMERCIAL		INSTITUTIONAL		I+C+I	INFILTRATION						TOTAL EXISTIN G	TOTAL FUTURE	PIPE					
STREET	From □ M□	To M□	□□□□□□□ AREA (□□□)	FUTURE AREA (ha)	□□□□□□□ P□P.	FUTURE POP.	CU M ULAT □□E □□□□□□□□ AREA (□□□)	FUTURE AREA (□□□)	□□□□□□□ + □UTURE AREA □□□□	□□□□□□□ POP.	FUTURE POP.	□□□□□□□ □□ FUTURE P□P.	PEAK □ACT.	□□□□□□□ PEAK □ FLOW (□□□)	FUTURE PEAK □LOW (□□□)	□□□□□□□ + □UTURE PEAK □ FLOW (□□□)	AREA (□□□)	ACCU. AREA (□)	PEAK □ FACTOR □□□r MOE □	AREA (ha)	ACCU. AREA (□□□)	AREA (□□□)	ACCU. AREA (□□□)	PEAK FLOW (□)	□□□□□□□ AREA (□□□)	□□□□□ □□□□□□ AREA (□)	□□□□□□□ □□□□. FLOW (□□□)	FUTURE AREA (ha)	□□□□□ □FUTURE AREA (ha)	□□□□□□ □□□□. FLOW (□)	FLOW (l/s)	FLOW (l/s)	LENGTH (m)	□□. (□□ □)	SLOPE (□□)	CAP. □ULL) (□□□)	VEL. □ULL) (□□ /)	□□M□□□□□ CAP. (□□□)
□□r□ □□d□□□ve □	289	288	0□2	0□0	15	0	3□6	0□0	3□6	□26	0	□26	4□0	1□5	0□0	1□5		0□0	4□0		0□0		0□0	0□0	0□2	3□6	1□5	□□0	0□0	0□0	2□0	**2.70**	55□8	200□0	0□0	20□5	0□□	**17.95**
Rem□ran□□r	295	296	0□0	0□0	0	0	0□0	0□0	0□0	0	0	0	4□0	0□0	0□0	0□0		0□0	4□0		0□0		0□0	0□□	0□0	0□0	0□0	0□0	0□0	0□0	0□0	**0.00**	27□0	200	0□4	28 23	0□0	**28.23**
Rem□ran□□r	296	297	1□2	0□0	36	0	1□2	0□0	1□2	36	0	36	4□0	0□9	0□0	0□9		0□0	4□0		0□0		0□0	0□□	1□2	1□2	0□9	0□0	0□0	0□0	0□7	**0.77**	79 20	200	0□9	20□2	0□5	**19.75**
Rem□ran□□r	297	298	0□5	0□0	30	0	1□6	0□0	1□6	66	0	66	4□0	0□1	0□0	0□1		0□0	4□0		0□0		0□0	0□□	0□5	1□6	0□1	0□0	0□0	0□0	1□1	**1.41**	70 20	200	0□7	19□6	0□4	**18.55**
Rem□ran□□r	298	299	0□9	0□0	21	0	2□6	0□0	2□6	87	0	87	4□0	0□3	0□0	0□3		0□0	4□0		0□0		0□0	0□□	0□9	2□6	0□3	0□0	0□0	0□0	1□6	**1.86**	70□0	200	0□7	24□4	0□9	**22.88**
Rem□ran□□r	299	288	0□2	0□0	15	0	2□8	0□0	2□8	1□2	0	1□2	4□0	1□9	0□0	1□9		0□0	4□0		0□0		0□0	0□□	0□2	2□8	1□9	0□0	0□0	0□0	2□9	**2.19**	77□8	200	0□4	24□5	0□7	**21.96**
□□r□ □□d□□□ve □	288	287	0□4	0□0	□2	0	6□8	0□0	6□8	240	0	240	4□0	2□7	0□0	2□7		0□0	4□0		0□0		0□0	0□0	0□4	6□8	2□8	0□0	0□0	0□0	5□4	**5.14**	41□3	200	0□1	20□8	0□6	**15.74**
□□r□ □□d□□□ve.	287	277	0□4	0□0	□2	0	7□2	0□0	7□2	2□2	0	2□2	4□0	2□0	0□0	2□0		0□0	4□0		0□0		0□0	0□0	0□4	7□2	2□0	0□0	0□0	0□0	5□0	**5.40**	61□3	200	0□4	19□5	0□1	**13.75**
Cen □na re □□□	277	276	0 25	0□0	9	0	7□7	0□0	7□7	261	0	261	4□0	2□9	0□0	2□9		0□0	4□0		0□0		0□0	0□0	0 25	7□7	2□0	0□0	0□0	0□0	5□9	**5.59**	65□0	200	0□4	19□4	0□1	**13.45**
La □r□r□□□□□	258	259	0□6	0□0	27	0	0□6	0□0	0□6	27	0	27	4□0	0 29	0□0	0 29		0□0	4□0		0□0		0□0	0□0	0□6	0□6	0 29	0□0	0□0	0□0	0□8	**0.58**	64□0	200	0□1	23□6	0□5	**22.88**
La □r□r□□□□□	259	260	0□9	0□0	21	0	1□6	0□0	1□6	48	0	48	4□0	0□1	0□0	0□1		0□0	4□0		0□0		0□0	0□0	0□9	1□6	0□2	0□0	0□0	0□0	1□3	**1.03**	□2□0	200	0□0	23□2	0□4	**22.09**
La □r□r□□□□□	260	276	0 25	0□0	9	0	1□1	0□0	1□1	57	0	57	4□0	0□1	0□0	0□1		0□0	4□0		0□0		0□0	0□0	0 25	1□1	0□1	0□0	0□0	0□0	1 22	**1.22**	47□0	200	0□1	23□1	0□4	**22.09**
Reno r□□r	283	2□2	0□6	0□0	27	0	0□6	0□0	0□6	27	0	27	4□0	0 29	0□0	0 29		0□0	4□0		0□0		0□0	0□0	0□6	0□6	0 29	0□0	0□0	0□0	0□8	**0.58**	83□0	200	0□1	23□3	0□4	**22.75**
Reno r□□r	2□2	276	0□9	0□0	21	0	1□6	0□0	1□6	48	0	48	4□0	0□1	0□0	0□1		0□0	4□0		0□0		0□0	0□□	0□9	1□6	0□2	0□0	0□0	0□0	1□3	**1.03**	86□0	200□0	0□3	23□2	0□□	**22.89**
Cen □na re □□□	276	275	0□0	0□0	0	0	10□4	0□0	10□4	366	0	366	4□0	3□1	0□0	3□1		0□0	4□0		0□0		0□0	0□□	0□0	10□4	3□3	0□0	0□0	0□0	7□4	**7.84**	□2□20	200□0	0 29	17□8	0□□	**9.74**
Cen □na re □□□	275	274	0□4	0□0	□2	0	10□7	0□0	10□7	378	0	378	4□0	4□4	0□0	4□4		0□0	4□0		0□0		0□0	0□□	0□4	10□7	4□6	0□0	0□0	0□0	8□0	**8.10**	70□0	200	0 27	17□9	0□4	**8.99**
Cen □na re □□□	274	227	0□9	0□0	21	0	11 27	0□0	□1 27	399	0	399	4□0	4 27	0□0	4 27		0□0	4□0		0□0		0□0	0□□	0□9	11 27	4 28	0□0	0□0	0□0	8□5	**8.55**	36□0	200	0□0	17□6	0□7	**9.41**
La □r□r□□□□□	258	257	0□0	0□0	0	0	0□0	0□0	0□0	0	0	0	4□0	0□0	0□0	0□0		0□0	4□0		0□0		0□0	0□0	0□0	0□0	0□0	0□0	0□0	0□0	0□0	**0.00**	39□0	200	0□0	23 28	0□4	**23.28**
La □r□r□□□□□	257	227	0□5	0□0	□0	0	0□5	0□0	0□5	30	0	30	4□0	0□2	0□0	0□2		0□0	4□0		0□0		0□0	0□0	0□5	0□5	0□2	0□0	0□0	0□0	0□4	**0.64**	87□0	200	0□0	23 24	0□4	**22.60**
□□□□□□□r□□□□	22□	22□	□□□	□□□	□□	□	□2□2	□□□	□2□2	□□□	□	□□□	□□□	□□□	□□□	□□□		□□□	□□□		□□□		□□□	□□□	□□□	□2□2	□□□	□□□	□□□	□□□	□□□	**9.58**	□□□□	2□□	□2□	□□□□	□□□	**7.29**
Reno r□□r	283	284	0□1	0□0	18	0	0□1	0□0	0□1	18	0	18	4□0	0□9	0□0	0□9		0□0	4□0		0□0		0□0	0□0	0□1	0□1	0□9	0□0	0□0	0□0	0□9	**0.39**	59□0	200	0□0	23 23	0□4	**22.85**
Reno r□□r	284	285	0□3	0□0	33	0	1□4	0□0	1□4	51	0	51	4□0	0□5	0□0	0□5		0□0	4□0		0□0		0□0	0□0	0□3	1□4	0□5	0□0	0□0	0□0	1□9	**1.09**	79□0	200	0□0	23 22	0□4	**22.13**
□□□□r□□r	2□□	2□□	□□□	□□□	2□	□	2□2□	□□□	2□2□	□□	□	□□	□□□	□□□	□□□	□□□		□□□	□□□		□□□		□□□	□□□	□□□	2□2□	□□□	□□□	□□□	□□□	□□□	**1.67**	□2□□	2□□	□□□	2□□□	□□□	**21.74**
Reno r□□r	286	226	0□2	0□0	15	0	2□3	0□0	2□3	93	0	93	4□0	0□9	0□0	0□9		0□0	4□0		0□0		0□0	0□0	0□2	2□3	1□0	0□0	0□0	0□0	1□9	**1.99**	86□0	200	0□4	24 20	0□7	**22.21**
□r□□□□□□□□d□□	231	230	0□2	0□0	15	0	0□2	0□0	0□2	15	0	15	4□0	0□6	0□0	0□6		0□0	4□0		0□0		0□0	0□0	0□2	0□2	0□6	0□0	0□0	0□0	0□2	**0.32**	70□0	200	0□1	23□0	0□4	**23.08**
□r□□□□□□□□d□□	230	229	0□9	0□0	21	0	1□2	0□0	1□2	36	0	36	4□0	0□9	0□0	0□9		0□0	4□0		0□0		0□0	0□0	0□9	1□2	0□9	0□0	0□0	0□0	0□7	**0.77**	67□0	200	0□9	22□2	0□3	**22.14**
□r□□□□□□□□d□□	229	228	0□4	0□0	□2	0	1□6	0□0	1□6	48	0	48	4□0	0□1	0□0	0□1		0□0	4□0		0□0		0□0	0□0	0□4	1□6	0□2	□□0	0□0	0□0	1□3	**1.03**	43□0	200	0□0	23 27	0□4	**22.24**
□r□□□□□□□□d□□	228	226	0□5	0□0	30	0	2□20	0□0	2□20	78	0	78	4□0	0□3	0□0	0□3		0□0	4□0		0□0		0□0	0□0	0□5	2□20	0□4	□□0	0□0	0□0	1□7	**1.67**	103□0	200□0	0□0	23 23	0□□	**21.55**
Cen □na re □□□	226	225	0□7	0□0	6	0	17□2	0□0	17□2	□24	0	□24	3□2	6□4	0□0	6□4		0□0	4□0		0□0		0□0	0□□	0□7	17□2	6□0	0□0	0□0	0□0	13 24	**13.24**	43□0	200	0□9	14□6	0□6	**1.12**
□□□□□□□□	245	243	0□2	0□0	15	0	0□2	0□0	0□2	15	0	15	4□0	0□6	0□0	0□6		0□0	4□0		0□0		0□0	0□□	0□2	0□2	0□6	0□0	0□0	0□0	0□2	**0.32**	69□0	200	0□1	23□6	0□4	**23.04**
□□□□□□□□	244	243	0□2	0□0	15	0	0□2	0□0	0□2	15	0	15	4□0	0□6	0□0	0□6		0□0	4□0		0□0		0□0	0□□	0□2	0□2	0□6	0□0	0□0	0□0	0□2	**0.32**	53 20	200	0□1	23□7	0□4	**23.04**
M□r□□□□□□	243	2□2	0□2	0□0	15	0	1 27	0□0	1 27	45	0	45	4□0	0□8	0□0	0□8		0□0	4□0		0□0		0□0	0□0	0□2	1 27	0□8	0□0	0□0	0□0	0□6	**0.96**	70□0	200	0□0	23□8	0□4	**22.21**
M□r□□□□□□	2□2	241	0□9	0□0	21	0	1□6	0□0	1□6	66	0	66	4□0	0□1	0□0	0□1		0□0	4□0		0□0		0□0	0□0	0□9	1□6	0□1	0□0	0□0	0□0	1□1	**1.41**	70□0	200	0□0	23□8	0□4	**21.76**
M□r□□□□□□	241	236	0□2	0□0	15	0	2□29	0□0	2□29	81	0	81	4□0	0□7	0□0	0□7		0□0	4□0		0□0		0□0	0□0	0□2	2□29	0□7	0□0	0□0	0□0	1□4	**1.74**	66□0	200	0□0	23□0	0□4	**21.37**
□□□□□□□□□□□	2□□	2□□	□□□	□□□	2□	□	□□□	□□□	□□□	2□	□	2□	□□□	□22	□□□	□22		□□□	□□□		□□□		□□□	□□□	□□□	□□□	□2□	□□□	□□□	□□□	□□□	**0.45**	□□□□	2□□	□□□	2□□□	□□□	**21.18**
Lacha □e □□□□	236	237	0□3	0□0	33	0	3□1	0□0	3□1	135	0	135	4□0	1□4	0□0	1□4		0□0	4□0		0□0		0□0	0□0	0□3	3□1	1□5	0□0	0□0	0□0	2□9	**2.89**	113□0	200	0□0	23 29	0□4	**20.40**
Lacha □e □□□□	237	238	0□3	0□0	33	0	4□4	0□0	4□4	168	0	168	4□0	1□0	0□0	1□0		0□0	4□0		0□0		0□0	0□0	0□3	4□4	1□0	0□0	0□0	0□0	3□0	**3.60**	108□0	200	0□1	23□6	0□4	**19.76**
□□□□□□□□	265	266	1□0	0□0	39	0	1□0	0□0	1□0	39	0	39	4□0	0□2	0□0	0□2		0□0	4□0		0□0		0□0	0□0	1□0	1□0	0□2	□□0	0□0	0□0	0□4	**0.84**	86□0	200	0□0	20□6	0□6	**20.03**
□□d□□□□□□r.	270	269	0□9	0□0	21	0	0□9	0□0	0□9	21	0	21	4□0	0 22	0□0	0 22		0□0	4□0		0□0		0□0	0□0	0□9	0□9	0 23	□□0	0□0	0□0	0□5	**0.45**	64□0	200	0□9	23□5	0□3	**22.60**
□□d□□□□□□r.	269	268	0□6	0□0	27	0	1□6	0□0	1□6	48	0	48	4□0	0□1	0□0	0□1		0□0	4□0		0□0		0□0	0□□	0□6	1□6	□□2	0□0	0□0	0□0	1□3	**1.03**	69□0	200□0	0□0	20□5	0□□	**19.82**
□□d□□□□□□r.	268	266	0□1	0□0	18	0	1□6	0□0	1□6	66	0	66	4□0	0□1	0□0	0□1		0□0	4□0		0□0		0□0	0□□	0□1	1□6	0□1	0□0	0□0	0□0	1□1	**1.41**	80□0	200□0	0□0	20□0	0□□	**19.29**
Lacha □e □□□□	266	267	0□4	0□0	□2	0	3□0	0□0	3□0	117	0	117	4□0	1 25	0□0	1 25		0□0	4□0		0□0		0□0	0□□	0□4	3□0	1 26	0□0	0□0	0□0	2□1	**2.51**	61□0	250	0 26	30□1	0□2	**27.80**
Lacha □e □□□□	267	239	0□5	0□0	30	0	4□5	0□0	4□5	147	0	147	4□0	1□7	0□0	1□7		0□0	4□0		0□0		0□0	0□□	0□5	4□5	1□8	0□0	0□0	0□0	3□5	**3.15**	78□1	250	0 23	28□7	0□8	**25.42**
□□□□□□□□□□	240	239	1□6	0□0	48	0	1□6	0□0	1□6	48	0	48	4□0	0□1	0□0	0□1		0□0	4□0		0□0		0□0	0□□	1□6	1□6	0□2	0□0	0□0	0□0	1□3	**1.03**	74□0	200	0□1	23□9	0□4	**22.36**
Lacha □e □□□□	239	238	0□1	0□0	18	0	6□2	0□0	6□2	213	0	213	4□0	2□28	0□0	2□28		0□0	4□0		0□0		0□0	0□0	0□1	6□2	2□29	0□0	0□0	0□0	4□6	**4.56**	81□0	250	0 28	31□3	0□4	**26.97**
Lacha □e □□□□	238	222	0□8	0□0	3	0	10□4	0□0	10□4	384	0	384	4□0	4□1	0□0	4□1		0□0	4□0		0□0		0□0	0□0	0□8	10□4	4□2	0□0	0□0	0□0	8 23	**8.23**	41□0	250	0 24	29□7	0□0	**21.14**
Lacha □e □□□□	222	221	0□7	0□0	6	0	11□1	0□0	11□1	390	0	390	4□0	4□7	0□0	4□7		0□0	4□0		0□0		0□0	0□0	0□7	11□1	4□9	0□0	0□0	0□0	8□6	**8.36**	□2□0	250	0 26	30□0	0□2	**22.04**
Cen □na re □□□	217	218	0□4	0□0	□2	0	0□4	0□0	0□4	□2	0	□2	4□0	0□3	0□0	0□3		0□0	4□0		0□0		0□0	0□0	0□4	0□4	0□3	0□0	0□0	0□0	0 26	**0.26**	35□0	200	0□1	23□2	0□4	**23.06**
La □r□□□□□□□□	215	216	0□0	0□0	0	0	0□0	0□0	0□0	0	0	0	4□0	0□0	0□0	0□0		0□0	4□0		0□0		0□0	0□0	0□0	0□0	0□0	0□0	0□0	0□0	0□0	**0.00**	13□0	200	0□3	23□9	0□6	**23.79**
La □r□□□□□□□□	216	218	0□9	0□0	21	0	0□9	0□0	0□9	21	0	21	4□0	0 22	0□0	0 22		0□0	4□0		0□0		0□0	0□0	0□9	0□9	0 23	0□0	0□0	0□0	0□5	**0.45**	71□0	200	0□0	23 27	0□4	**22.82**
Cen □na re □□□	218	219	0□6	0□0	27	0	1□9	0□0	1□9	60	0	60	4□0	0□4	0□0	0□4		0□0	4□0		0□0		0□0	0□0	0□6	1□9	0□4	0□0	0□0	0□0	1 29	**1.29**	88□0	200	0□0	23□5	0□4	**21.87**
Cen □na re □□□	219	220	0□1	0□0	18	0	2□20	0□0	2□20	78	0	78	4□0	0□3	0□0	0□3		0□0	4□0		0□0		0□0	0□0	0□1	2□20	0□4	0□0	0□0	0□0	1□7	**1.67**	88 20	200	0□0	23□7	0□4	**21.49**
□□□r□□□□□□□□	2□□	2□□	□□□	0□0	51	0	1□4	0□0	1□4	51	0	51	4□0	0□5	0□0	0□5		0□0	4□0		0□0		0□0	0□0	1□4	1□4	0□5	□□0	0□0	0□0	1□9	**1.09**	105□0	200	0□0	23 24	0□4	**22.14**
La □r□□□□□□□□	214	213	0□9	0□0	21	0	2□3	0□0	2□3	□2	0	□2	4□0	0□7	0□0	0□7		0□0	4□0		0□0		0□0	0□□	0□9	2□3	□□7	0□0	0□0	0□0	1□4	**1.54**	65□0	200□0	0□0	23 24	0□□	**21.70**
Lou□□□ □□□□□□□	213	220	0 25	0□0	9	0	2□29	0□0	2□29	81	0	81	4□0	0□7	0□0	0□7		0□0	4□0		0□0		0□0	0□□	0 25	2□29	0□7	0□0	0□0	0□0	1□4	**1.74**	76□0	200□0	0□0	23□8	0□□	**21.44**
Cen □na re □□□	220	221	0□7	0□0	6	0	4□6	0□0	4□6	165	0	165	4□0	1□6	0□0	1□6		0□0	4□0		0□0		0□0	0□□	0□7	4□6	1□7	0□0	0□0	0□0	3□4	**3.54**	36□0	200	0□2	23□7	0□5	**20.03**
□□□□□□□r□□□□	22□	22□	□2□	□□□	□	□	□□□□	□□□	□□□□	□□□	□	□□□	□□□	□□□	□□□	□□□		□□□	□□□		□□□		□□□	□□□	□2□	□□□□	□□□	□□□	□□□	□□□	□2□□	**12.53**	□□□□	□□□	□□□	□□□□	□□□	**28.85**

APPENDIX E2 - SANITARY SEWER CALCULATION SHEET

Embrun Sanitary Collection System

TWP □□dent

LOCATION			RESIDENTIAL AREA AND POPULATION														INDUSTRIAL			COMMERCIAL		INSTITUTIONAL		I+C+I	INFILTRATION						TOTAL EXISTING FLOW (l/s)	TOTAL FUTURE FLOW (l/s)	PIPE					
STREET	From □ M□	To M□	□□□□□□ AREA (□□□)	FUTURE AREA (ha)	□□□□□□ P□P.	FUTURE POP.	CUMULAT□E						PEAK □ACT.	□□□□□□□ PEAK □ FLOW (□□□)	FUTURE PEAK □LOW (□□□)	□□□□□□□ + □UTURE PEAK □ FLOW (□□□)	AREA (□□□)	ACCU. AREA (□)	PEAK □ FACTOR (□□□r M OE □)	AREA (ha)	ACCU. AREA (□□□)	AREA (□□□)	ACCU. AREA (□□□)	PEAK FLOW (□)	□□□□□□□ AREA (□□□)	□□□□□ □□□□□□ AREA (□)	□□□□□□□ □□□□. FLOW (□□□)	FUTURE AREA (ha)	□□□□□ □FUTURE AREA (ha)	□□□□□□□ □□□□. FLOW (□)			LENGTH (m)	□□. (□□ □)	SLOPE (□□)	CAP. (□ULL) (□□□)	VEL. (□ULL) (□□ / :)	□□M□□□□□ CAP. (□□□)
							□□□□□□□ □ AREA (□□□)	FUTURE AREA (□□□)	□□□□□□ + □UTURE AREA □□□□	□□□□□□□ POP.	FUTURE POP.	□□□□□□ □□ FUTURE P□P.																										
□□□ □□d□□□□□	2□□	2□□	□□□	□□□	□□	□	□□□	□□□	□□□	□□	□	□□	□□□	□□□	□□□	□□□		□□□	□□□		□□□		□□□	□□□	□□□	□□□	□□□	□□□	□□□	□□□	□□□	0.71	□□□□	2□□	□□□	2□□□	□□□	22.47
La □ □□d□□□□□	234	223	0□2	0□0	15	0	1□6	0□0	1□6	48	0	48	4□0	0□1	0□0	0□1		0□0	4□0		0□0		0□0	0□0	0□2	1□6	0□2	0□0	0□0	0□0	1□3	1.03	94□0	200	0□0	23□3	0□4	22.10
Cen □na re □□	223	224	1□0	0□0	39	0	18□8	1□8	19□7	651	0	651	3□1	6□1	0□0	6□1		0□0	4□0		0□0		0□0	0□0	1□0	18□8	6□9	0□0	1□8	0□3	13□0	14.32	134□0	300	0□20	43□1	0□1	29.09
□□d□□□□□□r.	270	271	0□6	0□0	27	0	0□6	0□0	0□6	27	0	27	4□0	0□29	0□0	0□29		0□0	4□0		0□0		0□0	0□0	0□6	0□6	0□29	0□0	0□0	0□0	0□8	0.58	75□0	200	0□0	23□24	0□4	22.66
□□d□□□□□□r.	271	2□2	0□4	0□0	□2	0	1□0	0□0	1□0	39	0	39	4□0	0□2	0□0	0□2		0□0	4□0		0□0		0□0	0□0	0□4	1□0	0□2	0□0	0□0	0□0	0□4	0.84	25□0	200	0□1	23□1	0□5	22.68
□□d□□□□□□r.	2□2	273	1□0	0□0	39	0	2□20	0□0	2□20	78	0	78	4□0	0□3	0□0	0□3		0□0	4□0		0□0		0□0	0□0	1□0	2□20	0□4	0□0	0□0	0□0	1□7	1.67	116□2	200	0□1	23□4	0□5	21.86
□□d□□□□□□r.	273	224	0□2	0□0	15	0	2□3	0□0	2□3	93	0	93	4□0	0□9	0□0	0□9		0□0	4□0		0□0		0□0	0□0	0□2	2□3	1□0	0□0	0□0	0□0	1□9	1.99	84□0	300	0□1	68□2	0□7	66.83
□□□□□□□r□□□	22□	22□	□□□	□□□	□	□	2□□□	□□□	22□□	□□□	□	□□□	□□□	□□□	□□□	□□□		□□□	□□□		□□□		□□□	□□□	□□□	2□□□	□□2	□□□	□□□	□□□	□□□□	16.29	2□□□	□□□	□2□	□□□□	□□2	27.40
Cen □na re □□	225	PS5	0□7	0□0	6	0	38□9	1□8	□0□27	1377	0	1377	3□1	13□4	□□0	13□4		0□0	4□0		0□0		0□0	0□0	0□7	38□9	14□8	0□0	1□8	0□3	28□2	28.95	25□0	300	0□20	43□25	0□1	14.30
PS2 Drainage Area																																						
No re □ame	101	100	1□5	0□7	27	0	1□5	0□7	1□2	27	0	27	4□0	0□29	0□0	0□29		0□0	4□0		15□5		1□0	0□0	1□5		0□0	0□7	0□7	0□6	0□29	0.35	104□0	250	0□6	35□3	0□2	35.17
No re □ame	100	99	3□20		159	0	4□5	0□7	5□2	186	0	186	4□0	1□9	0□0	1□9		0□0	4□0		15□5		1□0	0□0	3□20	3□20	1□22	0□0	0□7	0□6	3□21	3.27	99□0	250	0□9	25□5	0□3	22.58
No re □ame	99	98	1□0		21	0	6□25	0□7	6□2	207	0	207	4□0	2□21	0□0	2□21		0□0	4□0		15□5		1□0	0□0	1□0	4□0	1□1	□□0	0□7	0□6	3□2	3.99	111□0	250	0□20	26□2	0□4	22.43
No re □ame	98	96			0	0	6□25	0□7	6□2	207	0	207	4□0	2□21	0□0	2□21		0□0	4□0	1□5	17□0		1□0	0□0	1□5	6□5	2□1	□□0	0□7	0□6	4□3	4.69	61□0	250	0□29	31□6	0□5	27.17
No re □ame	96	95	1□5	□2□0	□2	0	8□0	□2□7	20□7	219	0	219	4□0	2□4	0□0	2□4		0□0	4□0		17□0		1□0	0□0	1□5	8□20	3□2	□2□0	□2□7	4□4	5□6	10.20	63□20	250	0□4	34□2	0□0	24.33
No re □ame	95	94	0□1	18□7	27	18	8□1	31□4	□9□5	246	18	264	4□0	2□3	0□9	2□2		0□0	4□0		17□0		1□0	0□0	0□1	8□1	3□23	18□7	31□4	11□5	5□6	18.00	30□0	300	0□3	55□9	0□8	37.19
□□r□□□□ □	□□	□□		□□□	□	□	□□□	□□□□	□□□□	2□□	2□	2□□	□□□	2□□	□22	2□□		□□□	□□□	□□□	2□□□		□□□	□□□	□□□	□□□□	□□□	□□□	□□□□	□2□□	□□□	19.23	□□□□□	□□□	□2□	□□□□	□□□	32.14
No re □ame	93	□2		10□4	0	39	8□1	41□2	50□3	246	60	306	4□0	2□3	0□4	3□27		0□0	4□0	3□0	23□0		1□0	0□0	3□0	14□1	5□1	10□4	41□2	15□2	8□4	24.60	73□0	300	0□1	53□3	0□6	28.93
No re □ame	□2	91			0	0	8□1	41□2	50□3	246	60	306	4□0	2□3	0□4	3□27		0□0	4□0	1□0	25□0		1□0	0□0	1□0	16□1	6□2	0□0	41□2	15□2	8□5	25.21	75□20	300	0□28	50□6	0□2	25.65
No re □ame	91	29	0□2		□2	0	8□3	41□2	50□5	258	60	318	4□0	2□6	0□4	3□0		0□0	4□0		25□0		1□0	0□0	0□2	16□3	6□24	0□0	41□2	15□2	9□0	25.46	71□0	300	0□0	53□9	0□5	27.73
No re □ame	29	28			0	0	8□3	41□2	50□5	258	60	318	4□0	2□6	0□4	3□0		0□0	4□0		25□0		1□0	0□0	0□0	16□3	6□24	0□0	41□2	15□2	9□0	25.46	16□0	300	0□2	□2□8	0□9	37.53
M□r□□□	81	80	9□5		239	0	9□5	0□0	9□5	239	0	239	4□0	2□6	0□0	2□6		0□0	4□0		0□0		0□0	0□0	9□5	9□5	3□7	□□0	0□0	0□0	6□22	6.22	96□0	250	0□5	39□9	0□1	33.67
M□r□□□	80	79	2□0		□9	0	□2□25	0□0	□2□25	308	0	308	4□0	3□29	0□0	3□29		0□0	4□0		0□0		0□0	0□0	2□0	□2□25	4□6	0□0	0□0	0□0	7□5	7.95	109□0	250	0□28	31□6	0□4	23.51
M□r□□□	79	76	4□22		□3	0	16□7	0□0	□6□7	401	0	401	4□0	4□29	0□0	4□29		0□0	4□0		0□0		0□0	0□0	4□22	16□7	6□26	□□0	0□0	0□0	10□5	10.55	104□0	250	0□28	31□6	0□4	20.91
□□□□	□□	□□	2□□	□□2	□□	□	2□□	□□2	□□□□	□□	□	□□	□□□	□□□	□□□	□□□		□□□	□□□		□□□		□□□	□□□	2□□	2□□	□□□	□□2	□□2	□□□	□2□	4.69	□□□□□	2□□	□□□	□2□□	□□□	28.29
□□□□	76	75	2□0		27	0	20□2	9□2	29□4	473	0	473	3□9	5□4	0□0	5□4		0□0	4□0		0□0		0□0	0□0	2□0	20□2	7□4	0□0	9□2	3□3	□2□8	16.30	85□0	250	0□0	□2□0	0□6	16.30
□□□□□□d Je □nne□□r□	75	46	0□8		□5	0	21□0	9□2	30□2	488	0	488	3□8	5□9	0□0	5□9		0□0	4□0		0□0		0□0	0□0	0□8	21□0	8□2	0□0	9□2	3□3	13□21	16.64	110□0	250	0□0	□2□7	0□6	15.93
Ca□t□beau	67	66	2□5		66	0	2□5	0□0	2□5	66	0	66	4□0	0□1	0□0	0□1		0□0	4□0		0□0		0□0	0□0	2□5	2□5	1□8	0□0	0□0	0□0	1□9	1.79	91□0	250	0□0	□2□7	0□6	30.78
Ca□t□beau	66	56			0	0	2□5	0□0	2□5	66	0	66	4□0	0□1	0□0	0□1		0□0	4□0		0□0		0□0	0□0	0□0	2□5	1□8	0□0	0□0	0□0	1□9	1.79	110□0	250	0□0	□2□7	0□6	30.78
Ca□t□beau□ □□□ean□□	56	55			0	0	2□5	0□0	2□5	66	0	66	4□0	0□1	0□0	0□1		0□0	4□0		0□0		0□0	0□0	0□0	2□5	1□8	□□0	0□0	0□0	1□9	1.79	1□2□0	250	0□0	□2□2	0□6	30.73
□□Jean □□□□□□	55	54	6□0		264	0	9□25	0□0	9□25	330	0	330	4□0	3□3	0□0	3□3		0□0	4□0		0□0		0□0	0□0	6□0	9□25	3□2	0□0	0□0	0□0	7□4	7.04	□2□0	250	0□28	31□7	0□4	24.42
□□□□□□□ □□□□□	□□	□□	2□□		□2	□	□□□□	□□□	□□□□	□□2	□	□□2	□□□	□□□	□□□	□□□		□□□	□□□		□□□		□□□	□□□	2□□	□□□□	□□□	□□□	□□□	□□□	□□□	8.44	□□□□	2□□	□2□	□□□□	□□□	23.21
□□Jean □□□□□□	53	51	0□8		15	0	□2□3	0□0	□2□3	387	0	387	4□0	4□4	0□0	4□4		0□0	4□0		0□0		0□0	0□0	0□8	□2□3	4□6	0□0	0□0	0□0	8□0	8.90	66□0	250	0□28	31□8	0□4	22.58
□□Jean □□□□□□□ □□□□	51	50	0□0		0	0	□2□3	0□0	□2□3	387	0	387	4□0	4□4	0□0	4□4		0□0	4□0		0□0		0□0	0□0	0□0	□2□3	4□6	□□0	0□0	0□0	8□0	8.90	□22□0	250	0□0	□2□7	0□6	23.67
□□□□□□□□□□	74	73	1□5		26	0	1□5	0□0	1□5	26	0	26	4□0	0□28	0□0	0□28		0□0	4□0		0□0		0□0	0□0	1□5	1□5	0□0	0□0	0□0	0□0	0□8	0.68	95□0	250	0□0	□2□7	0□6	31.89
□□□□□□□□□□	73	□2			0	0	1□5	0□0	1□5	26	0	26	4□0	0□28	0□0	0□28		0□0	4□0		0□0		0□0	0□0	0□0	1□5	0□0	0□0	0□0	0□0	0□8	0.68	95□0	250	0□0	□2□7	0□6	31.89
□□□□□□□□□□	□2	71			0	0	1□5	0□0	1□5	26	0	26	4□0	0□28	0□0	0□28		0□0	4□0		0□0		0□0	0□0	0□0	1□5	0□0	0□0	0□0	0□0	0□8	0.68	90□0	250	0□0	□2□7	0□6	31.89
□□□□□□□□□□□ □□□rd	71	70			0	0	1□5	0□0	1□5	26	0	26	4□0	0□28	0□0	0□28		0□0	4□0		0□0		0□0	0□0	0□0	1□5	0□0	0□0	0□0	0□0	0□8	0.68	90□0	250	0□0	□2□7	0□6	31.89
□□□rd	70	69	2□25		□5	0	3□0	0□0	3□0	101	0	101	4□0	1□8	0□0	1□8		0□0	4□0		0□0		0□0	0□0	2□25	3□0	1□25	0□0	0□0	0□0	2□3	2.33	101□0	250	0□4	34□7	0□1	32.34
□□□rd	69	68			0	0	3□0	0□0	3□0	101	0	101	4□0	1□8	0□0	1□8		0□0	4□0		0□0		0□0	0□0	0□0	3□0	1□25	0□0	0□0	0□0	2□3	2.33	100□0	250	0□28	31□7	0□4	29.13
□□□rd□ □□□□□□□□□□	68	50	3□22		66	0	6□2	0□0	6□2	167	0	167	4□0	1□9	0□0	1□9		0□0	4□0		0□0		0□0	0□0	3□22	6□2	2□8	0□0	0□0	0□0	4□26	4.26	98□0	250	0□28	31□0	0□4	27.24
	50	48			0	0	19□5	0□0	□9□5	554	0	554	3□5	5□5	0□0	5□5		0□0	4□0		0□0		0□0	0□0	0□0	19□5	7□24	0□0	0□0	0□0	13□9	13.09	41□0	250	0□4	34□7	0□1	21.78
	48	47	3□2		□2	0	22□7	0□0	22□7	□26	0	□26	3□2	6□6	0□0	6□6		0□0	4□0		0□0		0□0	0□0	3□2	22□7	8□5	0□0	0□0	0□0	15□22	15.22	74□0	250	0□28	31□3	0□4	16.31
	47	46			0	0	22□7	0□0	22□7	□26	0	□26	3□2	6□6	0□0	6□6		0□0	4□0		0□0		0□0	0□0	0□0	22□7	8□5	0□0	0□0	0□0	15□22	15.22	80□0	250	0□28	31□7	0□4	16.25
	46	45			0	0	43□7	9□2	□2□9	1114	0	1114	3□7	11□23	0□0	11□23		0□0	4□0		0□0		0□0	0□0	0□0	43□7	16□7	0□0	9□2	3□3	27□0	31.32	81□0	300	0□24	46□9	0□6	15.67
	45	44	1□1	0□0	69	6	45□8	9□2	54□0	1183	6	1189	3□5	11□6	0□6	11□2		0□0	4□0		0□0		0□0	0□0	1□1	45□8	17□0	□□0	9□2	3□7	29□26	32.78	78□0	300	0□23	46□2	0□6	14.03
	44	□2	2□1		78	8	47□9	9□2	□6□1	□261	14	□275	3□3	□2□7	0□4	□2□1		0□0	4□0		0□0		0□0	0□0	2□1	47□9	18□6	0□0	9□2	3□7	30□3	34.34	109□0	300	1□20	105□9	1□0	71.55
	□2	31	4□8	□2□6	183	3	□2□7	41□9	94□6	1444	16	1460	3□9	14□24	0□6	14□0		0□0	4□0	4□0	4□0		0□0	0□0	9□8	57□7	21□2	□2□6	41□9	15□8	35□6	52.00	1□2□0	300	0□25	48□6	0□9	-3.44
	31	30	1□1	0□1	45	55	54□8	41□0	95□8	1489	71	1560	3□7	14□0	0□0	15□0		0□0	4□0		4□0		0□0	0□0	1□1	58□8	22□0	0□1	41□0	15□2	36□0	53.52	24□0	300	0□1	□2□26	1□1	38.74
	30	28			0	0	54□8	41□0	95□8	1489	71	1560	3□7	14□0	0□0	15□0		0□0	4□0		4□0		0□0	0□0	0□0	58□8	22□0	0□0	41□0	15□2	36□0	53.52	23□0	300	1□6	□28□2	1□1	74.60
	2□	□□2			□	□	□2□□	□□□2	□□□□□	□□□□	□□□	□□□□	□□□	□□□□	□2□	□□□□		□□□	□□□		2□□□		□□□	□□□	□□□	□□□□	2□□□	□□□	□□□2	□□□□	□□□□	78.39	□□□	□□□	□□□	□□□□	□□□	18.31
PS1 Drainage Area																																						
From □□2□□r□ame	10	9			0	0	□2□1	83□2	146□3	1747	131	187□	3□1	1□□5	1□27	18□1		0□0	4□0	1□0	30□0		1□0	0□0	1□0	76□1	28□2	0□0	83□2	31□4	45□7	78.77	64□0	400	0□0	64□2	0□1	-14.15
□□r□□□□ □	□	□	□□□□		2□□	□	□□□□	□□2□	□□2□□	2□□□	□□□	2□□□	□□□	□□□□	□□□	2□□□		□□□	□□□	□□□	□□□□		□□□	□□□	□□□	□□□□	□□□□	□□□	□□2□	□2□□	□□□□	94.35	□□2□□	□□□	□□□	□□□2	□□2	-4.03
No re □ame	8	7	1□20		30	0	88□1	85□21	173□3	2094	434	2□28	3□0	19□2	4□7	23□9		0□0	4□0		31□0		1□0	0□0	1□20	1□2□1	38□9	□□0	83□2	31□4	58□1	94.41	77□0	400	0□6	84□24	0□7	-10.17
No re □ame	7	6	5□3	8□3	1□9	3	93□4	93□4	1□7□8	2253	437	2690	3□8	20□8	4□7	25□4		0□0	4□0		31□0		1□0	0□0	5□3	108□4	41□6	8□3	93□4	35□2	□2□3	101.72	86□0	400	0□4	78□6	0□3	-22.96
No re □ame	6	5	1□1	0□2	□0	15	94□5	94□26	1□9□1	2283	4□2	2735	3□8	21□22	4□20	25□2		0□0	4□0		31□0		1□0	0□0	1□1	109□5	41□8	□□2	84□4	31□3	□2□0	98.83	111□0	400	0□3	74□4	0□0	-23.99

APPENDIX E2 - SANITARY SEWER CALCULATION SHEET

Embrun Sanitary Collection System

TWP □dent

LOCATION			RESIDENTIAL AREA AND POPULATION														INDUSTRIAL			COMMERCIAL		INSTITUTIONAL		I+C+I	INFILTRATION						TOTAL EXISTIN G	TOTAL FUTURE	PIPE					
STREET	From □	To	□□□□□□	FUTURE	□□□□□□	FUTURE	CU MULAT □E						PEAK	□□□□□□□	FUTURE	□□□□□□□ + □UTURE	AREA	ACCU.	PEAK □	AREA	ACCU.	AREA	ACCU.	PEAK	□□□□□□□	□□□□□ □□□□□□	□□□□□□□ □□□□.	FUTURE	□□□□□ □FUTURE	□□□□□□□ □□□□.			LENGTH	□□.	SLOPE	CAP.	VEL.	□□M□□□□□
	M□	M□	AREA (□□□)	AREA (ha)	P□P.	POP.	□□□□□□□ AREA (□□□)	FUTURE AREA (□□□)	□□□□□□ + □UTURE AREA □□□□	□□□□□□ POP.	FUTURE POP.	□□□□□□ □□ FUTURE P□P.	□ACT.	PEAK □ FLOW (□□□)	PEAK □LOW (□□□)	PEAK □ FLOW (□□□)	(□□□)	AREA (□)	FACTOR □□□r□MOE □	(ha)	AREA (□□□)	(□□□)	AREA (□□□)	FLOW (□)	AREA (□□□)	AREA (□)	FLOW (□□□)	AREA (ha)	AREA (ha)	FLOW (□)	FLOW (l/s)	FLOW (l/s)	(m)	(□□ □)	(□□)	(□ULL) (□□□)	(□ULL) (□□ /)	CAP. (□□□)
□□r□□□□ □	□	□	□2□		2□	□	□□□□	□□2□	□□□□□	2□□□	□□2	2□□□	□□□□	2□□2	□2□	2□□2		□□□□	□□□□		□□□□□		□□□□	□□□□	□2□	□□□□□	□□□□	□□□□	□□□□	□□□2	□□□□	**103.18**	□2□□	□□□	□2□	□□□□□	□□□□	**-2.07**
No re □ame	4	3	1 □5		□2	0	97 □0	94 26	191 □6	2319	4 2	2771	3 □7	21 □2	4 20	25 □2		0 □0	4 □0		31 □0		1 □0	0 □0	1 □5	1 2□0	□2□6	0 □0	84 □4	31 □3	64 □8	**100.22**	□20 □0	400	0 □1	68 □1	0 □5	**-31.41**
No re □ame	3	2	1 □1	3 □7	□2	3	99 □1	97 □3	197 □4	2331	455	2786	3 □7	21 □2	4 22	25 □4		0 □0	4 □0		31 □0		1 □0	0 □0	1 □1	113 □1	43 29	□□7	96 □1	36 □2	64 □1	**105.95**	85 □0	400	0 □9	90 □5	0 □2	**-15.60**
No re □ame	2	1	3 □5		□6	0	103 □6	97 □3	2□0 □9	2367	455	2□22	3 □6	21 □3	4 21	26 □4		0 □0	4 □0		31 □0		1 □0	0 □0	3 □5	117 □6	44 □1	0 □0	84 □4	31 □3	66 □4	**102.79**	148 □0	400	0 □7	86 □5	0 □9	**-15.83**
																															0 □0							
From □□5			0 □7	0 □0	6 □0	0 □0	38 □9	1 □8	□0 27	□377 □0	0 □0	1377 □0	3 □1	13 □4	□□0	13 □4	0 □0	0 □0	4 □0	0 □0	0 □0	0 □0	0 □0	0 □0	0 □7	38 □9	14 □8	0 □0	1 □8	0 □3	28 □2	**28.95**						
																															0 □0							
No re □ame	1	PS1		39 □4	3 □6	0	1 □2□25	138 □6	2□0 □0	4140	455	4595	3 28	36 29	3 □9	40 28		0 □0	4 □0		31 □0		1 □0	0 □0	0 □0	156 □5	59 □9	39 □4	□25 27	47 □0	95 □8	**147.37**	56 □0	400	0 26	106 □0	0 □5	**-40.67**
																															0 □0							
Sou □□□□d□ □r□□□□□□□ PS1	206	PS1	3 □1	33 □2	1 □2	141	3 □1	33 □2	36 □3	1 □2	141	273	4 □0	1 □1	1 □1	2□2		0 □0	4 □0		0 □0		0 □0	0 □0	3 □1	3 □1	1 □0	3 □□2	33 □2	□2□4	2□1	**16.95**	56 □0	400	0 26	106 □0	0 □5	**89.75**
At PS1							**145.66**	**172.18**	**317.83**	**4272**	**596**	**4868**	**3**	**37**	**5**	**42**		**0**	**5**		**32**		**2**	**0**	**0**	**160**	**61**	**0**	**159**	**60**	**98**	**164.32**	**0**	**400**	**0**	**104**	**1**	**-60.19**

DESIGN PARAMETERS

PS8 □r□□□ 0 □354074 ha

Ex st □g □□r□□□□ □□□□□□□ 231 □□□□□d□□ H□rmon"K" 1

PS7 □r□□□ 0 □060456 ha

□□□r□□□r□□□□ □□□□□□□= 231 □□□□□d□□

PS6 □r□□□ 0 □745835 ha

Ex □tng □x raneous □□□□ 0 □8 □□/ □

□□□r□□□ □2□□□□□ □□

□□□r□□□r□□□□□□□□□□ □□□ □□□□

□d□□r□□□ □□□□□□□r□ 2

PS5 □r□□□ 0 □847 □9 □□

M□□□ □□ □□□□□□□ 0 □6 □□ □□

Mann □g s □□□ 0 □13

□ □□□□□d□□□ GAC	PROJECT: □□□□□□□ □□r□□□ as □ewa □e□M□□□r□lan □
Check □d□□:	LOCATI □N: □mb□un □□□□□r□□ewage □yst □m
Dwg. Ref □rence: See □ey Pl □n be ow	□r□□□□□□: 141 □8986 □0
Da □e: Aug-15 □	Shee □□□. 1 □□□□

Appendix F

PUBLIC NOTICES

Notice of Study Commencement

Municipal Class Environmental Assessment Study
Master Plan Update for Sewage and Water, Recreation, and Transportation

The Study:

[illegible]

[illegible]

The Process:

[illegible]

Comments:

[illegible]

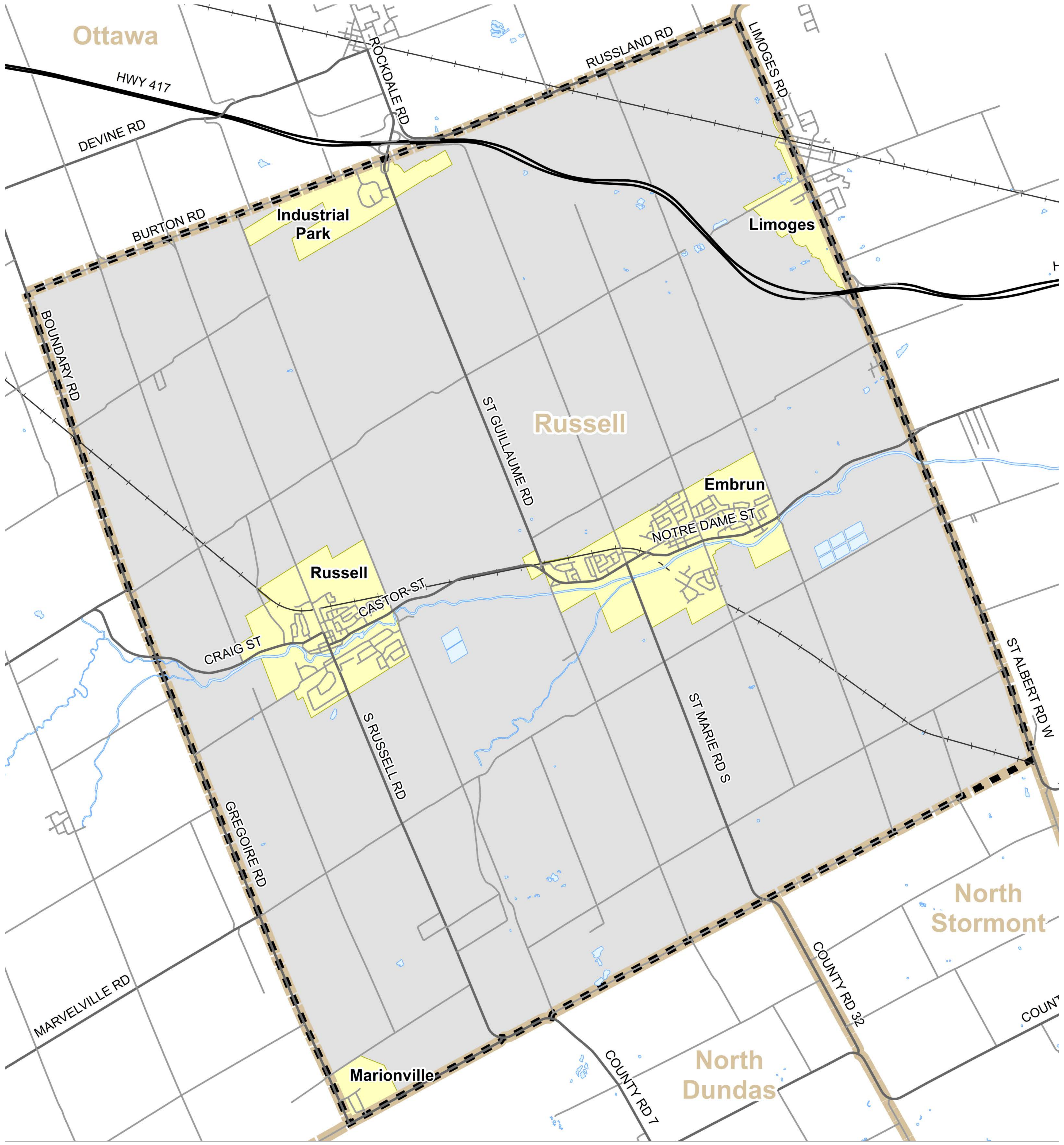
[illegible]

Appendix G

PUBLIC INFORMATION CENTRE PRESENTATION BOARDS

M
PUBLIC INFORMATION CENTRE

M
r d r M r d
r r 2



Ottawa
HWY 417
DEVINE RD
BURTON RD
RUSSLAND RD
ROCKDALE RD
LIMOGES RD
Industrial Park
Limoges
BOUNDARY RD
ST GUILLAUME RD
Russell
Embrun
NOTRE DAME ST
Russell
CASTOR ST
CRAIG ST
S RUSSELL RD
ST MARIE RD S
ST ALBERT RD W
GREGOIRE RD
MARVELVILLE RD
Marionville
COUNTY RD 7
COUNTY RD 32
North Stormont
North Dundas

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

Phase 1
[illegible]

Phase 2
[illegible]

Phase 3
[illegible]

Phase 4
[illegible]

Phase 5
[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

We are here

30-Day Review Period

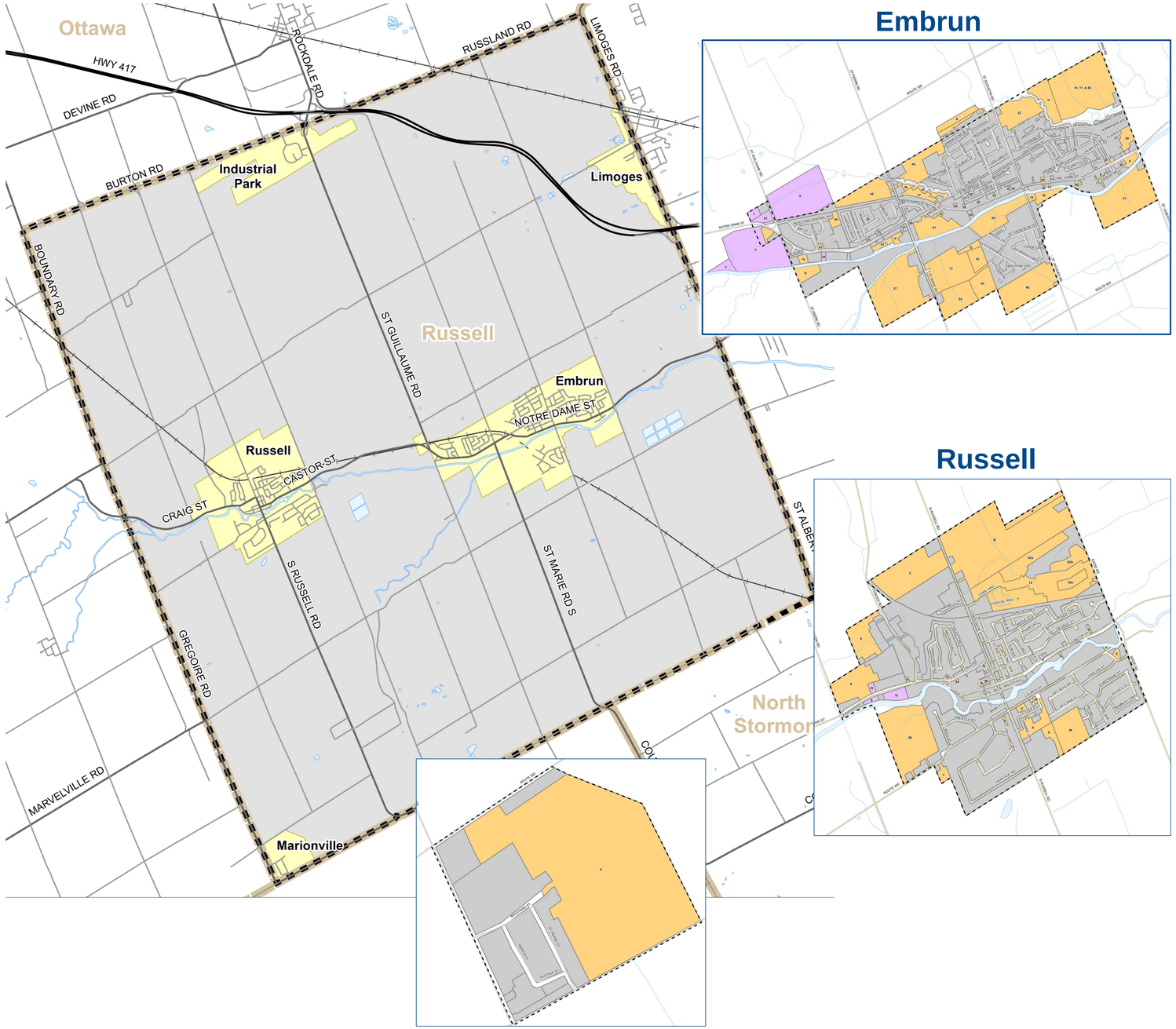
[illegible]

[illegible]

Municipalité de RUSSELL Township

WSP

□ □ □ □ □□ □□□ □ □□ □□ □□□ □ □□□ □ □□ □ □ □ □□ □□□ □ □ □ □



Embrun

Russell

Marionville

WHERE ARE THE GROWTH AREAS

→ □□□□□ □□□□r□□ □□□□r□□□□r□□□

- – □□□□□□□ □ □□□□□□□□□□□ □□□□□□□□□ □ □r□□□ □□d□M□r□□□□□□□□□□

- – □□□□□d□□r□□□□□ □r□□□

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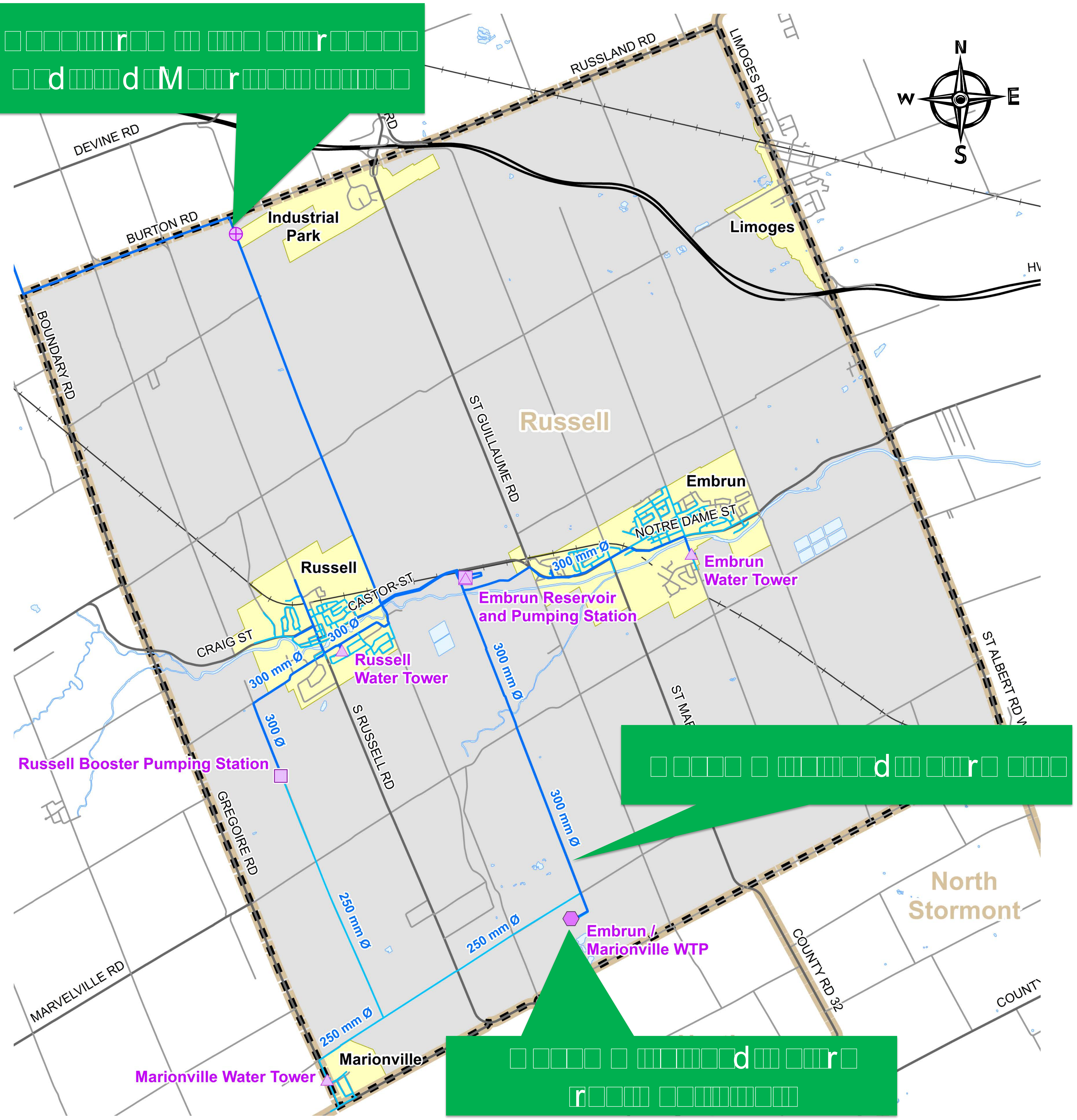
COMMUNITY	2014	2016	2021	2026	2031
□ □□□□□□	□□□□2□	□□□□□□□	□□□□□□□	□□2□□□	□□□□□□□
□□ □r□□□	□□□□□□□	□□□□□□□	□□□□□□□	□□□□□2□	□□□2□□□
M□r□□□□□□□□	□□2□	□□□□	□2□□	□2□□	□2□□
TOTAL	**12,181**	**14,024**	**17,003**	**19,467**	**22,167**

Municipalité de RUSSELL Township

WSP



RUSSLAND RD
LIMOGES RD
DEVINE RD
BURTON RD
Industrial Park
Limoges
BOUNDARY RD
ST GUILLAUME RD
Russell
Embrun
NOTRE DAME ST
300 mm Ø
Embrun Water Tower
Embrun Reservoir and Pumping Station
CASTOR ST
CRAIG ST
300 mm Ø
300 Ø
Russell Water Tower
300 mm Ø
300 Ø
S RUSSELL RD
Russell Booster Pumping Station
GREGOIRE RD
300 mm Ø
250 mm Ø
250 mm Ø
250 mm Ø
Embrun / Marionville WTP
North Stormont
COUNTY RD 32
MARVELVILLE RD
Marionville
Marionville Water Tower
ST ALBERT RD
N
S
E
W

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WATER SYSTEM DESIGN CRITERIA		
Design Criteria	**Residential Values**	**Industrial Park Values**
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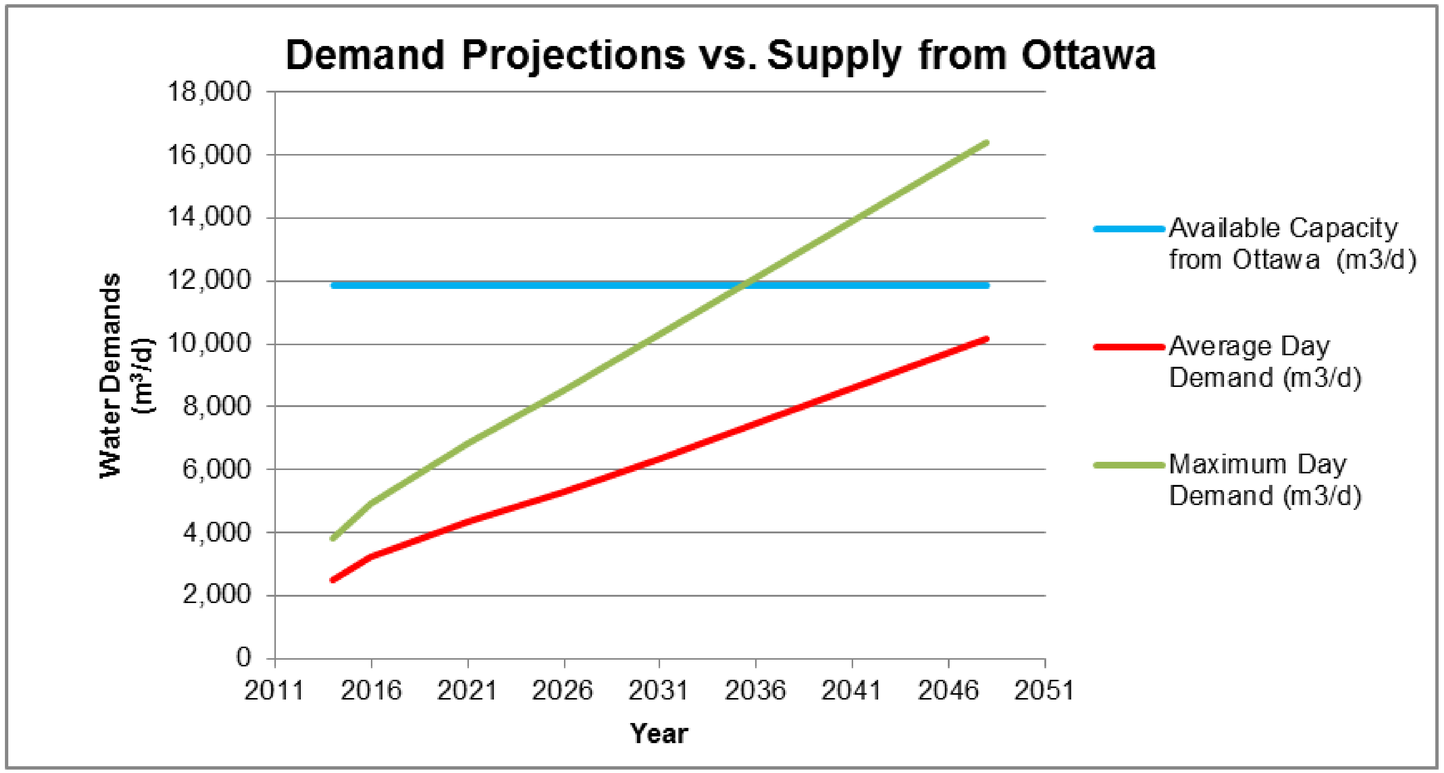
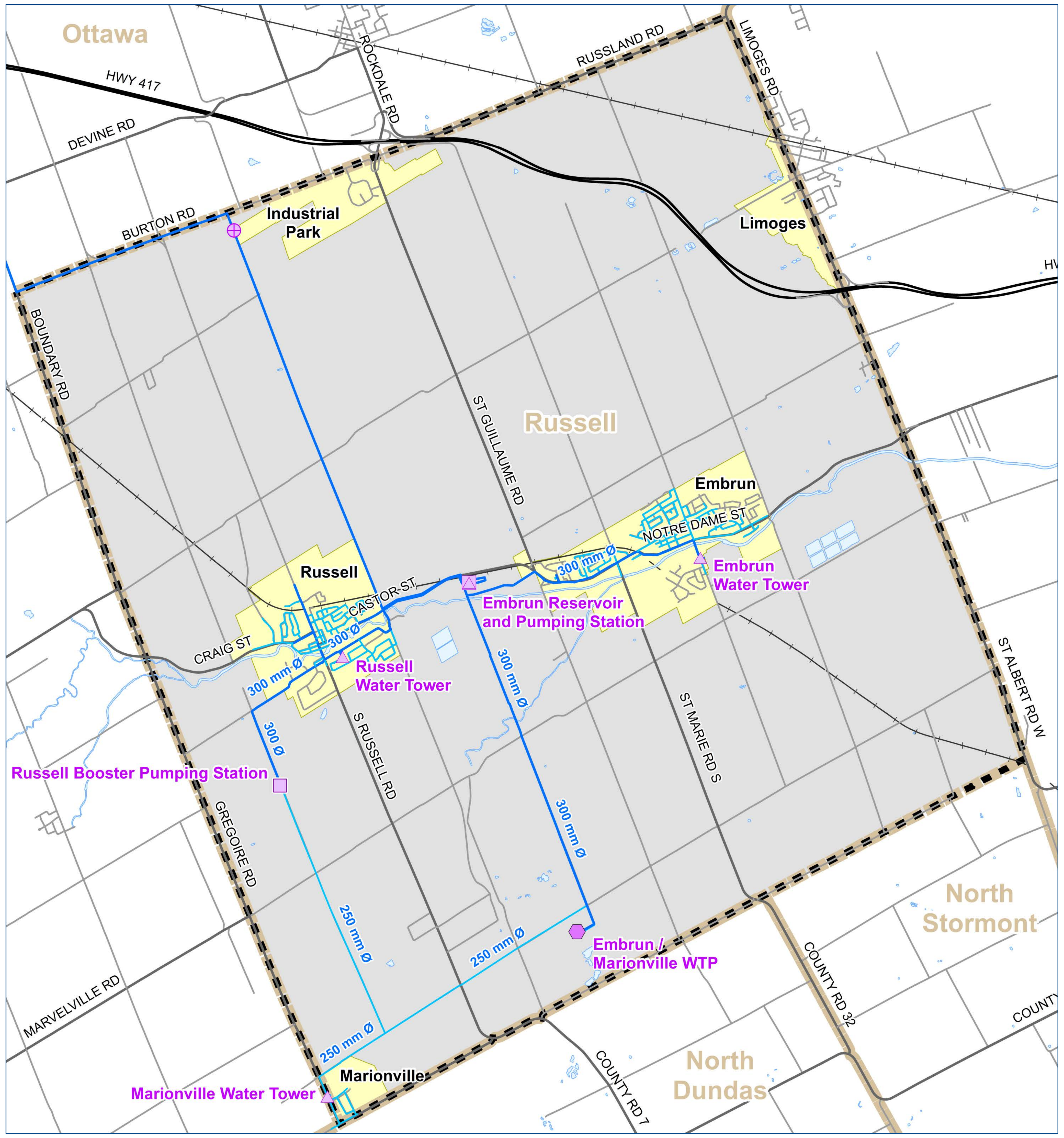


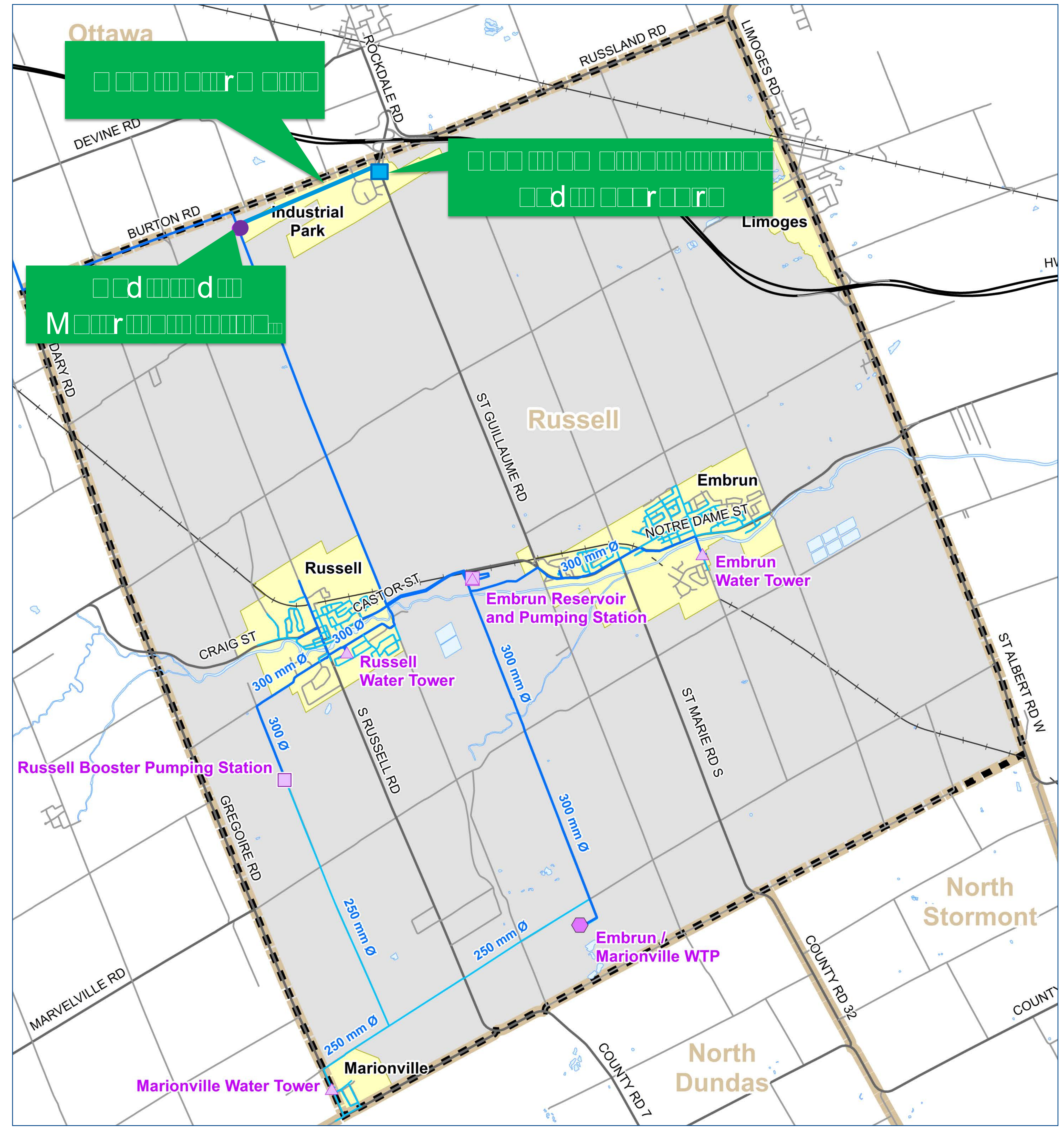
Water supply capacity is sufficient beyond 2031. Additional capacity required to achieve build-out.

Municipalité de RUSSELL Township

WSP

W2 –





Municipalité de RUSSELL Township

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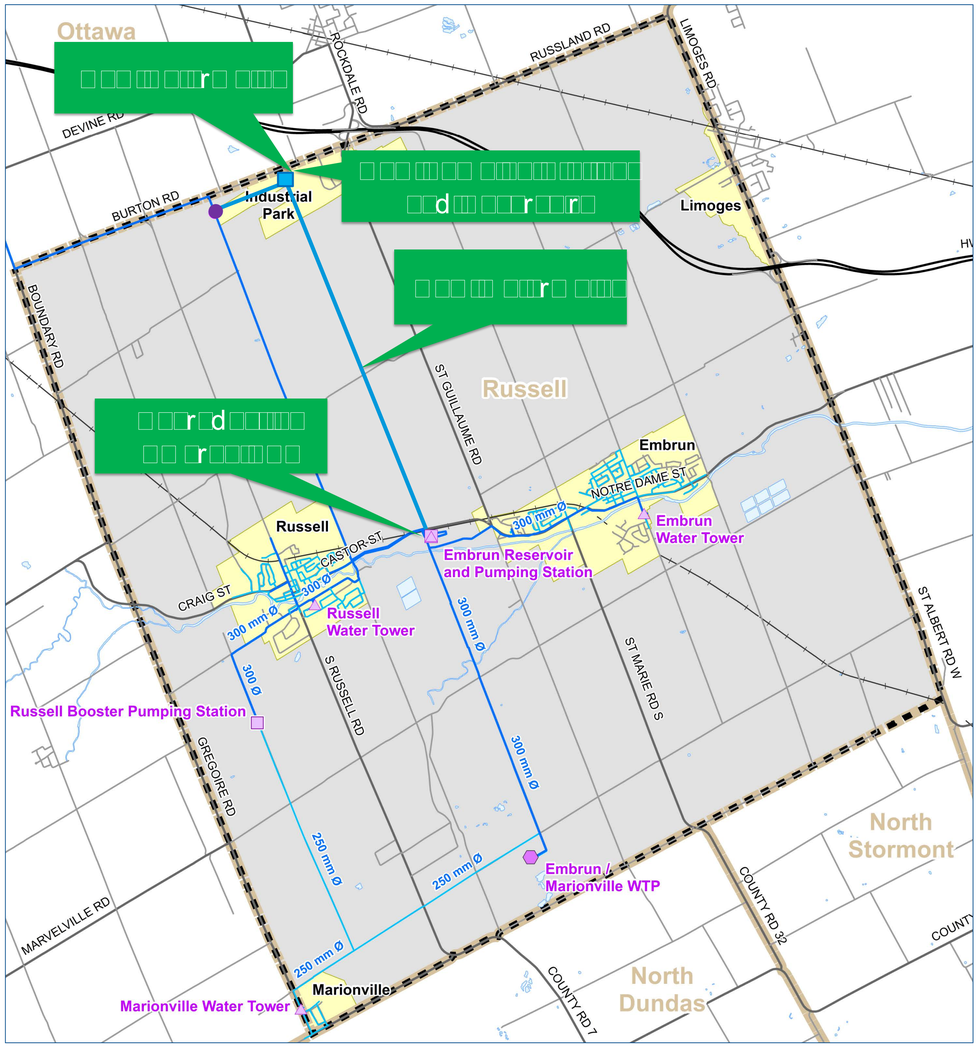

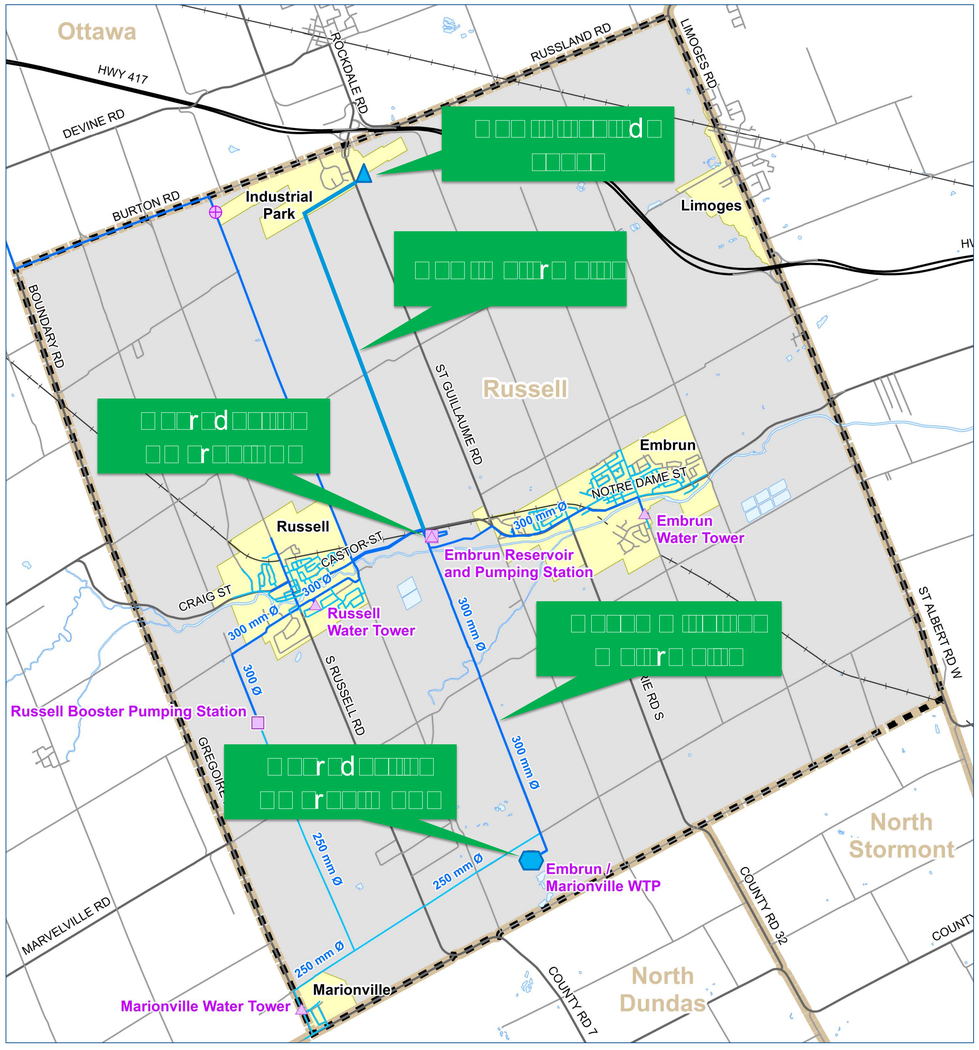

Municipalité de RUSSELL Township

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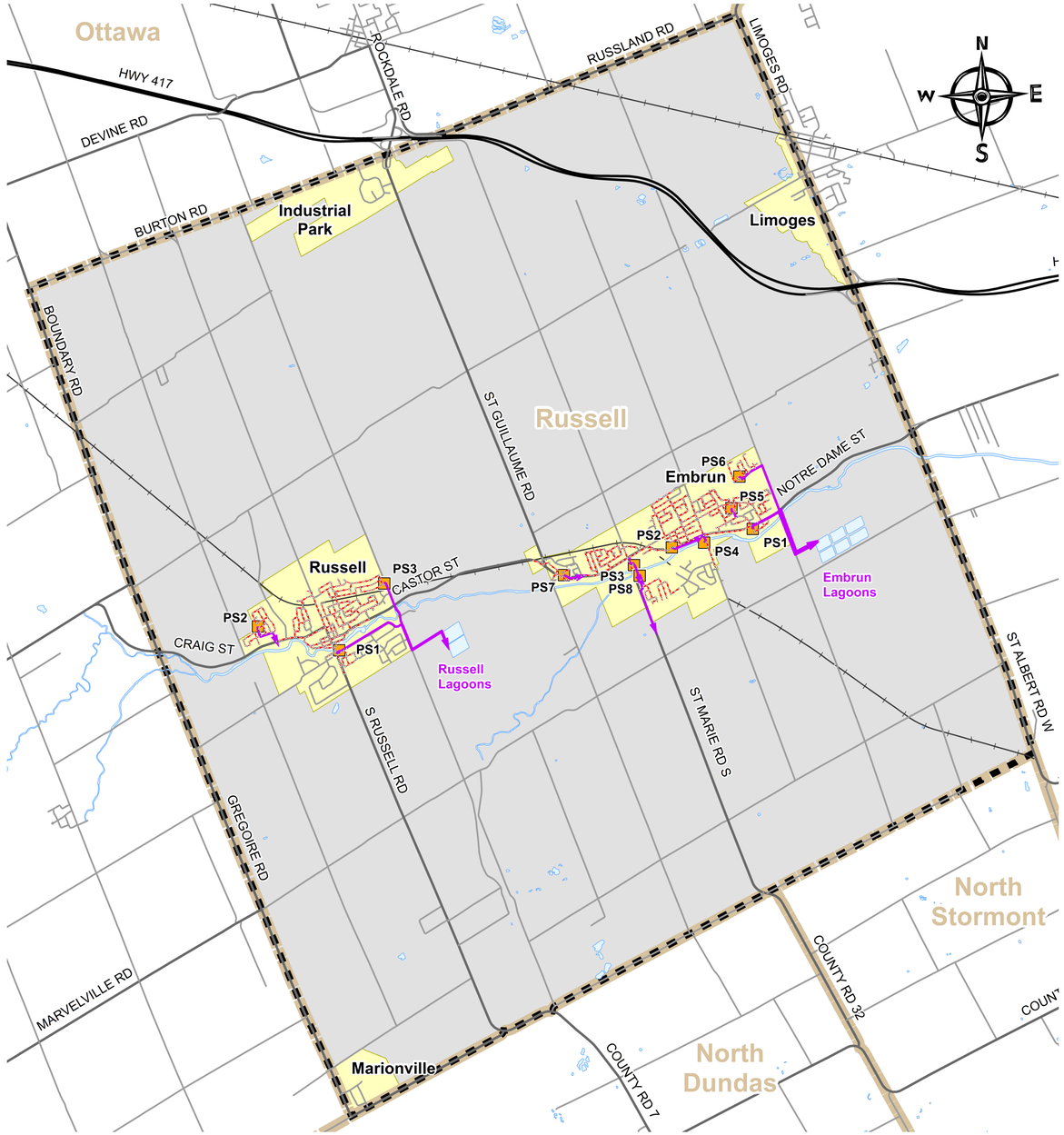

Municipalité de RUSSELL Township

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WASTEWATER SYSTEM DESIGN CRITERIA - RUSSELL		
Design Criteria	**Residential Values**	**Industrial Park Values**
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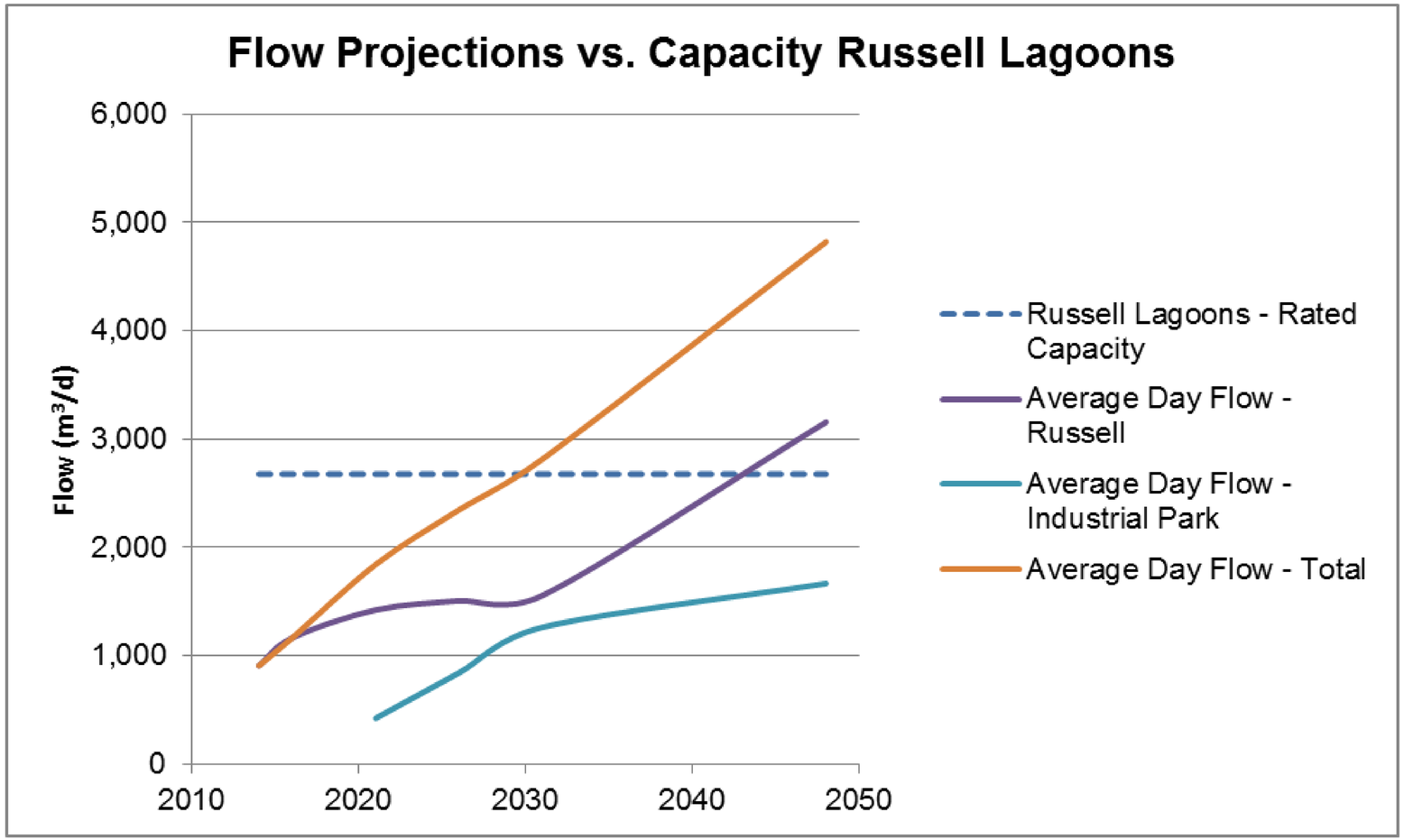

Lagoon expansion required prior to 2031.

Municipalité de RUSSELL Township

WSP

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WASTEWATER SYSTEM DESIGN CRITERIA - EMBRUN	
Design Criteria	**Residential Values**
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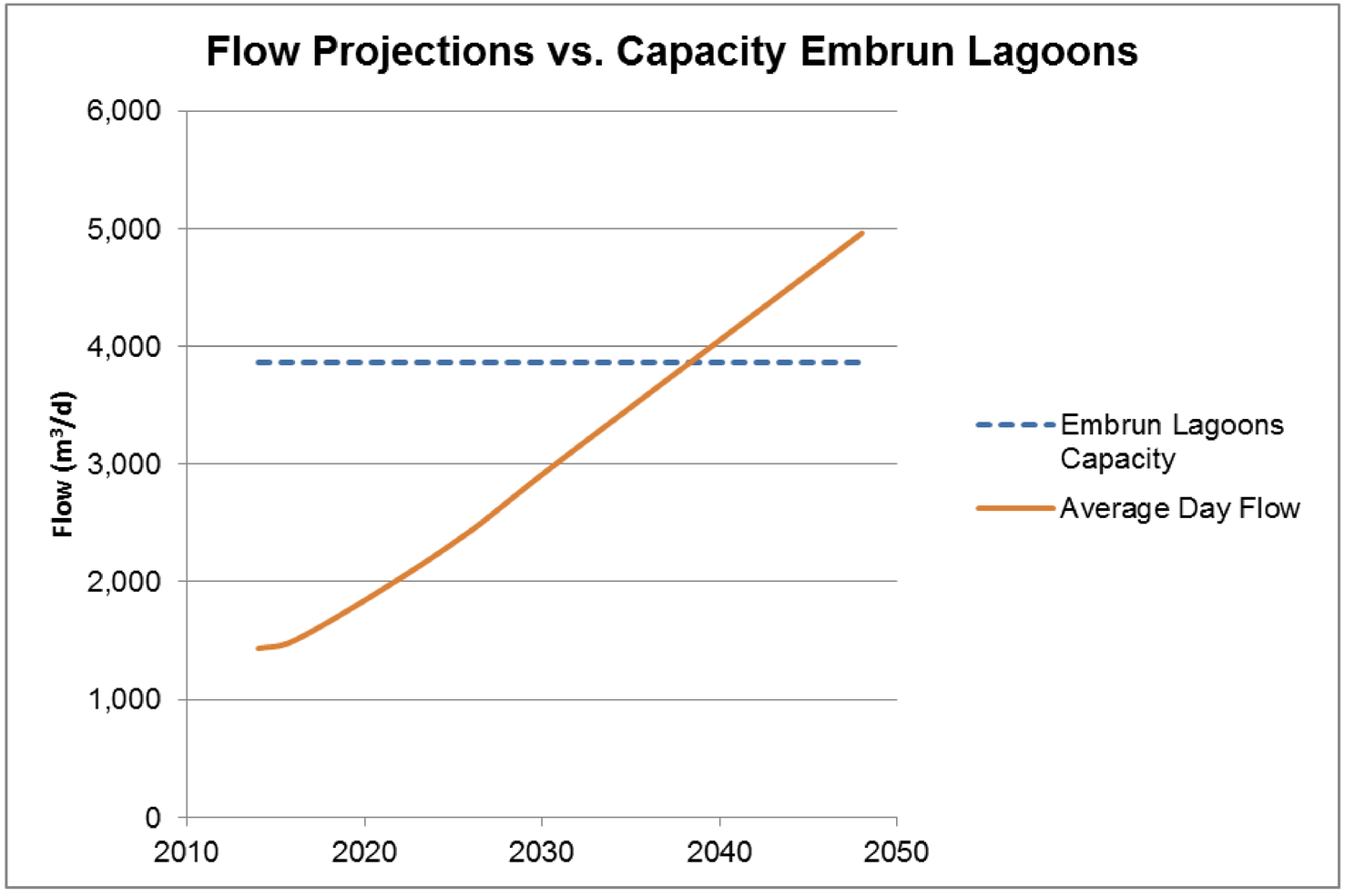
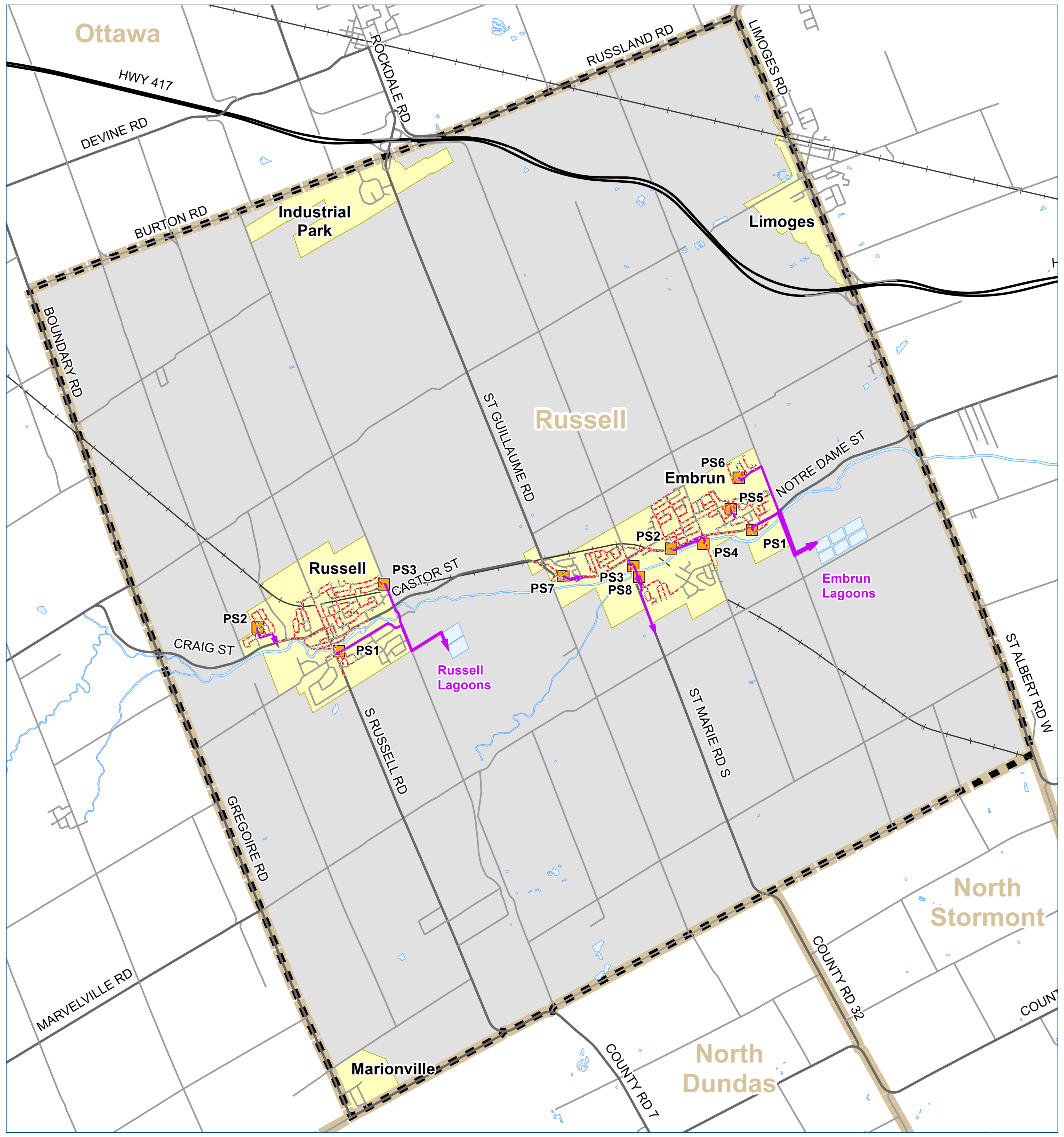
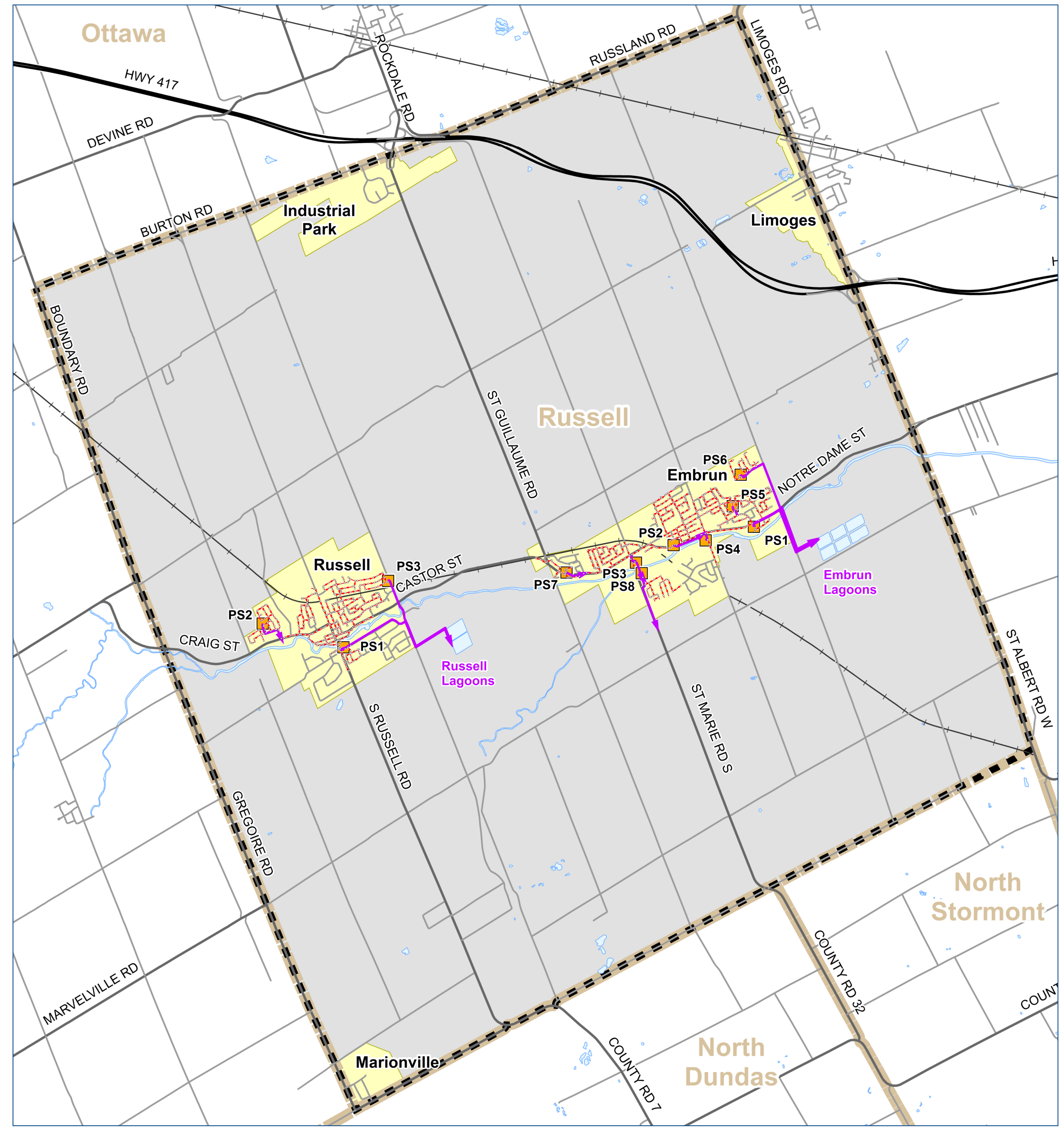


Lagoon capacity is sufficient beyond 2031. Additional capacity required to achieve build-out.

Municipalité de RUSSELL Township

WSP





Municipalité de RUSSELL Township

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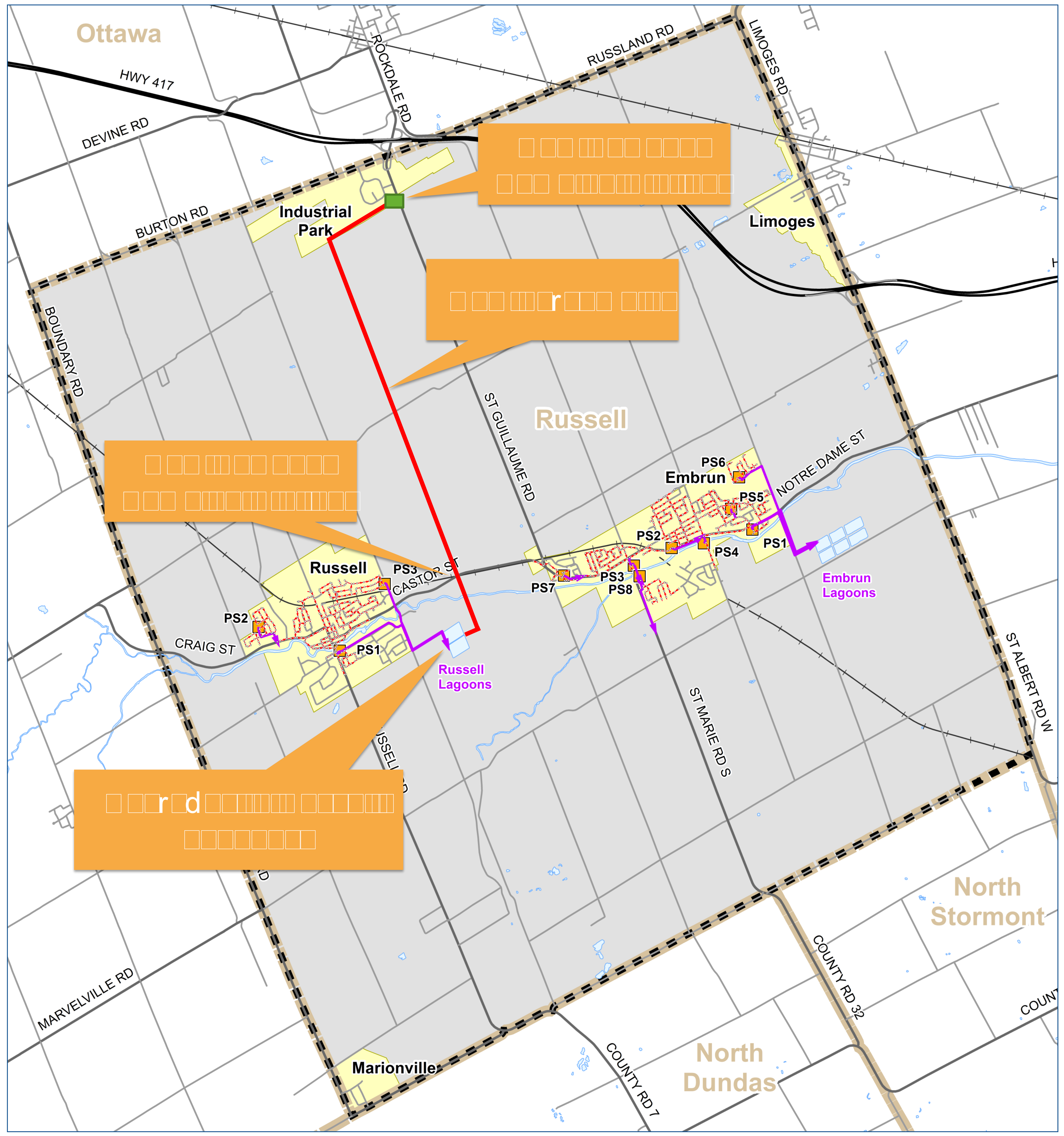
Ottawa
HWY 417
DEVINE RD
BURTON RD
RUSSLAND RD
LIMOGES RD
ROCKDALE RD
Industrial Park
Limoges
BOUNDARY RD
ST GUILLAUME RD
Russell
NOTRE DAME ST
Embrun
PS6
PS5
PS2
PS4
PS1
PS7
PS3
PS8
Embrun Lagoons
Russell
PS3
CASTOR ST
PS2
CRAIG ST
PS1
Russell Lagoons
ST MARIE RD S
ST ALBERT RD W
North Stormont
COUNTY RD 32
MARVELVILLE RD
Marionville
COUNTY RD 7
North Dundas

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NATURAL ENVIRONMENT

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SOCIAL & CULTURAL HERITAGE

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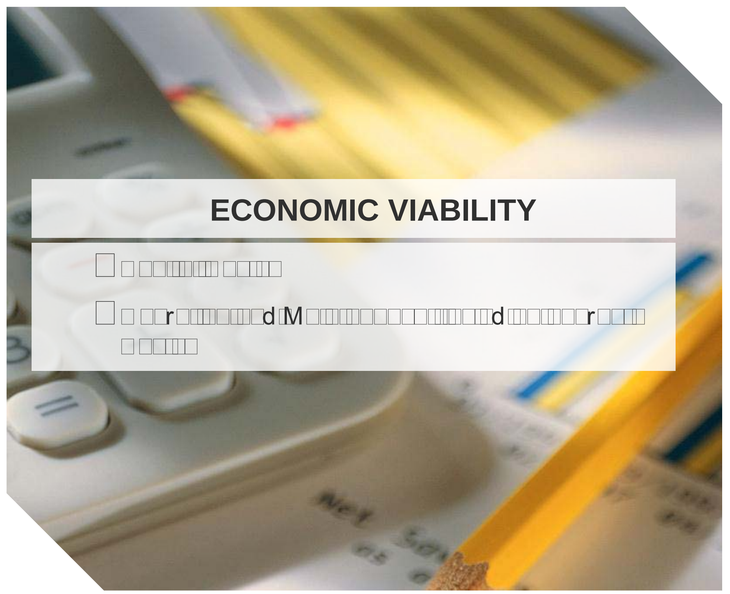

ECONOMIC VIABILITY

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TECHNICAL CONSIDERATIONS

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Municipalité de RUSSELL Township

WSP

W1 – Do Nothing

W2 – Service Industrial Park

W3 – Service Industrial Park and Provide Connection to Embrun Reservoir

W4 – Recommission Embrun/Marionville WTP to service the Industrial Park.

WW1 – Do Nothing

WW2 – Servicing Limited to Russell and Embrun

WW3 – Servicing of Industrial Park and Growth Areas within Russell and Embrun

Municipalité de RUSSELL Township

WSP

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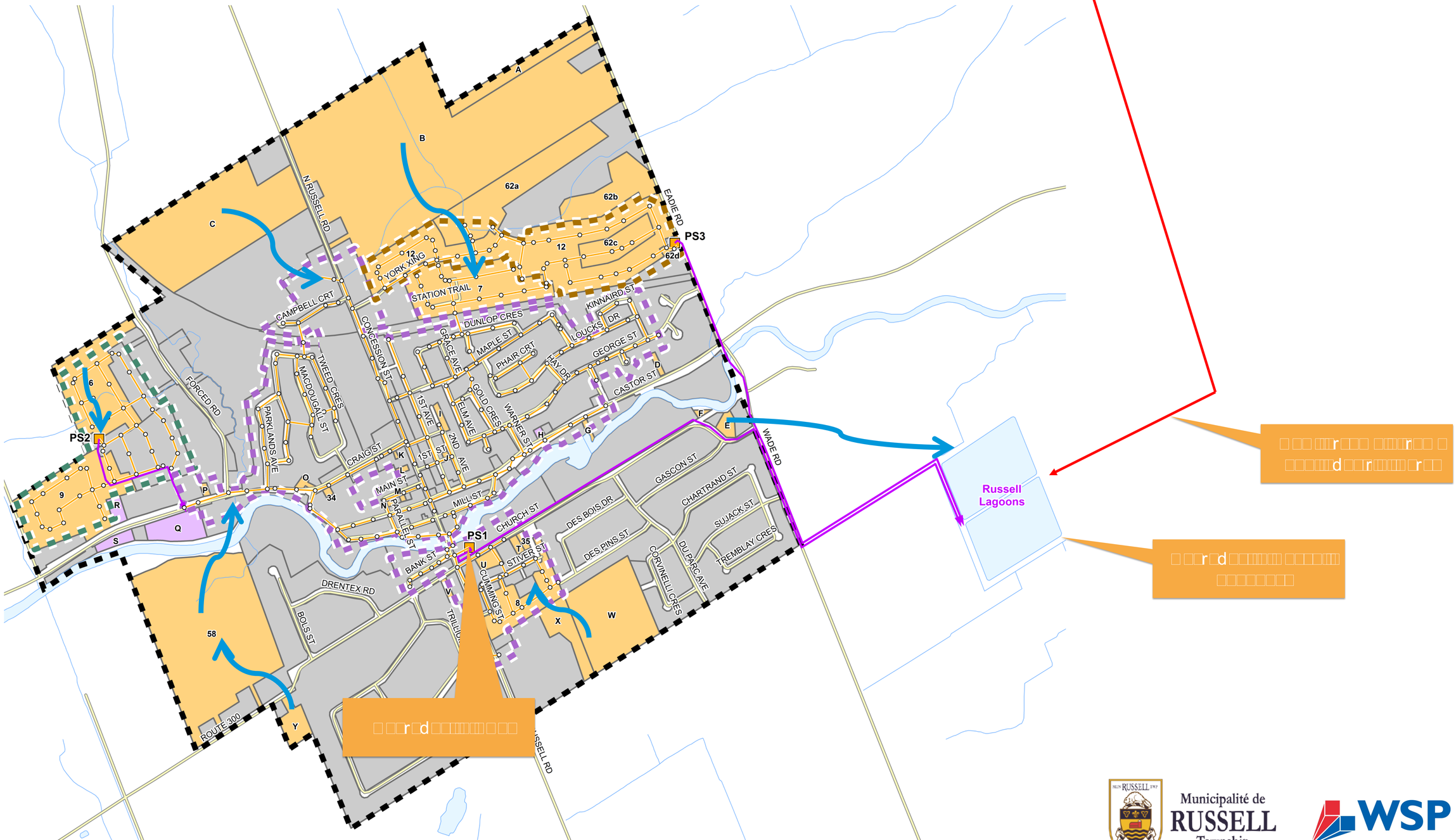

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Municipalité de RUSSELL Township

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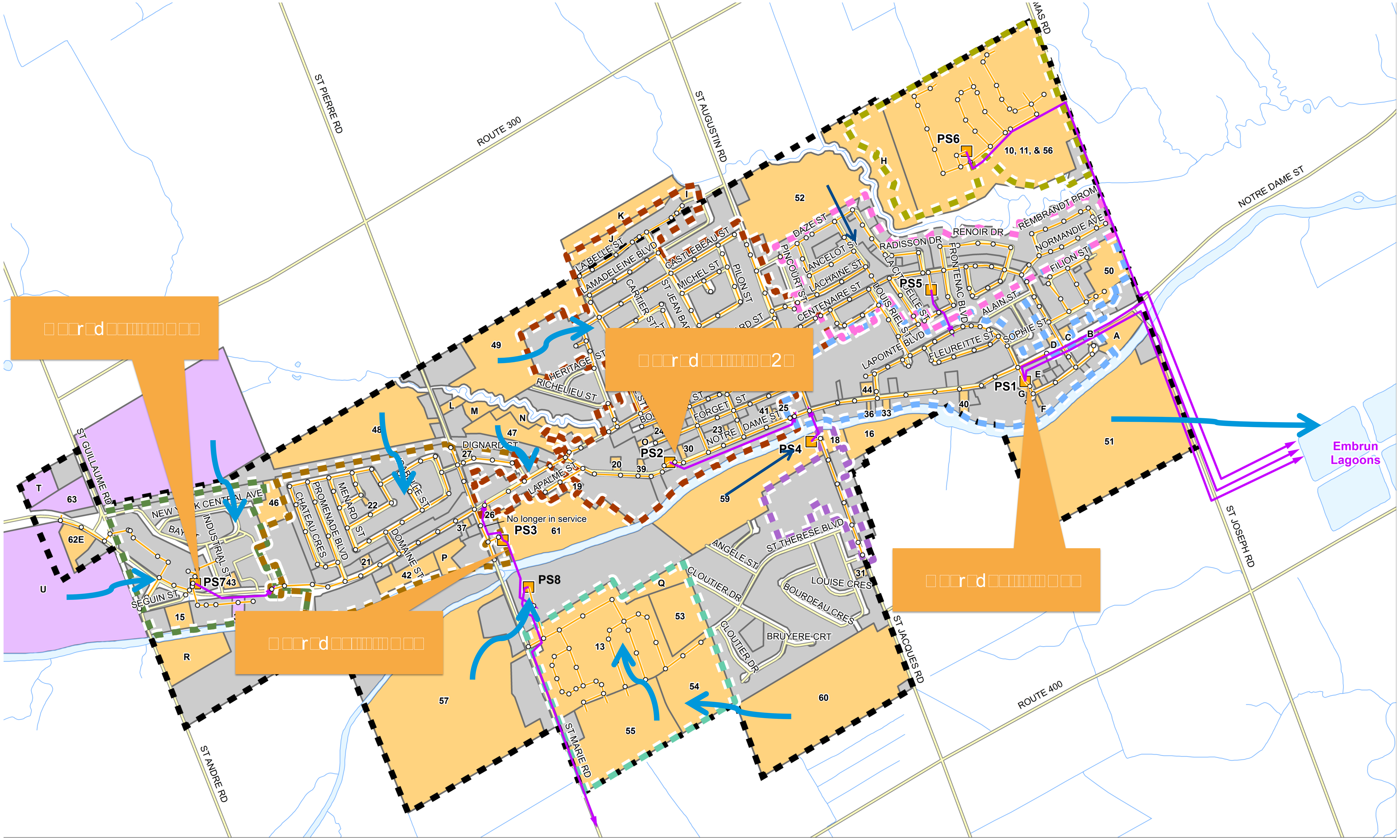

Municipalité de RUSSELL Township

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Contact for questions or comments:

November 13, 2015.

Municipalité de RUSSELL Township

WSP