

EXECUTIVE SUMMARY
MID-SPENCER/GREENSVILLE RURAL SETTLEMENT AREA
SUBWATERSHED STUDY

April 2016



Prepared for:

The City of Hamilton



Prepared By:

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Aquafor Beech Reference: 64618

EXECUTIVE SUMMARY

INTRODUCTION

The City of Hamilton initiated this study for the Greenville Rural Settlement Area (RSA) and surrounding Mid-Spencer Creek Subwatershed.

The Greenville RSA and Mid-Spencer Subwatershed are located in the former Town of Flamborough and the City of Hamilton. Residents in the Greenville RSA and the subwatershed area are currently serviced by private septic systems and groundwater sourced municipal communal, private communal or individual wells.

A Secondary Plan was prepared for Greenville in 1992 and the land use policies and guidelines for development are outlined in Official Plan Amendment 13 (OPA 13) to the Official Plan for the Town of Flamborough. The Secondary Plan sets out requirements for stormwater drainage and hydrogeology studies to be completed prior to new development within the Greenville Settlement Area. **Figure 3.3.1** and **Figure 3.3.2** illustrate the areas designated for development and the land use designations for the RSA respectively.

The Secondary Plan outlines the requirement for a Comprehensive Servicing Study that is to be undertaken to “provide guidelines to determine the extent and density of residential development that can be sustained without degradation of the quality or quantity of ground or surface waters within and outside the Secondary Plan Boundary”. One of the objectives of this study is to define existing environmental conditions and to determine the potential impact of proposed development within the Greenville RSA.

STUDY AREA

There are two distinct study areas for this project, the Greenville RSA and the Mid-Spencer Creek Subwatershed. Both are located within the Spencer Creek watershed, a majority of which is located within the western portion of the City of Hamilton (**Figure 1.2.1**).

The Mid-Spencer Creek is generally bounded by Governor’s Road to the south, Westover Road to the west, Sixth Concession Road to the north and Brock Road to the east. The Mid-Spencer Creek drains an area of approximately 56.4 km². The dominant land use is rural, with the exception of the Greenville RSA and the former Town of Dundas which is located in the southern part of the Subwatershed.

The Greenville RSA is generally bounded by CN Railway to the south, Middletown Road to the west, Dundas Street East (Highway 5) to the north and Ofield Road South to the east. Presently, there are approximately 900 residences located within the RSA. The Greenville RSA covers an area of approximately 655 ha.

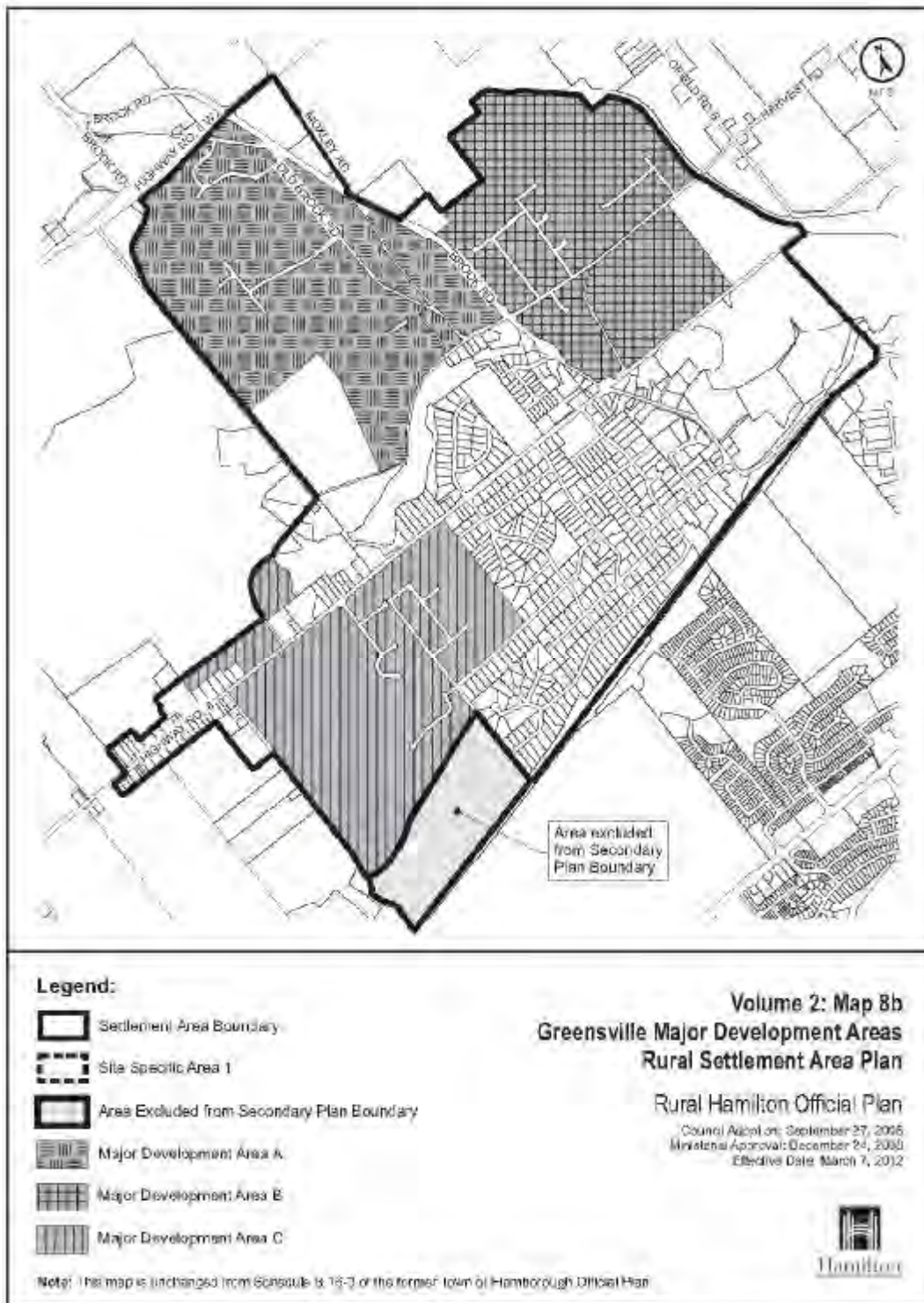


Figure 3.3.1: Greenville Secondary Plan illustrating areas designated for development

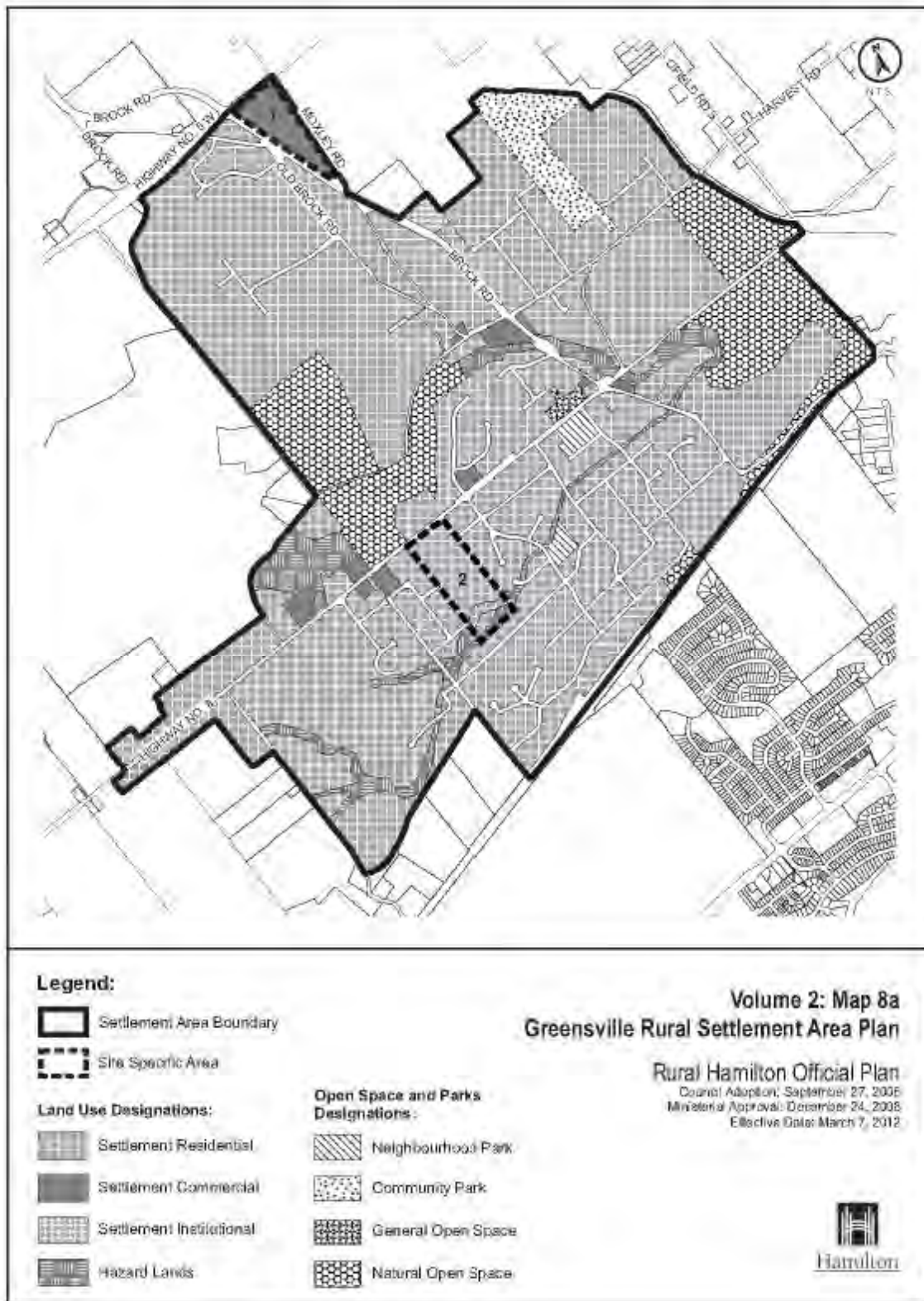
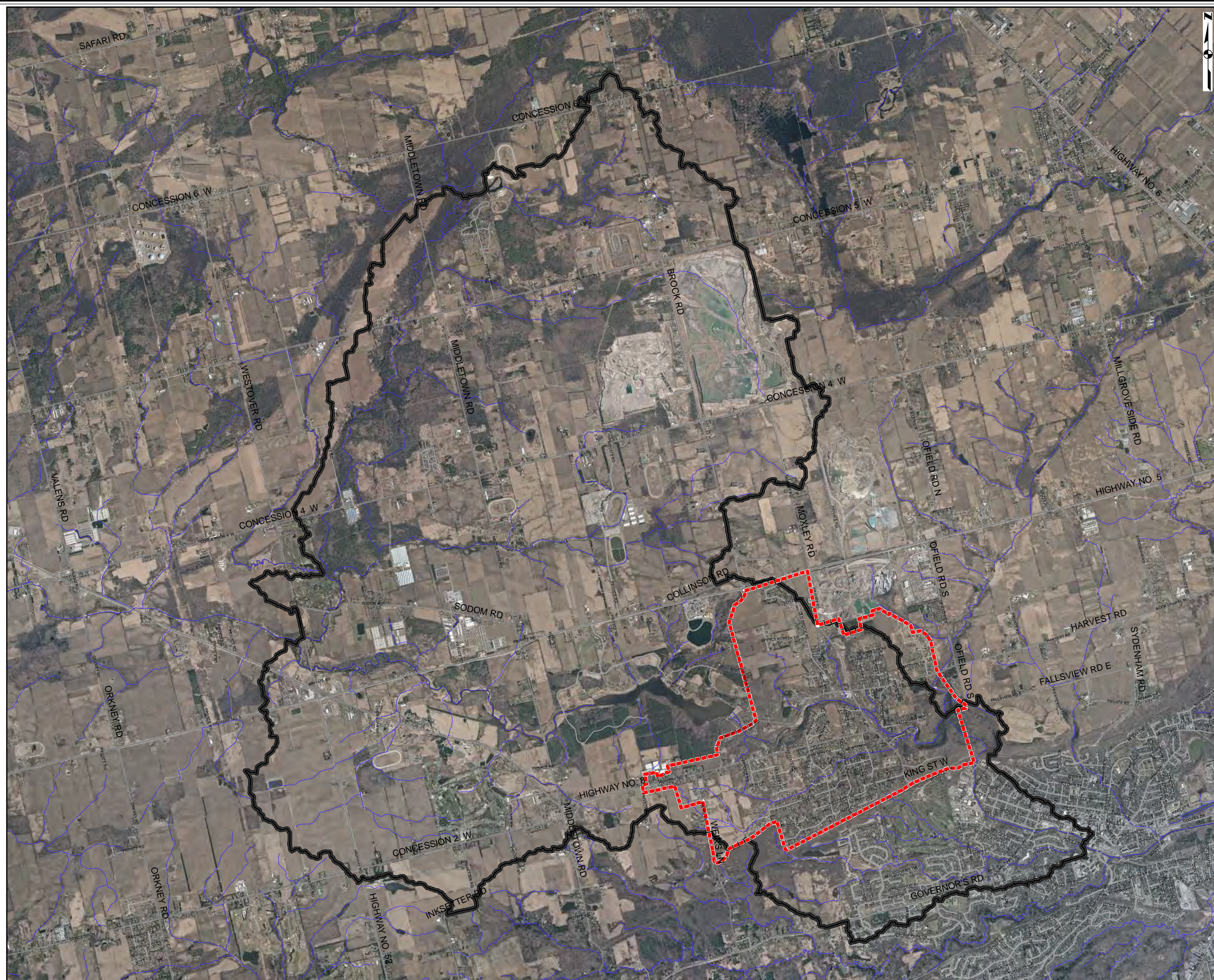
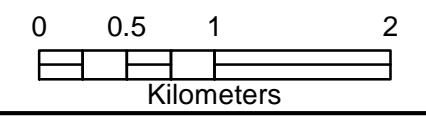


Figure 3.3.2: Greenville Secondary Plan illustrating areas approved for development



- Legend**
- - - - - Rural Settlement Area
 - Mid-Spencer Creek Subwatershed Boundary

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**GREENSVILLE
SUBWATERSHED STUDY**

Study Areas

FIGURE: 1.2.1

DATE: February 2016

The entirety of the Greensville Rural Settlement Area is located within the Greenbelt Plan Area. Furthermore, the majority of the Greensville Rural Settlement Area is subject to the Niagara Escarpment Plan (NEP). The portion of the Greensville Rural Settlement Area that is within the Niagara Escarpment Plan is designated as a Minor Urban Area, as illustrated in **Figure 1**, below. Other NEP designations within the Rural Settlement Area include Escarpment Natural, Escarpment Protection, and Escarpment Rural Areas.

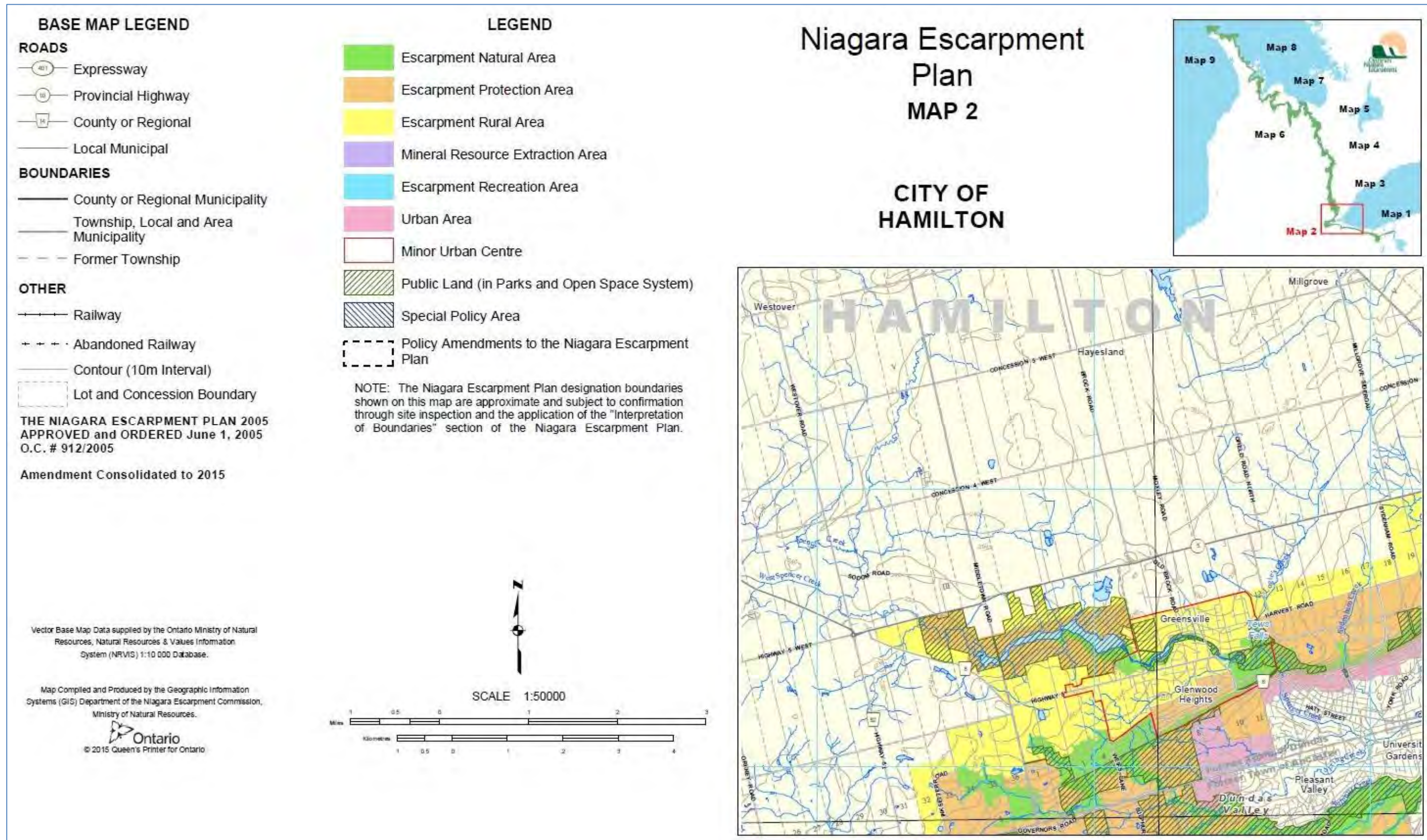


Figure 1: Niagara Escarpment Plan (figure amended from NEP maps)

STUDY GOAL, OBJECTIVE AND KEY TASKS

Study Goal

The study goal is defined as:

“to protect, maintain and enhance the ecological processes, functions and significant natural features of the area, providing a framework through which future growth may be established and undertaken in a manner which is environmentally sound and socially and economically sustainable.”

Study Objective

The objective of the study is to provide a basis for the protection, maintenance and enhancement of surface water and groundwater quantity and quality. The resulting plan will provide recommendations as to where and how future development activity can safely occur so as to minimize flood risks, stream erosion, degradation of water quality and negative impacts on natural systems, including groundwater. Recommendations may also identify opportunities for ecological enhancement where deemed integral to the function of the plan.

Key Tasks

The study will be carried out in three stages. The key tasks to be undertaken for each stage are outlined below.

STAGE I – SUBWATERSHED CHARACTERIZATION

- Define existing environmental conditions
- Identify and evaluate natural features and functions of the study area and their potential interrelationships with other natural features
- Summarize constraints and opportunities

STAGE II – DEVELOP AND EVALUATE SUBWATERSHED MANAGEMENT STRATEGIES

- Identify alternative Subwatershed Management Strategies
- Establish criteria to evaluate the alternative strategies
- Select a Preferred Subwatershed Management Strategy

STAGE III – DEVELOP AND IMPLEMENTATION AND MONITORING PLAN

- Develop an Implementation and Monitoring Plan to ensure the long term integrity of the Preferred Subwatershed Management Strategy

It should be noted that the level of effort, in order to respond to the Secondary Plan requirements was more considerable for the Rural Settlement Area. Work in this area included review of background information together with detailed field assessments to confirm the existing natural features. For the Subwatershed area the focus was to use existing information and augment the findings with a more limited degree of technical and field assessments.

SUBWATERSHED PLANNING

The process of Subwatershed Planning has evolved over the last 20 years (**Figure 1.4.1**).

Presently, Subwatershed Plans deal with a number of issues including:

- flooding;
- erosion;
- water quality;
- the water budget (i.e., groundwater, baseflow and peak flows);
- terrestrial and aquatic habitat;
- woodlands;
- wetlands;
- Areas of Natural and Scientific Interest;
- Environmentally Sensitive Areas;
- aesthetics; and
- recreation.

Furthermore, the plans are ecosystem based, with the potential interaction between each of the environmental features being strongly considered.

The Subwatershed Plan, in this manner, becomes an integral part of the overall planning process, and if successfully completed should provide:

- a solid foundation such that the environmental features will be protected, enhanced or restored under present conditions, and as land use changes occur; and
- an environmentally sound framework within which those involved in planning and decision-making can evaluate the consequences of current and post-development scenarios in the context of the entire subwatershed.

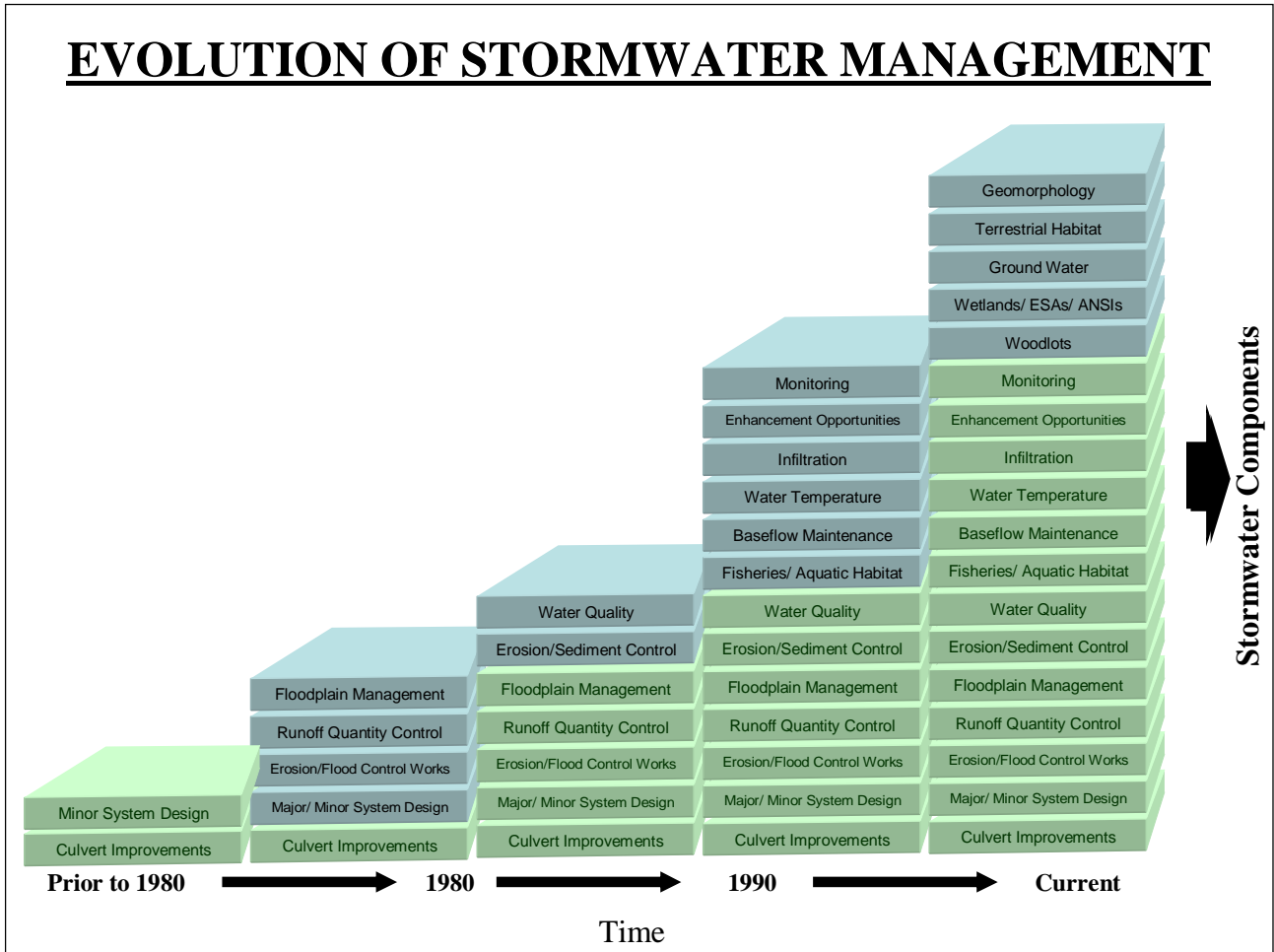


Figure 1.4.1: Evolution of Stormwater Management

MUNICIPAL CLASS ENVIRONMENTAL ASSESSMENT (EA) PROCESS

This study was completed following Approach 1 under the Class Environmental process and will therefore address Phases 1 and 2 of the EA process for any Schedule ‘B’ projects that are identified and outline additional work that will be required to implement Schedule ‘C’ projects.

For this study there are two components which are to be addressed as part of the EA process. These include:

- Stormwater management
- Domestic water supply

PROBLEM AND OPPORTUNITY DEFINITION –PHASE 1 -ENVIRONMENTAL ASSESSMENT

The first phase of the Environmental Assessment process involves identification of the problems and opportunities.

Within the RSA the initial concerns were related to proposed development and the potential impacts of development on the natural heritage system, water resources or groundwater regime. As the study progressed it became clear that existing development impacted existing environmental conditions, particularly after several wells went dry during a dry period in 2007.

As a result of the above, the overall approach that was taken was to develop a strategy that would ensure that proposed development within the RSA did not adversely impact existing environmental conditions while looking for opportunities to enhance existing environmental conditions by implementing stewardship measures within areas that are already developed. Consistent with the statement above, the focus is within the Rural Settlement Area.

SUBWATERSHED CHARACTERIZATION –STAGE 1 -SUBWATERSHED PLANNING

A summary of the subwatershed characterization for the Rural Settlement Area and Mid Spencer Creek subwatershed is provided below. Further information with respect to characterization can be found in **Chapter 4** of the report.

Hydrology and Hydraulics (Surface Water Resources)

Continuous and design event modelling was undertaken in order to define flows at key locations within the RSA and Mid Spencer Subwatershed. Floodplain mapping was also prepared for an unnamed tributary within the Greenville RSA. Details with respect to the findings are provided in **Section 4.3** of the report.

Groundwater Resources

A majority of the homes (925 in 2006) within the RSA are serviced by individual wells and private septic systems. Approximately 36 homes are serviced by the Greenville municipal well while 26 homes are serviced by the private Briencrest Communal well.

There are two main aquifers in the RSA, namely a shallow overburden sand aquifer and deeper bedrock aquifer. Approximately 80 percent of the wells extend into the bedrock aquifer while the remaining 20 percent are located in the overburden aquifer (**Section 4.4** of the report provides further details).

Under existing conditions two main issues were identified. In 2007 a number of wells ran dry. A majority of these wells are located in the northern half of the RSA and are located in the shallow overburden aquifer.

Up to 10 percent of the wells were, at one point, deemed unsafe due to elevated bacteria or nitrate concentrations.

Other relevant conclusions include:

- Current domestic water demand represents 12 percent of the available recharge (recharge occurs as a result of infiltration of precipitation). Approximately 85 percent of water used by residents is returned to the ground through individual on-site septic systems
- The volume of residential water that is returned to the ground via septic systems represents approximately 17 percent of the total recharge within the RSA.
- From the experience in 2007, it appears that the problems of water supply and wells running dry were due to a year where precipitation was less than 75% of its long term average.
- Water quality concerns are principally due to incidences of bacterial contamination in the short term and to elevated nitrates in the long term. The nitrate levels have decreased since 1983 and the nitrate concentration at the Greensville Municipal well has remained at less than 6 mg/l since 2007.
- In 2004, the Hamilton-Halton Watershed Stewardship Program conducted a septic system awareness survey. The survey found that a significant percent (56%) of the septic systems were 25 years old with some being older than 50 years.

Natural Heritage Resources

Aquafor Beech Limited characterized the Natural Heritage System (NHS) for the Mid-Spencer Creek/Greensville Subwatershed study area, including the RSA, by building upon the City of Hamilton's existing NHS. Depending on the level of detail required, Natural Heritage Features were characterized using a combination of primary and secondary sources including detailed field surveys, reconnaissance/roadside surveys, air photo interpretation, and background information review. Per the project's terms of reference, particular emphasis was placed on the RSA, as this is the only area within the subwatershed where development is expected to occur.

The Mid-Spencer Creek/Greensville Subwatershed contains a number of Natural Heritage Features. These Natural Heritage Features include: habitat for species considered Endangered, Threatened, or of Special Concern by COSEWIC and other species of conservation concern, fish habitat, wetlands, Areas of Natural and Scientific Interest (ANSIs), Significant Woodlands, Significant Wildlife Habitat, alvars, seepages and springs, permanent and intermittent streams, Environmentally Significant Areas (ESAs), and the linkages between them. In addition,

minimum Vegetation Protection Zone widths for Core Natural Heritage Features have been provided (Section 4.6 of the report provides further details).

DEVELOP AND EVALUATE SUBWATERSHED MANAGEMENT STRATEGIES – STAGE II SUBWATERSHED PLANNING

This Stage of the Subwatershed Plan was primarily focused on the Rural Settlement Area. The objective is to define future land uses and identify a number of Alternative Management Strategies, including the ‘Do Nothing’ alternative and compare the effects of the strategies against existing conditions (for example, does the strategy improve or diminish existing surface water, groundwater or natural heritage conditions). The primary focus was to assess the strategies to define potential impacts for the remaining nine areas within the Rural Settlement Area that are still to be developed (**Figure 6.1.1**)

As was mentioned previously, the assessment of alternatives as they relate to Domestic Water or Stormwater were evaluated using the Environmental assessment process

In summary, it was found that the ‘Do Nothing’ alternative was not a satisfactory option as adverse impacts on all of the surface water resources, groundwater resources and natural heritage system would occur. The Preferred Management Strategies for the Rural Settlement Area and Mid Spencer Creek Subwatershed are further defined under Stage III – Subwatershed Planning. Provided below is a summary of the findings as they relate to the **Environmental Assessment** component of the project

EVALUATION OF ALTERNATIVE SOLUTIONS – PHASE 2- ENVIRONMENTAL ASSESSMENT

A number of alternatives were developed to address issues related to stormwater management and domestic water supply for lands to be developed within the Rural Settlement Area. Further description of the process is provided below.

Stormwater Management

A number of alternatives to address flooding, erosion and water balance (collectively referred to as stormwater management) for the lands to be developed within the Rural Settlement Area were established. A screening level approach was first used to narrow down the alternatives.

Following the screening approach a more detailed assessment of the more viable alternatives was undertaken. Each of the alternatives that were brought forward were evaluated against a series of criteria that were broadly categorized as:

Mid-Spencer Creek /
Greenville Rural
Settlement Area
Subwatershed Study

Legend

- Watercourses
- Catchment
- New Development Areas

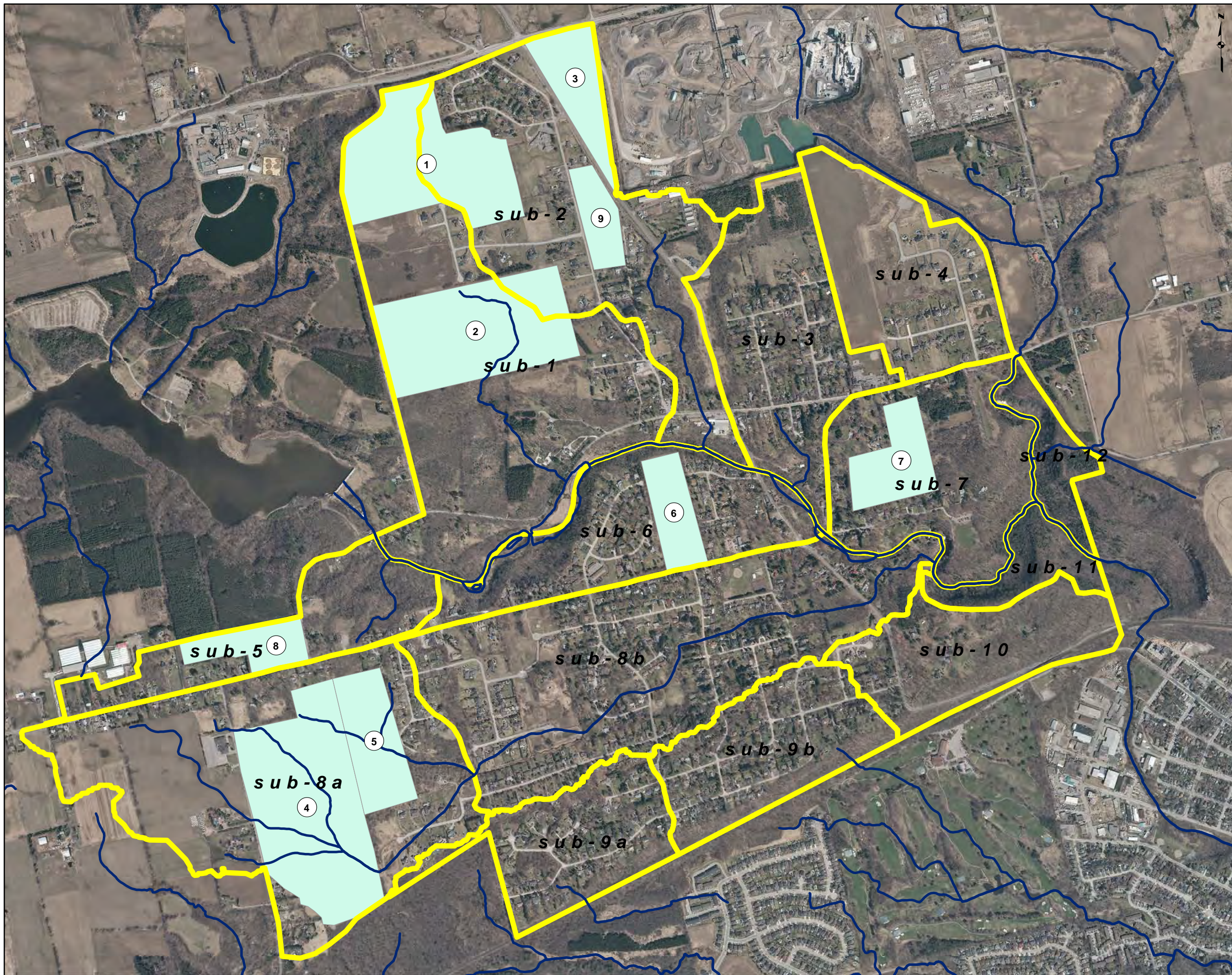


FIGURE 6.1.1

Rural Settlement Area
Subcatchments
(New Development)

- Physical and Natural Environment
- Social, Economic and Cultural Environment
- Technical Factors
- Financial Factors
- Legal and Jurisdictional Factors

The Preferred Alternative is described in detail in **Section 7.10** of the report and is further outlined under Subwatershed Planning – Stage III below. The Preferred Alternative is defined as Low Impact Development Source Control and Traditional Measures which best meets the requirements related to flooding, erosion and water balance.

Domestic Water Supply

The Greenville Rural Settlement Area area encompasses 655 hectares and a population of approximately 2,500 persons who rely on groundwater wells for drinking water. There is one City owned municipal well (supplying 36 homes) and the Briencrest well which supplies 26 homes.

A number of alternatives to provide domestic water to existing and future residents and businesses within the rural settlement area were considered. The alternatives which were considered include:

- Do Nothing
- Control/Limit development
- Bring up Municipal water
- Provide more Communal wells
- Maintain Status Quo and add a Backup City Well

Each of the alternatives were then evaluated against a series of criteria which are broadly categorized as:

- Physical and Natural Environment
- Social, Economic and Cultural Environment
- Technical Factors
- Financial Factors
- Legal and Jurisdictional Factors

The Preferred Domestic water supply Alternative is to maintain individual services (wells and septic systems) on future lots and to add a backup well to the existing city well.

This alternative was selected based on the impact to the environment, capacity of groundwater resources, consistency with existing policy and the objective to provide a better level of service to the homes currently serviced by the municipal well.

The location, sizing and preliminary design of the necessary infrastructure (treatment plant, storage tank) will be subject to further assessment to be undertaken under Schedule C of the Municipal Class Environmental Assessment.

DEVELOPMENT OF AN IMPLEMENTATION AND MONITORING PLAN – STAGE III SUBWATERSHED PLANNING

The final stage of the Subwatershed Plan involves the development of an Implementation and Monitoring Plan for the Rural Settlement Area and Mid Spencer Creek areas.

Provided below is a summary of the proposed implementation plans.

Rural Settlement Area

Stormwater Management Strategy

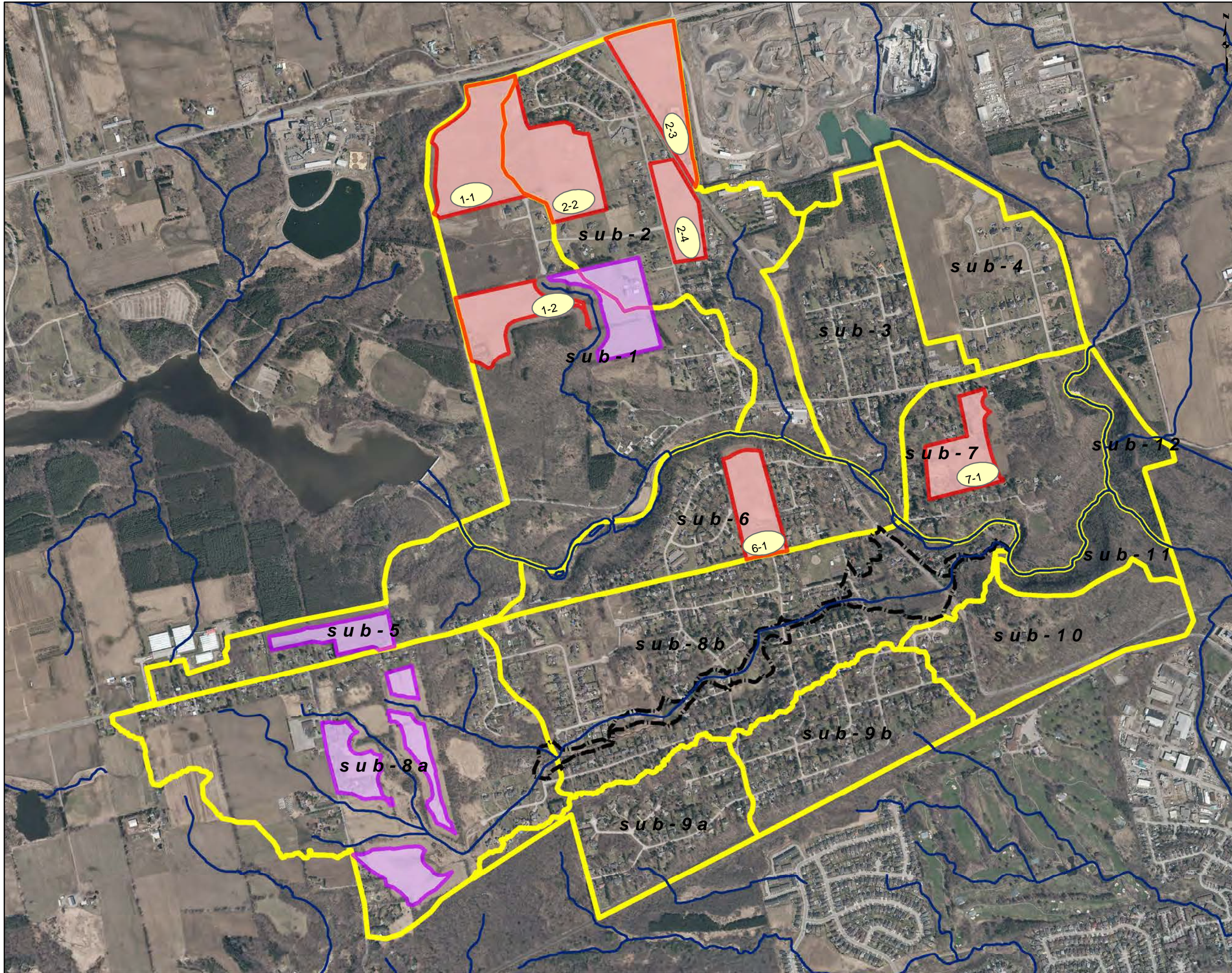
There are nine new development areas to be constructed within the Rural Settlement Area. The preferred strategy involves a combination of Low Impact Development (LID) measures together with traditional stormwater measures (stormwater ponds) to address issues related to flooding, erosion and water balance. The LID measures will address potential groundwater deficits by promoting the infiltration of 127m³/ac/year on a residential lots while the stormwater ponds will maintain impacts associated with erosion and flooding for the 2-100 year storms. The general location of stormwater facilities is shown on **Figure 9.2.1**.

Findings from the impact assessment part of the study found that a variety of stewardship measures could be implemented within **existing properties** in order to improve groundwater quality or quantity. These measures which could include modifying the landscape to promote infiltration, installation of rain gardens or soakaway pits or redirection of downspouts were presented to the public for input. **Section 10.4.1** of the report provides further details.

Groundwater Strategy

For new development there are two primary considerations. The first item was addressed above and relates to the preservation of groundwater quantity as a result of proposed development (impermeable surfaces associated with proposed development will reduce the quantity of infiltration into the groundwater system).

**Mid-Spencer Creek /
Greenville Rural
Settlement Area
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Legend

- Watercourses
- Floodline
- Catchment
- Catchment Area for Development**
- Catchment Area >5ha (Wet Pond)
- Catchment Area <5ha (Traditional Source Controls)
- 1-1 Stormwater management Pond (quality and quantity control)

FIGURE 9.2.1

**Stormwater Management
Facilities for Water Quality
/Erosion and Flood Control**

The target for new development is to maintain or enhance pre-development groundwater recharge both on-site and off-site. As noted above, the anticipated recharge deficit from future residential development in the RSA is 127 m³/ac/year, representing 32 mm precipitation that must be captured and infiltrated on an annual basis. This figure represents a post-development impervious coverage of 15%.

The predicted post-development infiltration shortfall of 127 m³/ac/year (or 32 mm precipitation) can be compensated by capturing and over-infiltrating precipitation, using LID methods described in **Section 10.4.1**. Infiltration of an additional 1.0 mm for every precipitation event onto pervious areas will make up for the post-development shortfall.



The second item relates to lot sizes and the concerns with respect to nitrate loadings from new homes and businesses. The City of Hamilton Guidelines for Hydrogeological Studies and Technical Standards for Private Services provide detail for undertaking On-Site Nitrate Impact Calculations. The objective is to ensure that the estimated concentration of 10.0 mg/l of nitrate in the receiving groundwater at the site boundary is not exceeded. This study (Figure 10.4.5) defines the minimum lot size for each of the nine proposed development areas within the Greenville RSA. These lot sizes shall be used by the developer and should be increased subject to modifications for number of bedrooms and percent imperviousness according to the Hydrogeological Guidelines document. Should smaller lot sizes than those identified in Figure 10.4.5 be proposed, approval of applications under the *Planning Act* to permit the reduced lot sizes would be required.

Further, to implement the recommendations of the Subwatershed Study, amendments will be required to the Greenville Rural Settlement Area Plan Policies and Maps from Volume 2 of the ROP, including a requirement to remove the reference to phasing and the Major Development Areas.

A series of measures to reduce the impacts associated with existing septic systems as well as measures to monitor or replace existing private wells were presented at the second Public Open House. Collectively these measures would improve the quality of the groundwater or protect/improve the reliability for existing wells. **Section 10.4.6** of the report provides further details.



**Mid-Spencer Creek /
Greenville Rural
Settlement Area
Subwatershed Study**

Legend

Predominant Soil Texture ¹	Minimum Lot Size (ha)
 Silty Sand	0.7
 Sandy Silt	0.82

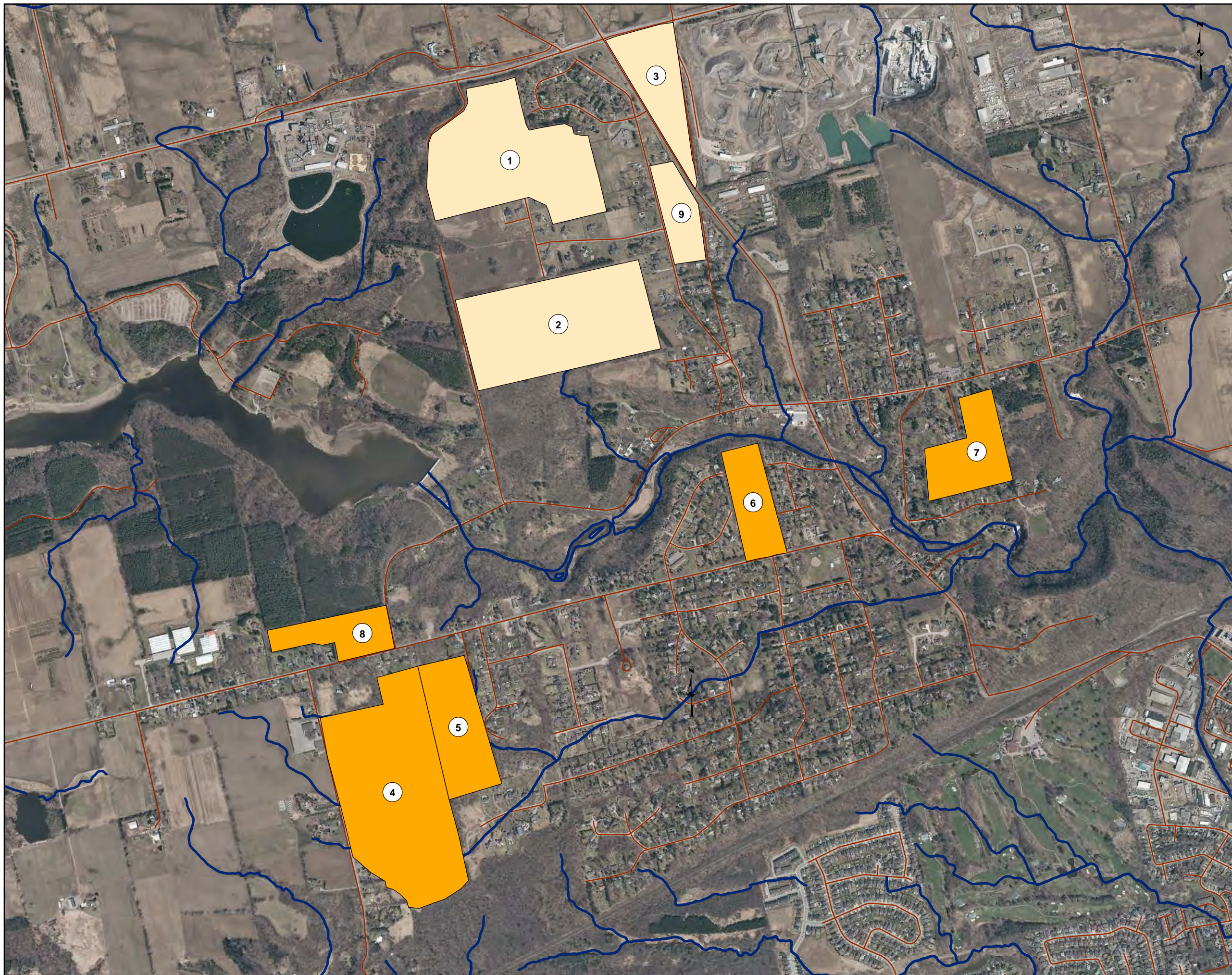
All lot sizes adjusted to 10% imperviousness (Hamilton Guidelines for Hydrogeological Studies and Technical Standards for Private Services, Appendix B and C1) and based on a three-bedroom home.

¹ Derived from Ontario Soil Survey Classifications categorized into Predominant Soil Textures from Table C1 (Typical Groundwater Recharge Rates), Appendix C of the "Guidelines for Hydrogeological Studies and Technical Standards for Private Services".

-  Watercourses
-  Streets

References:
Soils of Wentworth County, Report 32 of the Ontario Soil Survey (1965).
Mid Spencer Creek/Greenville Rural Settlement Area Subwatershed Study, Schlumberger (2007).
Hamilton Guidelines for Hydrogeological Studies and Technical Standards for Private Services. Servicing Strategy Report-Brarcliffe Estates Subdivision Phase 2, MTE Consultants Inc. (2005)

FIGURE 10.4.5
**Minimum Residential
Lot Size by
Predominant Soil Texture**



Natural Heritage

The recommended Natural Heritage System strategy for the Greenville RSA presents recommendations for stewardship, monitoring, ecological rehabilitation and enhancement, as well as best management practices. The characterization of the Natural Heritage System and the related recommendations are presented as a means of maintaining or enhancing the Natural Heritage System. The NHS and natural hazards within the RSA are shown below in **Figure 9.2.3**. Per Section B.11.1.1.6 of the Greenville Secondary Plan and the provisions of the City of Hamilton's Rural Official Plan, the NHS for the Greenville RSA protects Key Natural Heritage Features, including Environmentally Significant Areas; identifies Linkages; and provides recommendations for minimum Vegetation Protection Zones (i.e. buffers) to Core Natural Heritage Features.

The Natural Heritage System Strategy presents an overview of the requirements of the City of Hamilton's Rural Official Plan. Requirements for future studies, including a list of applicable approval agencies, are also presented. Rehabilitation and enhancement recommendations follow the direction of the Mid-Spencer Creek Stewardship Action Plan.

Mid Spencer Subwatershed

The primary focus for the Mid Spencer Subwatershed was to define existing conditions and to establish general direction with respect to restoration/rehabilitation measures that would be undertaken by the City, Hamilton conservation Authority, other agencies or local residents.

A summary of the recommendations are provided below.

Surface Water Resources

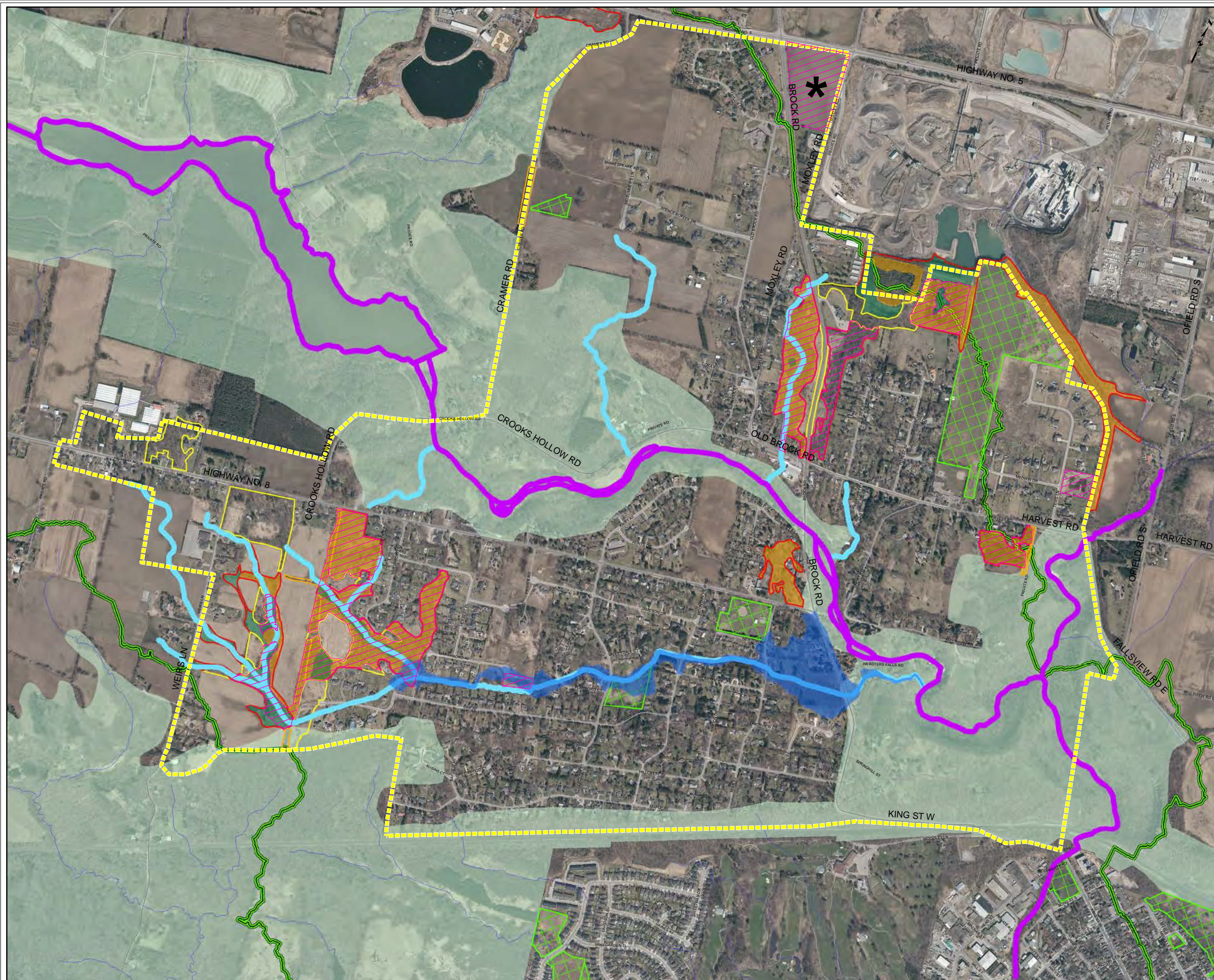
No recommendations were made for this component of the study

Groundwater Resources

Section 10.5 of the report provides general recommendations with respect to retrofit opportunities for septic systems, private wells and general measures to promote infiltration.

Natural Heritage System

The recommended Natural Heritage System strategy for the greater Mid-Spencer/Greenville Subwatershed study area presents recommendations for stewardship as well as best management practices. These recommendations are presented as a means of maintaining or enhancing the Natural Heritage System. Specific details of restoration and rehabilitation opportunities are presented in the Natural Heritage Plan in the **Section 10.5** of the report.



KEY MAP

LEGEND:

- Mid-Spencer Creek Subwatershed Boundary
- Rural Settlement Area
- Parks
- Wetland
- Preliminary Natural Heritage System
- Significant Woodland
- Floodplain
- Significant Wildlife Habitat and/or SAR Habitat

Revised Natural Heritage System

- Core Areas
- Linkages
- Hedgerow

FishHabitat

- Direct Fish Habitat
- Indirect (Contributing) Fish Habitat

NOTES:

- Status to be confirmed through future study

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**GREENSVILLE
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Details of the Revised Natural Heritage
System Within The Rural Settlement Area

FIGURE: 9.2.3

DATE: February 2016

The Natural Heritage System Strategy presents an overview of the requirements of the City of Hamilton's Rural and Urban Official Plans. Requirements for future studies, including a list of applicable approval agencies, are also presented.

PUBLIC CONSULTATION

Two public open houses as well as two Community Advisory Group meetings were held during the course of the study. Further explanation is provided in **Chapter 5** and **Chapter 8** of the report.