

**City of Hamilton
Airport Employment Growth District
- Phase 2**

Water & Wastewater Servicing Master Plan -Final



June 2011



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Executive Summary

1. Introduction

In 2006, the City of Hamilton completed the Growth Related Integrated Development Study (GRIDS) planning process in conjunction with the City of Hamilton Water and Wastewater Master Plan. These planning documents set out the Population and Employment targets and presented the major water and wastewater infrastructure projects throughout the City up to the year 2031. One major employment growth area that was identified was the existing agricultural lands surrounding the John C. Munroe Hamilton International Airport to the south, north and west. The Airport Employment Growth District (AEGD) will set out to provide approximately 660 net hectares of new employment land and 27,700 new jobs in the south Hamilton Mountain / Mount Hope area by year 2031.

The 2006 City of Hamilton Water and Wastewater Master Plan set out the overall servicing strategies for all the City's growth areas. Included in these strategies were the trunk infrastructure requirements to service the AEGD.

This current planning process for the AEGD provides opportunity to review the servicing strategies in detail to ensure sustainable, flexible and implementable solutions are developed and evaluated under a public Master Planning process.

2. Study Area

The Study Area for this Master Plan consists of the area surrounding the John C. Munro Hamilton International Airport. This area is bounded by Upper James St / Homestead Dr in the east, White Church Rd/Carluke Rd E in the South, Fiddler's Green Rd in the west and Garner Rd, Glancaster Rd and Twenty Rd in the north. A small section of this area along Upper James St is designated as Existing Airport Business Park and is within The City of Hamilton's Urban Boundary. The additional lands required for development of the AEGD will be within an urban area expansion. Although this represents the full buildout boundary for the AEGD that was identified in the 2006 Water and Wastewater Master Plan and also at the outset of this study, the employment target set out in the GRIDS planning process will only require a portion of the land area in order to accommodate this job growth. For the purposes of this study, the land within the AEGD boundary that accommodates the employment growth to 2031 is referred to as

the “Secondary Plan Area” and any other land in excess of this is labelled “Additional Study Area”. The Secondary Plan Area generally consists of lands in the northeast AEGD, east of Hwy 6, while the Additional Study Area is made up of the balance of the Study Area. The area north of the airport between Southcote Rd and Smith Rd (Smith Farm) as well as southeast corner of Fiddler’s Green Rd and Garner Rd (Ancaster Christian Reform Church) are to be included in the Secondary Planning Area at the direction of City of Hamilton Council

3. Problem/Opportunity Statement

The purpose of the Problem/Opportunity Statement is to define the principal starting point in the undertaking of the Master Plan Class EA and assist in defining the scope of the project.

As such, the Problem/Opportunity Statement has been defined as:

- The Province, through its Places to Grow document, has identified the need to accommodate growth within the City of Hamilton. Through the GRIDS process, a significant portion of the employment growth has been designated to areas within the AEGD boundary.
- Water and wastewater infrastructure will be required to service these future employment lands.
- The new infrastructure within the AEGD boundary as well as upgrades to the existing systems needs to be identified.

4. Master Plan Methodologies

The methodology for analyzing planning information, developing water demands and wastewater flows and modelling the systems needs to be developed. Employment data for the AEGD was developed through the GRIDS process and refined through Stage I and II of the AEGD Secondary Plan Process. This resulted in a target of approximately 28,000 employees within the Secondary Plan Area under the land use categories of Airside Industrial, Airport Related Business, Light Industrial and Airport Business Park. Based on these land uses and respective densities, water demands and wastewater flows were developed and overall servicing strategies were created. Water and wastewater modeling was performed using WaterGems and MOUSE respectively in order to ensure adequate system capacities under the servicing strategy and to identify any water or wastewater system deficiencies.

5. Evaluation Criteria

The servicing strategies that were developed in order to satisfy the growth needs were evaluated based on a number of factors. These factors generally matched the Triple Bottom Line (TBL) evaluation approach previously approved for GRIDS. Each alternative was evaluated to determine the level of impact and mitigation required for each of the:

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

6. Design Criteria/Eco-Industrial Criteria

The 2006 City of Hamilton Water and Wastewater Master Plan developed water and wastewater design criteria using consumption data through billing records. The criteria is used for generating water demand and wastewater flow projections throughout the City and sizing proposed infrastructure. The existing employment criteria that was developed is 260 L/emp/day average day water demand and 260 L/emp/day average day wastewater flow. As part of the AEGD Water and Wastewater Servicing Master Plan the water consumption for five employment areas across the city were reviewed. The analysis confirmed that the existing water demand and wastewater generation is applicable for the AEGD analysis.

In addition to this analysis, the potential for reduction of existing design criteria using eco-industrial methods was reviewed. Although many site specific measures may be investigated and applied in the future, and such measures may provide an opportunity to reduce the water demand and wastewater flow, there is significant risk of planning infrastructure on this basis. Using City of Hamilton design criteria, the total estimated water demand for the AEGD Secondary Plan Area is approximately 22 ML/d.

Given that the airport is located within the AEGD, flows within the airport boundary needed to be considered. The future water demand for the John C Munro Hamilton International Airport was further compared against typical airport usage and was based on the projected ultimate capacity airport of approximately 9.5 Million Passengers/Year. Water consumption of similar sized airports around the world has an upper range of 30 – 33 L/passengers. This criteria results in

an estimated ultimate peak hourly water demand of approximately 2.4 to 2.6 ML/d for the airport and immediate surrounding uses.

7. Planning Projections

The total employment growth that is estimated for the urban boundary expansion area is approximately 24,376 employees with an additional 3,720 employees within the existing Airport Business Park, totaling 28,096 employees. These employees with an average density of 37 jobs/net hectare will require 702 net hectares of developable land. The 702 net hectares, which translates to 878 gross hectares is referred to as the “Secondary Plan Area” and makes up only a portion of the entire study area. The remaining lands are referred to as the “Future Study Area” which will be further analyzed as an area for growth as development within the AEGD progresses.

8. Phasing Options

Growth within the service area requires the delineation of separate Phases in order to plan infrastructure and land development in a logical and effective manner. When determining the location of the preliminary phase of growth, many factors were considered:

- Proximity to existing water and wastewater infrastructure
- Maximizing the available capacity within existing water and wastewater infrastructure
- Incorporating all land use types
- Minimizing initial servicing costs
- Developing logical gateways/entrances to the AEGD

Four Phasing options were developed that attempted to address these basic criteria. Phasing Option Number 4, which focuses initial growth in the northwest, northeast and southern corners of the AEGD was deemed to most effectively satisfy the above factors.

9. Water System

Water for the AEGD is supplied from the Woodward Ave Water Treatment Plant and pumped through a series of pumping station up the Niagara Escarpment via 1050 mm and 1200/1500

mm watermains. The AEGD is divided into two different pressure districts; Pressure District 18 (PD18) lies in the northwest between ground elevations of approximately 220m and 260m and is serviced by pumping station HD018 and reservoir HDR18. Pressure District 6 (PD6) consists of land between ground elevations of approximately 205m and 240m and is serviced by pumping station HD06A and HD06B.

There is currently an existing water distribution network surrounding the AEGD which consists of watermains ranging from 200mm to 750mm. There is also an existing 600 mm watermain that runs along Glancaster Rd beneath Runways 12-30 connecting to a 400 mm watermain on Airport Rd.

10. Development and Evaluation of Water Servicing Alternatives

The preferred Water Servicing Strategy outlined in the 2006 City Wide Water and Wastewater Master Plan was used as the basis for the development of Water Servicing Options for the AEGD. These options present a more refined and detailed strategy that incorporates the previously approved plan while making the necessary modifications due to changes in the Land Use Plan. Overall, three water servicing options were developed and evaluated based on a triple bottom line approach taking into consideration technical, economic, legal, environmental and socio-economic factors.

- Water Servicing Option A maximizes the Pressure District 18 service area and minimizes the area serviced by Pressure District 6
- Water Servicing Option B maximizes the Pressure District 6 service area and minimizes the area serviced by Pressure District 18
- Water Servicing Option C proposes a slightly larger Pressure District 18 and slightly smaller Pressure District 6 than Servicing Option B

The preferred Water Servicing Option that was selected was Option B. The overall strategy for this option is to maximize the Pressure District 6 service area. Under Option B, the PD6 area will consist of lands east of Glancaster Rd and south of Book Rd between elevations of approximately 220 m to 240 m. PD18 areas will lie north of Book Rd and west of Glancaster Rd and have elevations between approximately 240 m and 250 m. PD6 currently has flexibility for

development within the AEGD due to the existing PD6 watermains throughout the AEGD and along the AEGD boundary as well as excess capacity in the HD06A pumping station.

11. Wastewater System

Wastewater is currently treated at the Woodward Ave Wastewater Treatment Plant (WWTP). Flow reaches the plant by way of several trunk sewers throughout the City of Hamilton. Flows from areas surrounding the AEGD make their way to the WWTP through the existing Ancaster and Upper James/Hamilton Mountain wastewater infrastructure.

The existing Upper James infrastructure consists of a series of sewage pumping stations (SPS), forcemains (FM) and gravity sewers that move flow northerly to the Twenty Rd SPS before discharging to the existing Hamilton Mountain trunk sewer system.

The existing Ancaster/Meadowlands sewer system consists of various smaller diameter sewers discharging to the Ancaster/Fennell Trunk sewer. There is also a proposed 825 mm sewer which will run from Garner Rd on the future Raymond Rd alignment to the existing Ancaster system.

12. Development and Evaluation of Wastewater Servicing Alternatives

The preferred Wastewater Servicing Strategy outlined in the 2006 City Wide Water and Wastewater Master Plan was used as the basis for the development of Wastewater Servicing Options for the AEGD. These options present a more refined and detailed strategy that incorporates the previously approved plan while making the necessary modifications due to changes in the Land Use Plan. Overall, three wastewater servicing options were developed and evaluated based on a triple bottom line approach taking into consideration technical, economic, legal, environmental and socio-economic factors.

- Wastewater Servicing Option A utilizes capacity within existing infrastructure in the northwest, northeast and south and splits the flows from the central portion of the AEGD to either the Twenty Rd SPS or a new Dickenson Rd/Book Rd Trunk sewer.

- Wastewater Servicing Option B utilizes capacity within existing infrastructure in the northwest, northeast and south and splits the flows from the central portion of the AEGD between the Twenty Rd SPS and a new Hwy 6 trunk sewer and south AEGD SPS & FM
- Wastewater Servicing Option C utilizes capacity within existing infrastructure in the northwest, northeast and south and send the majority of flows from the central portion of the AEGD to a new Dickenson Rd/Book Rd Trunk sewer

The preferred Wastewater Servicing Option that was selected was Option C. This option splits the flow that is generated within the AEGD between existing serviced areas and the new Dickenson/Centennial trunk sewer. In general, areas in the northwest will be serviced by the existing Ancaster sewers while areas in the northeast will be serviced by the existing Twenty Rd SPS and the Hamilton Mountain sewers. All of the flow produced by the central area of the AEGD will flow to the east via the new Dickenson Rd/Book Rd trunk sewer, and will be discharged to the Dickenson/Centennial trunk sewer. Some Secondary Plan Area flow in the south will be pumped north by the new AEGD SPS/FM, which will be sized for the growth to 2031 only. Flows from the Additional Study Area will be sent south to a new/upgraded AEGD SPS/FM to be pumped to the Dickenson/Centennial Trunk Sewer. This alternative best utilizes the capacity within the new trunk sewer and provides flexibility at existing northeast AEGD infrastructure. It also maximizes the capacities of existing infrastructure in the south (Homestead/Upper James) and northwest (Meadowlands)

13. Total Capital Program and Implementation

CAPITAL PROGRAM SUMMARY		
Water		Cost 2010 (\$)
	Linear	\$22.2M
	Elevated Tank (50% AEGD, 50% Ex. Development)	\$6.3M
Sub-total Water		\$28.5M
Wastewater		
	Linear	\$38.6M
	SPS/FM	\$5.5M
Sub-total Wastewater		\$44.1M
TOTAL		\$72.6M

Notwithstanding the overall water and wastewater servicing strategy for the buildout of the Secondary Plan Area, growth within the AEGD and construction of the AEGD infrastructure will be dependent on available capacity in the existing City infrastructure, timing of completed upgrades to key facilities in the City, and potential infill rates within the AEGD development area.

For water servicing, there is currently sufficient overall treatment plant capacity at the Woodward Ave. WTP to support the timing of the AEGD development. The water distribution system currently has sufficient transmission and distribution capacity to support Stage 1 of the AEGD. The current City of Hamilton Master Plan has planned upgrades to the Pressure District PD5 pumping station and new feedermain on the escarpment to support development as a whole on the Hamilton Mountain and buildout of the AEGD Secondary Plan Area.

For water storage to the AEGD, PD6 storage will continue to be pumped. There is sufficient storage to support both Phases of the AEGD growth in PD6. It is recommended that the future elevated storage for PD18 be in service for Phase 2 to provide improved operational benefit.

For wastewater servicing, there is not currently sufficient overall treatment capacity at the Woodward Ave WWTP to support buildout of the AEGD development. However, the City is

currently implementing the construction program to achieve 2031 treatment capacity in 2014. Once the WWTP upgrades are complete, there will be sufficient capacity to allow all Phases of the AEGD Secondary Plan Area to proceed.

In order to consider allowing Phase 1 of the AEGD Secondary Plan Area to proceed prior to the completion of the Woodward Ave WWTP upgrades, additional monitoring of existing average and peak flows to the plant would need to be undertaken. In addition, monitoring of already committed development through the City's Staging of Development plan would also need to be undertaken. However, based on the requirements and duration of the planning process for the AEGD, the rate for construction of the development and ultimate timing for occupancy, it is anticipated that the overall schedule may coincide with the WWTP commissioning of the new upgrades.

For the wastewater collection system, only the Twenty Road SPS requires upgrades to support Phase 1 of the AEGD Secondary Plan Area. The balance of the existing sewers and pumping stations has sufficient capacity to support Phase 1. However, development within Phase 2 of the AEGD is dependent on the Dickenson/Centennial trunk sewer infrastructure being in service.

In addition, it is anticipated that the construction of the AEGD watermains and sewers will be coordinated with the road works and overall timing of development in the area.

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Appendices

Appendix A	AEGD Phase I Report	(Under Separate Cover)
Appendix B	Public Consultation Document	(Under Separate Cover)

1.0 Introduction

1.1 Background

In 2006, the City of Hamilton completed the Growth Related Integrated Development Study (GRIDS) planning process in conjunction with the City of Hamilton Water and Wastewater Master Plan. These planning documents set out the Population and Employment targets and presented the major water and wastewater infrastructure projects throughout the City up to the year 2031. One major employment growth area that was identified was the existing agricultural lands surrounding the John C. Munroe Hamilton International Airport to the south, north and west. The Airport Employment Growth District (AEGD) will set out to provide approximately 759 net hectares of employment land and 28,097 new jobs (including Urban Area Expansion and Existing Airport Business Park) in the south Hamilton Mountain / Mount Hope area by year 2031.

The 2006 City of Hamilton Water and Wastewater Master Plan set out the overall servicing strategies for all the City's growth areas. Included in these strategies were the trunk infrastructure requirements to service the AEGD.

This current planning process for the AEGD provides opportunity to review the servicing strategies in detail to ensure sustainable, flexible and implementable solutions are developed and evaluated under a public Master Planning process.

1.2 Master Plan Goals and Objectives

The approach and goals of the AEGD Master Planning process are as follows:

- Review existing servicing conditions in the AEGD and neighbouring systems
- Confirm servicing principles and criteria to be used for alternative development and evaluation
- Complete and document the study and selection of the preferred solutions within the Class Environmental Assessment process for Water and Wastewater Master Plans
- Develop sound water and wastewater servicing strategies which are cost effective, optimize existing infrastructure, minimize impact to or enhance the natural, social and economic environments, and meet the technical service requirements

In completing this approach, key objectives to be satisfied include:

- Develop several options for servicing
- Evaluate the servicing options against environmental and technical criteria
- Establish preferred long-term servicing strategies to meet the servicing needs of the existing system and approved growth
- Complete the process with extensive public and agency participation
- Clearly identify the needed water and wastewater infrastructure and detail the capital plan.

1.3 Master Plan Report Outline

This Report contains the following sections:

- 1.0 Introduction and Background – provision of relevant information leading to the initiation of this study
- 2.0 Master Planning Process – description of the Class EA Master Planning process
- 3.0 Problem/Opportunity Statement – definition of the problem/opportunity needing to be addressed under this study and presentation of baseline planning information
- 4.0 Master Plan Methodologies – description of the approach, specific tasks and relevant background information unique to the completion of the AEGD Water and Wastewater Master Plan
- 5.0 Existing Conditions – description of the natural and social environments within the AEGD
- 6.0 Planning Scenarios – description of the preferred growth option
- 7.0 Phasing Options – description and selection of preferred growth phasing within the AEGD

Water

- 8.0 Existing Water System – description of the existing water system and trunk infrastructure
- 9.0 Water Design Criteria – definition of the design criteria used for the water system
- 10.0 Description and Evaluation of Water Servicing Options – presentation and evaluation of water servicing options

Wastewater

- 11.0 Existing Wastewater System – description of the existing wastewater system and trunk infrastructure
- 12.0 Wastewater Design Criteria – definition of the design criteria used for the wastewater system
- 13.0 Description and Evaluation of Wastewater Servicing Options – presentation and evaluation of wastewater servicing options

Summary

- 14.0 Preferred Servicing Solution – description of the preferred water and wastewater servicing strategies and implementation summary

2.0 Master Planning Process

The Municipal Class Environmental Assessment process, identified in Figure 1, has generally been followed for the AEGD Water and Wastewater Master Plan Study. The study has been carried out according to the guidelines set out in A.2.7 Master Plans of the Municipal Engineers Association (MEA) Class Environmental Assessment.

Approach #2 of the Master Planning process from the Municipal Engineers Association (MEA) document was used as a guide for the AEGD Water and Wastewater Master Plan Study. This process is well suited to long range planning for a significant geographical area, such as the AEGD. Approach #2 is appropriate for the preparation of a comprehensive amendment to the official plan as is the case for the AEGD, accompanied by master plans for transportation and stormwater. The simultaneous preparation of these planning documents can reduce the social, environmental and economical impacts of the preferred alternatives, as land use is finalized through the secondary planning process. This was a well-suited planning approach for the overall AEGD Study.

The use of Approach #2 for the preparation of the AEGD Water and Wastewater Master Plan provides a broad context for need and justification. The assessment within the master plan satisfies Phases 1 and 2 of the Class EA process for Schedule B projects identified within the Water and Wastewater Master Plan and will support, in addition, Phases 3 and 4 for any Schedule C projects. Additional details of the Class EA process is provided in the subsequent sections.

This Water and Wastewater Master Plan Report has been prepared to document the process followed and the recommendations made for the future water and wastewater systems.

2.1 Class Environmental Assessment Process

“Class” Environmental Assessments (Class EAs) were approved by the Minister of the Environment in 1987 for municipal projects having predictable and mitigable impacts. The municipal Class EAs were revised and updated in 1993, 2000 and 2007. The Class EA approach streamlines the planning and approvals process for municipal projects which have the following characteristics:

- Recurring

- Similar in nature
- Usually limited in scale
- Predictable range of environmental impacts
- Responsive to mitigation.

The Municipal Class Environmental Assessment, prepared by the Municipal Engineers Association (October 2000 as amended in 2007), outlines the procedures to be followed to satisfy EA requirements for water, wastewater, road and transit 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:

- Schedule A - minor, operational and maintenance activities and are approved without the need for further assessment.
- Schedule A+ - also pre-approved with public notification prior to project implementation.
- Schedule B - require a screening of alternatives for their environmental impacts and Phases 1 and 2 of the planning process must be completed.

- Schedule C - must satisfy all five phases of the Class EA planning process. These projects have the potential for greater environmental impacts. Phase 3 involves the assessment of alternative methods of carrying out the project, as well as public consultation of the preferred conceptual design. Phase 4 includes the preparation of an Environmental Study Report which is filed for public review. Provided no requests for “bump-up” to an Individual Environmental Assessment are received, Schedule C projects are then approved and may proceed directly to implementation.

The Municipal Class EA process includes an appeal provision to change the status of a project from being subject to the Municipal Class EA process to being subject to an individual EA as per Part II of the EA Act.

If a concern is not resolved through discussions with the City of Hamilton (proponent), then members of the public, interest groups and review agencies may request the Minister of the Environment to require the proponent to comply with Part II of the EA Act (addresses individual EAs), before proceeding with the proposed undertaking. The Minister determines whether or not this is necessary, and the decision is final.

If no Part II Order requests are outstanding by the completion of the review period, the project is considered to have met the requirements of the Class EA and the proponent may proceed to Phase 5 and implementation of the project.

The Class EA process flowchart is provided in Figure 1.

This AEGD Master Plan is being completed under Approach 2 for Master Plans as outlined in the MEA document. This approach is based on coordinating the Master Planning process with the secondary planning process. This approach satisfies Phases 1 and 2 of the Class EA process.

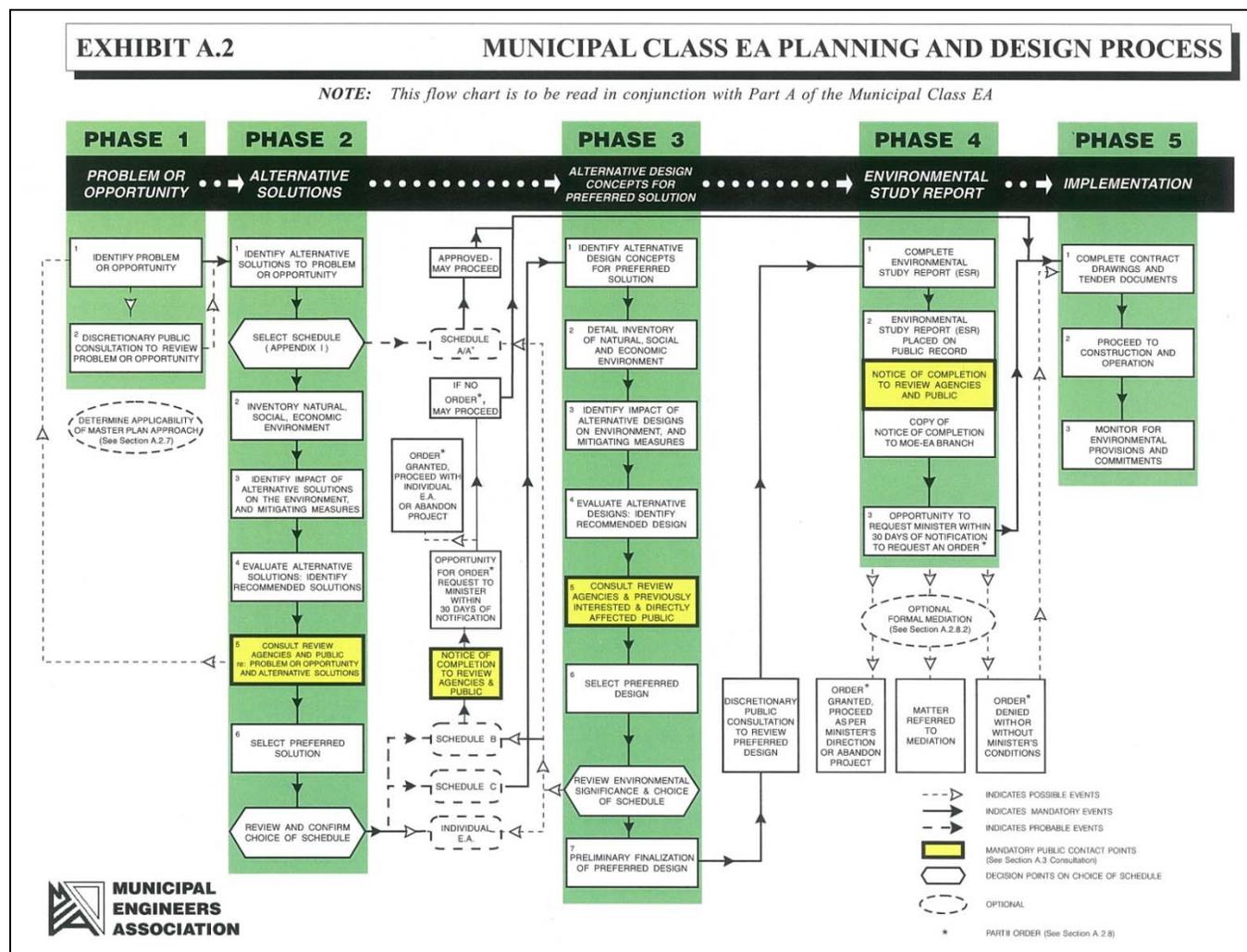


Figure 1 Master Plan Class EA Process

2.1.1 Consultation and Communication

Public consultation and communication is integral to the secondary planning process. The Master Planning consultation component was equally integrated into the overall secondary planning process consultation and communication program. The activities that were undertaken as part of the process are described in the following sections and are considered critical and required under the Class EA Master Planning process. As part of this study, a separate, stand-alone Public Consultation document was created entitled, "Hamilton Airport Employment Growth District Public and Agency Consultation Report". This document contains all relevant public consultation information and documentation pertaining to the AEGD Study.

2.1.2 Public Access to Information

At the onset of the project, the City developed a website (www.aegd.ca), where all project publications, presentation materials and other documentation has been made available to the general public. Notices of upcoming Public Information Centres (PICs) and other project milestones were also posted on this website.

For those without Internet access, the City also maintained a Contact List, and sent relevant project materials to all who had expressed interest in the process.

2.1.3 Public Information Centres

The AEGD secondary planning process and Master Plan process have proceeded under two (2) distinct phases matching the Class EA process. Phase 1 established the baseline conditions and problem statement. Phase 2 has worked through the development and evaluation of options. Public Information Centres (PICs) were held in Phase 1 at locations in the AEGD as well as downtown. Similarly, three rounds of PICs were held in Phase 2 also at locations in the AEGD as well as downtown.

- Round 1: Phase I PIC: May 21, 2008
Phase I PIC: May 27, 2008
- Round 2: Phase II PIC: May 25, 2009
Phase II PIC: May 26, 2009
Phase II PIC: October 5, 2009 (updated strategy information)
Phase II PIC: October 6, 2009 (updated strategy information)
- Round 3: Phase II PIC: July 15, 2010 (final strategy and land use presentation)
Phase II PIC: August 3, 2010 (final strategy and land use presentation)
Phase II PIC: August 10, 2010 (final strategy and land use presentation)
Phase II PIC: September 8, 2010 (final strategy and land use presentation)

2.1.4 Stakeholder Workshops – Community Liaison Committee

In addition to the public consultation and communication plan, a community liaison committee (CLC) was struck and utilized throughout the AEGD secondary planning process. The

committee comprised of local residents and business owners, rate payer groups, City staff, City councilors and consultants and provided a good cross section of interested stakeholders to review project progress and decision making. The CLC met regularly throughout Phases 1 and 2 and provided feedback through to selection of the preferred land use plan and servicing strategies.

3.0 Problem/Opportunity Statement

3.1 Study Area

Through the 2006 City of Hamilton Water and Wastewater Master Plan and GRIDS planning process, the areas surrounding the John C Munroe Hamilton International Airport were designated as future employment areas. This area is bounded by Fiddler's Green Rd to the west, Carluke Rd E, White Church Rd and Airport Rd in the south, Upper James St / Homestead Dr to the east and Twenty Rd, Glanaster Rd and Garner Rd in the north.

In order to accommodate the projected 2031 employment targets, the AEGD development area to 2031 is shown in Figure 2 and is depicted by the Urban Boundary border.

The local service area for the AEGD Master Plan similarly comprises the lands as outlined above. However, review of servicing impacts on the existing systems is a critical component of this analysis. As such, the existing lake-based water and wastewater systems and service area from the treatment plants to the AEGD were also included in the study area.

As noted above, the previous AEGD land area has been reduced. Under the 2006 City of Hamilton Water and Wastewater Master Plan, the trunk servicing strategies were developed for the full boundary of the AEGD; shown in Figure 2 as Secondary Plan Area. At that time, it was anticipated that the 2031 growth would require the full land area. Through further analysis under the AEGD secondary plan, higher density employment targets and detailed land evaluation determined that a smaller land area was required to meet the 2031 growth targets. This allowed for the potential for additional employment lands, still within the original boundary, to support growth beyond 2031.

The AEGD Master Plan for water and wastewater servicing will focus on the servicing strategies for the 2031 Secondary Plan Area requirements. However, consideration and impact for servicing the Additional Study Area was also reviewed.

3.2 Problem/Opportunity Statement

The purpose of the Problem/Opportunity Statement is to define the principal starting point in the undertaking of the Master Plan Class EA and assist in defining the scope of the project.

As such, the Problem/Opportunity Statement has been defined as:

- The Province, through its Places to Grow document, has identified the need to accommodate growth within the City of Hamilton. Through the GRIDS process, a significant portion of the employment growth has been designated to areas within the AEGD boundary.
- Water and wastewater infrastructure will be required to service these future employment lands.
- The new infrastructure within the AEGD boundary as well as upgrades to the existing systems needs to be identified.



Hamilton

Hamilton AEGD Study

Figure 2
Study Area

Legend

-  Airport Boundary
-  Recommended 2031 Urban Boundary
-  Secondary Plan Boundary
-  Additional Study Area
-  Council Directed Additional Lands



Map Created By: MZ
Map Checked By: CH
Date Created: Sept 22, 2009
Date Modified: Feb 1, 2011

4.0 Master Plan Methodologies

4.1 Overview

Under any Master Plan, the methodology for analyzing planning information, developing water demands and wastewater flows and modelling the systems needs to be developed to best serve the proponent.

4.2 Employment Data

The City of Hamilton Master Plan utilized planning data developed through the GRIDS process to establish the servicing requirements. This data was further reviewed and referenced during the AEGD Master Planning process.

The detailed analysis of land use requirements, densities and distribution of employment within the AEGD was undertaken by the project team under the secondary planning process. This detailed employment data was used as the basis for the servicing analysis. Ultimately, the AEGD boundary was delineated into various land use blocks. For each block, the employment density was developed. This provided the opportunity to allocate the employment within smaller land use blocks across the full AEGD boundary.

From the land use analysis, the AEGD lands support approximately 24,376 employees in the AEGD Expanded Urban Area plus an additional 3,720 employees in the Existing Airport Business Park Urban Area resulting in a total of 28,097 employees.

The AEGD Secondary Plan developed the employment density for the development area based on anticipated land use, typical airport related employment uses and in conformity with Places to Grow and the overall City growth projections. As such, the employment densities for AEGD are 20 emp/net ha for Light Industrial, 36 emp/net ha for Airside Industrial, 39 emp/net ha for Prestige Business Park, and 81 emp/net ha for Airport Related Business. It should be noted that these densities differ from typical City standards for employment areas of up to 125 employees/ha. This variance is consistent with the Master Plan and GRIDS process and is applicable to the AEGD growth area only.

4.3 Water and Wastewater System Models

Analysis of the infrastructure requirements for this Master Plan was undertaken utilizing updated versions of the computerized water and wastewater models that were previously used in the 2006 City of Hamilton Water and Wastewater Master Plan.

4.3.1 Water Model

The base City of Hamilton water model was developed and updated by the City and through the City-wide Master Plan process. The water model was developed in the WaterGEMS software supplied by Haestad Methods/Bentley. The base model includes all pumping stations, reservoirs, elevated tanks, valves and the existing watermains. The model is a skeletonized network consisting generally of watermains larger than 200 mm diameter with some smaller watermains included for connectivity. The AEGD servicing options were developed as full pipe scenarios within the AEGD boundary and added to the City-wide and Master Plan model. The modeling tool was utilized to simulate levels of service under ranging conditions including minimum flow, average flow, max day flow, peak hour flow and with fire flows.

4.3.2 Wastewater Model

Similarly, the base wastewater model was developed and updated by the City and through the City-wide Master Plan process. The software package was MOUSE, by DHI, and provides for detailed wet weather flow simulations. The base model includes all of the sewage pumping stations and the main trunk infrastructure. Within the separated sewer system (SSS), the trunk sewers were generally defined as any pipe having a diameter of 300 mm and greater. Within the combined sewer system, the trunk sewers were generally defined as any pipe having a diameter of 600 mm and greater.

Full pipe scenarios were run to confirm capacities of existing infrastructure surrounding the AEGD within the City-wide model. Additional sanitary sewer spreadsheet models, matching City standards, were used to confirm capacities of the proposed infrastructure.

4.4 Evaluation Criteria

Information on each of the servicing options was developed to enable a comparative evaluation of impacts, and selection of a preferred option. The factors considered generally matched the Triple Bottom Line (TBL) evaluation approach previously approved for GRIDS. Each alternative was evaluated to determine the level of impact and mitigation required for each of the:

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

5.0 Existing Conditions

A full description of the existing conditions in the study area including natural environment, social environment and existing/neighbouring land uses is documented in Phase 1 of the AEGD secondary planning process under the AEGD Secondary Plan Phase 1 Land Use Report. This report can be found attached as Appendix A.

The existing servicing conditions were also documented in Phase 1 of the process under the AEGD Secondary Plan Phase 1 Infrastructure Report. The existing servicing conditions are further detailed in the subsequent sections of this report.

6.0 Planning Scenarios

6.1 Secondary Plan Area

Employment growth within the AEGD urban boundary expansion was estimated through the GRIDS process to total approximately 24,376 employees with an additional 3,720 employees allocated to the Existing Airport Business Park (within the urban boundary). This quantity of employees spread throughout the service area with an average density of 37 jobs/ha would require approximately 702 net hectares (or 878 gross hectares) of new developable land. The land use analysis that was described previously in this report shows that there exists significantly more developable land than required within the AEGD boundary in order to meet the projected 2031 GRIDS target. Since the 2031 GRIDS employment growth target can be met with only 702 net hectares, there are approximately 471 hectares of additional net developable land within the original AEGD boundary that will be designated Additional Study Area.

In addition to employment growth within the Secondary Plan Area, two separate, Council Directed Additional Areas have been identified in this study for potential growth and are to be included in the infrastructure servicing plan.

The Smith Farm area is bounded by Southcote Rd on the west, Smith Rd on the East, the Airport Boundary to the south and future road alignment to the north. It will be divided into 15.37 ha of Airside Industrial and 6.40 ha of Prestige Business Park.

The Ancaster Christian Reform Church is located in the northwest corner of the AEGD Study Area at the southeast corner of Garner Rd and Fiddler's Green Rd. This area will consist of 15.8 ha of Prestige Business Park.

7.0 Phasing Options

The preferred Growth area provides 702 net hectares (approximately 24,376 employees) of new employment area to be developed and serviced within the Secondary Plan Area of the AEGD to 2031. A growth area of this magnitude will require separate, progressive phases of development in order to ensure that the land is developed in a logical and effective manner. When determining the location of the preliminary phase of growth, many factors were considered:

- Proximity to existing water and wastewater infrastructure
- Maximizing the available capacity within existing water and wastewater infrastructure
- Incorporating all land use types
- Minimizing initial servicing costs
- Developing logical gateways/entrances to the AEGD

A significant factor in determining phasing is the wastewater servicing strategies and ability to maximize gravity service areas and minimize new infrastructure. With no existing wastewater infrastructure in the central areas of the AEGD, there is potential that wastewater servicing limitations may dictate that logical employment development will move inward from areas of existing servicing, extending the infrastructure as growth progresses into the AEGD.

In order to determine the optimum phasing for the AEGD, four (4) options were developed:

1. Servicing of “gateway” areas at the boundary
2. Nodes and Corridors
3. Airport focused
4. Modified servicing of “gateway” areas at the boundary

7.1 Phasing Option 1

Phasing Option 1 focuses initial growth areas in the north (Garner Rd and Glancaster Rd), northeast (Twenty Rd and Upper James St) and south (Airport Rd) corners of the AEGD. This strategy satisfies the majority of the factors listed above; however, it does not provide initial growth at the Hwy 6 and Garner Rd intersection. Preliminary development at this junction could be advantageous as a visible, high profile gateway to the AEGD.

7.2 Phasing Option 2

Phasing Option 2 focuses initial growth areas in nodes (Hwy 6 & Garner Rd, Twenty Rd & Upper James St and Airport Rd) and corridors (Twenty Rd, Dickenson Rd). The initial growth could take place in major intersections and roads, followed by development filling in outward from these areas. This strategy satisfies most of the phasing considerations; however, extensive infrastructure would be required to develop the corridors created along Twenty Rd and Dickenson Rd.

7.3 Phasing Option 3

Phasing Option 3 focuses initial growth areas around the airport with subsequent future development moving outwards to the rest of the study area. This Phasing Option does not include a good balance of land use types nor does it maximize any existing sanitary sewer infrastructure. Significant sanitary sewer infrastructure will be required to begin development, rendering this option relatively unfeasible.

7.4 Phasing Option 4

Phasing Option 4 focuses initial growth areas in the northwest (Garner Rd and Hwy 6), northeast (Twenty Rd and Upper James St) and south (Airport Rd) corners of the AEGD. This strategy is similar to Phasing Option 1 in that it satisfies the majority of the factors listed above. Phasing Option 4, however, provides a section of initial growth at the Garner Rd /Hwy 6 intersection, which can be a beneficial location for a gateway to the AEGD and would be ideally suited for preliminary development.

7.5 Preferred Phasing Option

Phasing Option 4 was chosen as the preferred option because it will provide an occupied and visible gateway to three separate corners of the AEGD. It will provide a balance of different land use types available in the initial servicing phase and allow staged development to progress from the corners of the AEGD inwards with the logical extension of infrastructure. This option will also require minimal short term servicing costs which will facilitate initial development.

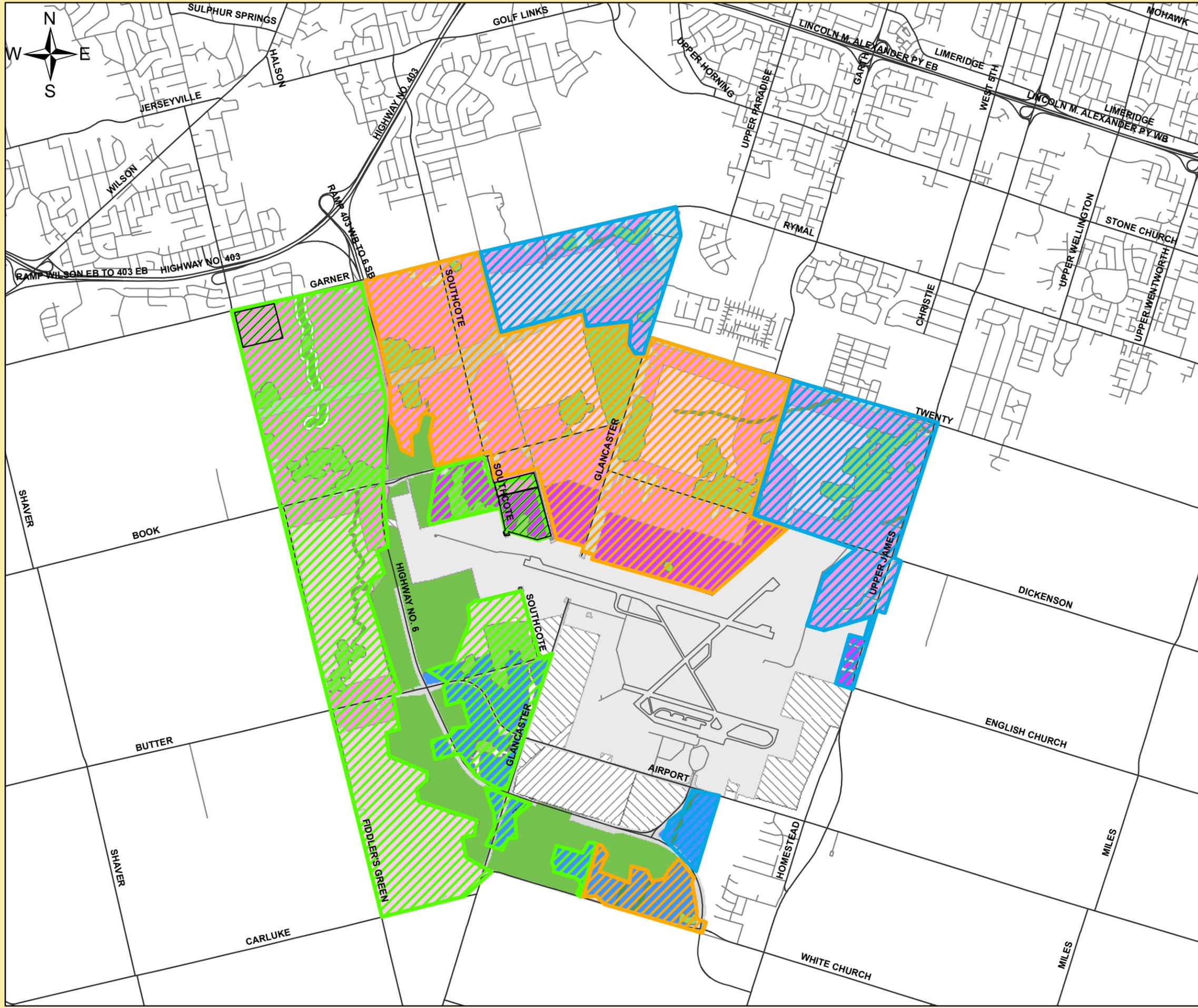
The four Phasing Options can be seen in Figure 3 to Figure 6.

Based on Option 4, two phases of growth were established:

Phase 1 – Areas at the gateways to the AEGD intend to be developed first;

Phase 2 – internal areas intend to be developed subsequent to Phase 1.

Notwithstanding this phasing analysis, there may be potential/interest for other areas within the Secondary Plan Area to be accelerated within the development program. The framework of the analysis contained within this report provides comment with respect to available servicing capacity. There may be available capacity for other variations of Servicing Phase I. These other potential areas would need to be checked against available infrastructure capacity and logical extensions of the water and wastewater systems.



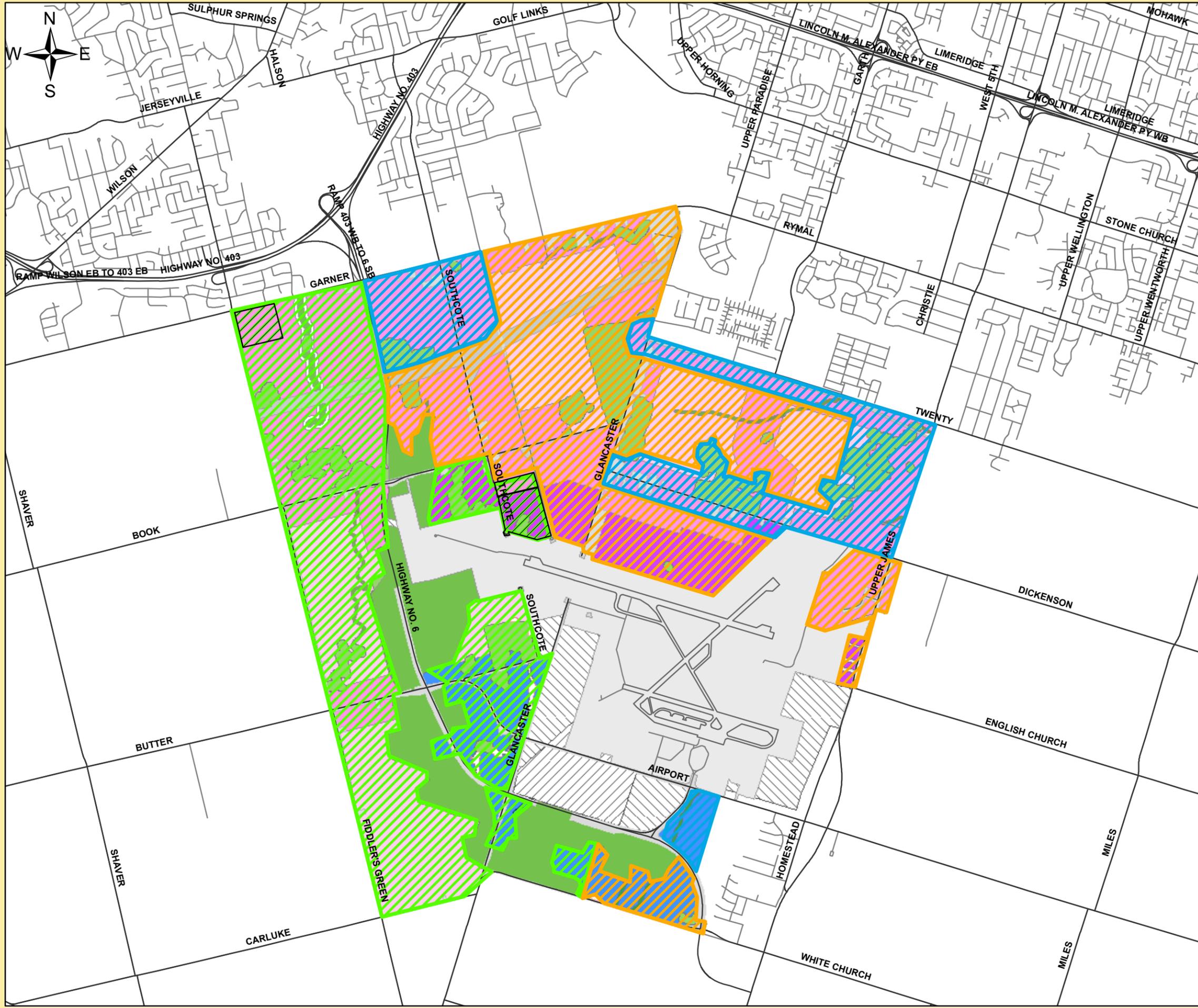
Hamilton

Hamilton AEGD Study

Figure 3 Phasing Option I

Legend

-  PO I - Servicing Phase 1
-  PO I - Servicing Phase 2
-  PO I - Additional Study Area
-  Roads
-  AI: Airside Industrial
-  ARB: Airport Related Business
-  IND: Light Industrial
-  PBP: Prestige Business Park
-  Council Directed Additional Lands



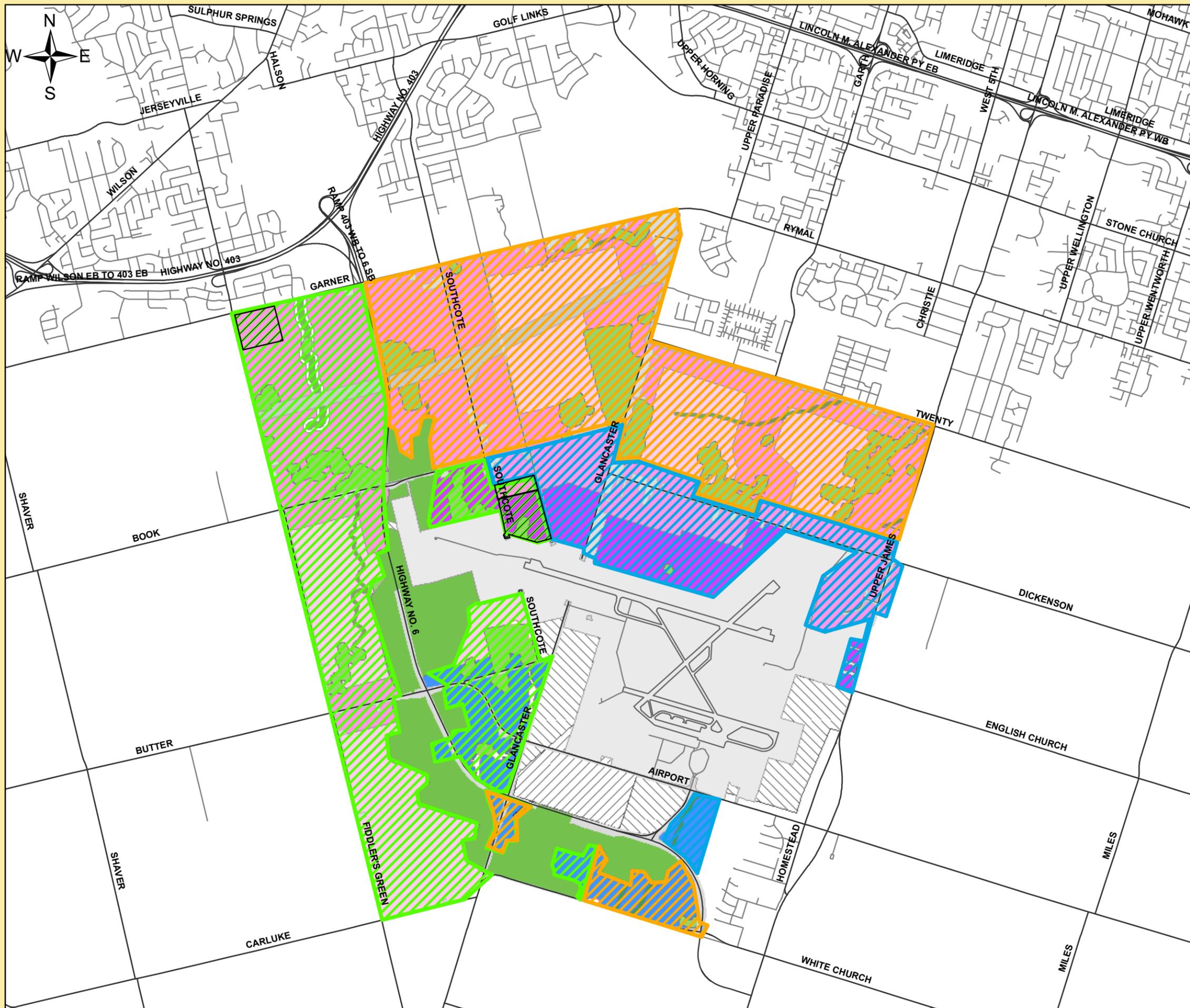
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Hamilton AEGD Study

Figure 4 Phasing Option II

Legend

-  PO II - Servicing Phase 1
-  PO II - Servicing Phase 2
-  PO II - Additional Study Area
-  Roads
-  AI: Airside Industrial
-  ARB: Airport Related Business
-  IND: Light Industrial
-  PBP: Prestige Business Park
-  Council Directed Additional Lands



Hamilton

Hamilton AEGD Study

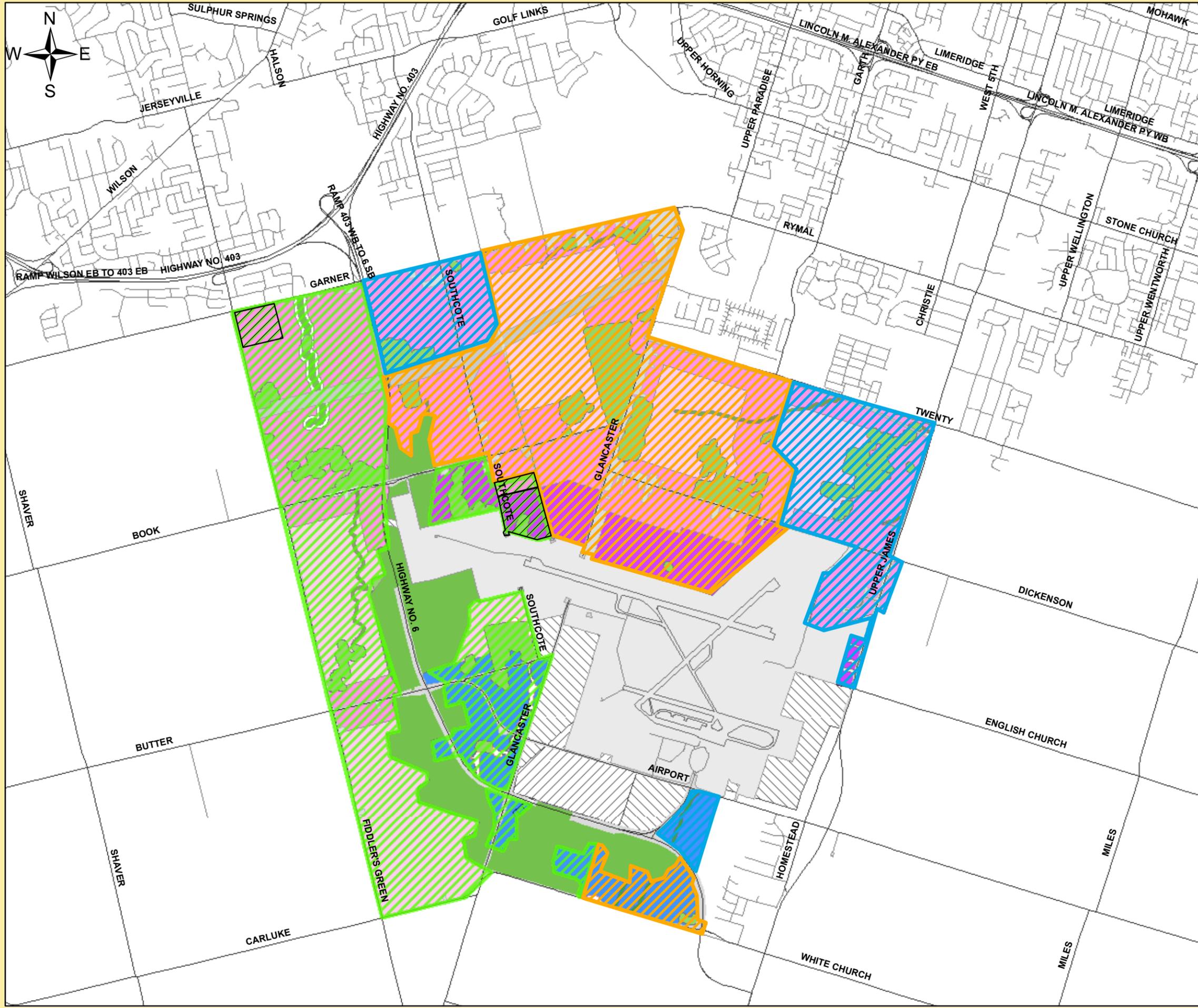
Figure 5 Phasing Option III

Legend

-  PO III - Servicing Phase 1
-  PO III - Servicing Phase 2
-  PO III - Additional Study Area
-  Roads
-  AI: Airside Industrial
-  ARB: Airport Related Business
-  IND: Light Industrial
-  PBP: Prestige Business Park
-  Council Directed Additional Lands



Map Created By: MZ
 Map Checked By: CH
 Date Created: Sept 22, 2009
 Date Modified: Feb 2, 2011



Hamilton

Hamilton AEGD Study

Figure 6 Phasing Option IV

Legend

-  P.O.IV - Servicing Phase 1
-  P.O.IV - Servicing Phase 2
-  P.O. IV- Additional Study Area
-  Roads
-  AI: Airside Industrial
-  ARB: Airport Related Business
-  IND:Light Industrial
-  PBP: Prestige Business Park
-  Council Directed Additional Lands

WATER SERVICING

8.0 Existing Water System

Drinking water is currently treated at the Woodward Ave Water Treatment Plant located on Woodward Ave North in the City of Hamilton. Treated water is supplied to the AEGD and Hamilton Mountain by being pumped up the escarpment by two trunk feeder mains; a 1,050 mm pipe near Upper Ottawa St and a 1,500 / 1,200 mm pipe near Greenhill Ave. Servicing for the AEGD area is provided by two different pressure districts; Pressure District 18 (PD18) and Pressure District 6 (PD6). Additional water system details can be found in the Water and Wastewater Infrastructure Phase 1 report in Appendix A

8.1 Pressure District PD18

Pressure District 18 is generally made up of the former Town of Ancaster and services areas within the ground elevations of approximately 220 m and 260 m. This pressure district is fed via separate 400 mm and 750 mm pipes on Garner Rd via Pumping Station HD018 and Reservoir HDR18 located near the intersection of Garner Rd and Glancaster Rd. These water mains on Garner Rd are the main feeds for the northwest PD 18 area within the AEGD.

8.2 Pressure District PD6

Pressure District 6 consists of areas within the south Hamilton Mountain, the Hamilton International Airport itself and Haldimand County with ground elevations ranging from approximately 205 m to 240 m.

PD6 is serviced by pumping station HD06A in the west on Stone Church Rd and Garth St and HD06B in the east located at Stone Church Rd and Turnbridge Cres. These stations operate together to provide servicing for the Pressure District. There are several existing PD6 water mains that surround and traverse the AEGD and provide servicing for the area. A 600 mm watermain runs along Glancaster Rd from Twenty Rd, under runway 12-30, and continues along Glancaster Rd to Airport Rd where it connects to a 500 mm watermain. This 500 mm watermain runs east on Airport Rd to the Airport entrance where it joins a 400 mm pipe that continues east to Upper James St and north on Homestead Dr / Upper James St to Twenty Rd. An existing 300 mm watermain runs from Twenty Rd to Sunibel Dr then increases to a 400 mm to Garth St. From Garth St, a 300 mm and 600 mm watermain continue to Glancaster Rd. Along Glancaster Rd a 200 mm watermain runs from the Airport boundary to Rymal Rd. At the

southern end of the AEGD, a 500 mm watermain travels on Homestead Dr / Upper James St from Airport Rd to Haldibrook Rd with a parallel 300 mm watermain from Airport Rd to White Church Rd.

9.0 Water Design Criteria

9.1 Unit Water Demand Criteria

The 2006 City of Hamilton Water and Wastewater Master Plan developed water demand criteria using actual consumption data through billing records. Peaking factors were developed using actual production data from supply/pump/storage facilities. Unique consumption rates were observed for residential and employment users in each local municipality. However, for the purposes of long term infrastructure planning, overall residential and employment usage rates were established based on the historical data. Table 1 shows the water design criteria used for the analysis.

Table 1 Water Design Criteria

Criteria	Value
Average Day Residential Consumption (Secondary Plan Level)	360 L/cap/d
Average Day Employment Consumption	260 L/emp/d
Maximum Day Factor	1.9
Peak Hour Factor	3.0

This criteria is being utilized uniquely for the AEGD service area only for conformance with the Master Plan and overall GRIDS process. As noted previously, the employment criteria is consistent with the anticipated type of employment designated within the AEGD.

As part of the AEGD Water and Wastewater Servicing Master Plan, water consumption for five employment areas across the city were identified and reviewed. These areas included: East Hamilton between Barton St and the QEW, southwest Clappison's Corners, Ancaster Business Park at Wilson St W and Garner Rd W, Upper James St between the Lincoln Alexander Pkwy and Rymal Rd and the Meadowlands along Golf Links Rd. Billing data from 2006 to 2009 for these employment areas was reviewed and analyzed. Our analysis validated and confirmed that the existing employment criteria is accurate and applicable for use in the AEGD analysis.

In addition to planning for the base flows generated by the recommended AEGD employment densities, consideration was also given to the risk of higher flow generating uses (Hotels, Conference Centres, etc) within the Airport Related Business area as well as customer driven flows within the Employment Supportive Centres. This sensitivity analysis did not result in the need to increase the criteria and flows.

9.2 Eco-Industrial Considerations

The potential for reduction of the water consumption criteria was reviewed through this study by the project team. Current trends towards water conservation and wastewater reduction along with numerous successful case studies around the world have made water efficiency and conservation an important aspect of this study. The analysis conducted by the project team indicated that future water demands have the potential to be reduced through various site-specific measures. However, there has been no demonstration of area wide reduction of water consumption which would warrant a reduction in design criteria. There may be opportunity for water demand reduction on a site by site basis only as the service areas develops over time. While reduction and conservation measures will continue to be encouraged across the City, projecting reduced water demands and planning infrastructure on that basis may cause risk to the system security.

9.3 Future Airport Demand

Given that the airport is located within the AEGD, flows within the airport boundary needed to be considered. Recent readings from airport water meters were taken in order to determine the current water demand and in order to estimate the future water demands. For the period of July 2008 to July 2009, which represents the current traffic of approximately 550,000 passengers/year, the total average daily water use was less than 0.15 ML/d. Long term detailed planning within the airport itself has not yet been finalized; however, the projected ultimate size is estimated to be approximately 9.5 million passengers per year. Analysis was conducted that examined the water consumption of comparable airports around the world in order to establish approximate design criteria that would be applicable to the Hamilton International Airport. The upper range of water demand that was observed ranged from 30 – 33 L/passenger. This consumption criteria yields an estimated ultimate peak hourly water demand of approximately 2.4 – 2.6 ML/d for the airport and immediate surrounding uses.

9.4 Water Infrastructure Unit Costs.

For the purposes of the AEGD Water and Wastewater Servicing Master Plan, the watermain projects were based on linear unit costs approved through the 2009 Development Charges Update. The Development Charges Update broke out urban versus rural costs per metre of constructed pipe. Because the AEGD consists primarily of new development and also due to anticipated timing of infrastructure installation in coordination with road work and sewer installation, the Greenfield unit cost was applied in most cases. However, stand alone projects may require increased budget. Where applicable, the preliminary analysis of infrastructure depths and major crossings was performed in order to determine any necessary additional costs. The unit cost for linear water projects, including valves, appurtenances and restoration can be found in Table 2.

Table 2 Linear Watermain Unit Costs

	2009 \$/m	
	Greenfield	Urban
100 mm	166	524
150 mm	199	564
200 mm	232	604
300 mm	398	770
400 mm	664	1,095
500 mm	783	1,228
600 mm	1,022	1,527
750 mm	1,447	1,965
900 mm	1,726	2,044
1050 mm	2,164	2,535
1200 mm	2,469	2,854
1350 mm	3,558	3,996
1500 mm	3,956	4,420
1650 mm	4,473	4,925

Source: 2009 City of Hamilton Water and Wastewater Development Charges Update. Unit costs include restoration and appurtenances (Valves, Chambers, Hydrants, Blow-offs, Manholes, etc)

10.0 Description and Evaluation of Water Servicing Options

The 2006 City of Hamilton Water & Wastewater Master Plan recommended a high-level water strategy to service the 2031 GRIDS employment growth numbers within the AEGD. This strategy, which was mainly trunk infrastructure focused, planned to provide water to the service area through two pressure districts; PD18 and PD06. The major infrastructure required for this area consisted of a 7 ML, PD18 elevated tank which was required to service the existing and future growth in Ancaster and, in addition, would provide storage for the PD18 areas within the AEGD boundary. Also recommended was a 12.2 km, 400 mm PD06 trunk watermain from the existing HD018 pumping station on Garner Rd to the intersection of White Church Rd and Upper James St. The overall strategy for servicing the AEGD was to maximize the PD06 service area and minimize the PD018 service area. This would avoid upgrades to the HD018 pumping station and make the best use of the substantial capacity of the HD06A pumping station.

The water servicing options introduced through the AEGD Water and Wastewater Servicing Master Plan were developed using a more refined and detailed approach than the previous 2006 City of Hamilton Water and Wastewater Master Plan. The overall trunk strategy was refined and local detailed servicing was created. Separate options were developed that will maximize the use of available capacity within existing infrastructure, while remaining consistent with Master Plan's overall servicing strategy.

Generally, the overall objectives for the Water Servicing Options are:

- Provide a high level of service to growth areas while minimizing impacts to existing users
- Provide security of supply
- Review and mitigate impacts to natural, social and economic environments
- Best meet policy statements
- Ensure servicing meets technical criteria
- Optimize use of existing infrastructure
- Ensure strategies are cost-effective
- Where possible, remain consistent with 2006 Master Plan approved strategy

In total, three water servicing options were developed:

- Option A – Maximized PD18 Servicing
- Option B – Maximized PD6 Servicing
- Option C – Split PD6/PD18

The three options are depicted at the end of this section in Figure 7 to Figure 9.

10.1 Option A - Maximized PD18 Servicing

The overall strategy for water servicing Option A is to maximize the Pressure District 18 service area. Under Option A, the PD18 area will generally consist of all lands within the AEGD to the west of Glanaster Rd between elevations of approximately 220 m and 250 m. The PD6 areas will lie east of Glanaster Rd and have elevations ranging from approximately 220 m to 240 m. There are currently PD18 service areas as well as existing water infrastructure in Ancaster along Garner Rd which would provide an opportunity to extend servicing into the AEGD growth areas to the south.

PD6

PD 6 will be limited to areas east of Glanaster Rd and will be serviced by watermains fed from pumping station HD06B. These will consist of a 400 mm trunk watermain running south and west along the Garth St Extension to Dickenson Rd and a network of looped 300 mm watermains along the existing and future AEGD road alignments. Areas within PD6 at the southern limits of the AEGD will be fed off the existing 300 mm and 400 mm watermains on Airport Rd and White Church Rd.

PD18

Water servicing for PD18 will be provided by a 400 mm trunk watermain running south along Southcote Rd to Book Rd, west on Book Rd to the western boundary of the Secondary Plan Area. A network of looped 300 mm watermains will follow the AEGD road alignments and will provide internal servicing for the area. The new growth areas within PD18 will be fed by the Pressure District 18 pumping station, HD018 which, under this option, will require upgrades in order to meet the proposed water demands. In addition to the pumping station upgrades, a new PD18 elevated storage facility will be required to service existing PD18 in Ancaster as well as

the PD18 growth areas in the AEGD. This elevated tank will provide operational flexibility as well as floating storage within the Pressure District.

10.1.1 Servicing Phase 1

Servicing Phase 1 areas will be serviced by branches from existing watermains throughout the three initial growth areas. The northwest PD18 Servicing Phase 1 area will connect to the existing 400 mm watermain on Garner Rd with a 300 mm watermain on a new road alignment and a 400 mm watermain on Southcote Rd. The northeast PD6 Servicing Phase 1 area will connect 300 mm watermains to the existing 300 mm and 400 mm pipes on Dickenson Rd, Twenty Rd and Upper James St. The southern PD 6 Servicing Phase 1 area will connect to an existing 300 mm and 400 mm watermains on Provident Way and Airport Rd, respectively.

10.1.2 Servicing Phase 2

Servicing Phase 2 will continue to build off the existing infrastructure and introduce new 400 mm trunk watermains within PD18 and PD6. In PD18, 400 mm watermains will extend south along Southcote Rd to Book Rd and east along an internal road parallel to Garner Rd. Within PD6, a 400 mm watermain will follow the Garth St extension alignment to Glancaster Rd and connect with the existing 600 mm watermain on Glancaster Rd. The 400 mm watermain will also run on Glancaster Rd from Twenty Rd to Rymal Rd and on Rymal Rd to Garth St.

10.2 Option B – Maximized PD6 Servicing

The overall strategy for water servicing Option B is to maximize the Pressure District 6 service area. Under Option B, the PD6 area will consist of lands east of Glancaster Rd and south of Book Rd between elevations of approximately 220 m to 240 m. PD18 areas will lie north of Book Rd and west of Glancaster Rd and have elevations between approximately 240 m and 250 m. PD6 currently has flexibility for development within the AEGD due to the existing PD6 watermains through the AEGD and along the AEGD boundary as well as excess capacity in the HD06A pumping station.

PD6

PD6 will be serviced via a new 400 mm trunk watermain along Glancaster Rd, Book Rd and the Garth St extension. Internal looped 300 mm watermains along the AEGD road network will

service the remainder of Pressure District 6. Areas within PD6 at the southern limits of the AEGD will be fed off the existing 300 mm and 400 mm watermains on Airport Rd and White Church Rd.

PD18

Pressure District 18 will generally be limited to lands north of Book Rd. They will be serviced by two 400 mm watermains south of Garner Rd as well as looped 300 mm watermains along the existing and future AEGD road alignments. Pumping Station HD06A has sufficient capacity to service the proposed Pressure District 6 area and will not require any upgrades, however servicing in PD18 will require an elevated tank that will service both the existing PD18 in Ancaster and the PD18 growth area in the AEGD. This elevated tank will provide operational flexibility as well as floating storage within the Pressure District.

10.2.1 Servicing Phase 1

Servicing Phase 1 areas will be serviced by connecting to existing watermains throughout the three initial growth areas. The northwest PD18 Servicing Phase 1 area will connect to the existing 400 mm watermain on Garner Rd with a 300 mm watermain on a new road alignment and a 400 mm watermain on Southcote Rd. The northeast PD6 Servicing Phase 1 area will connect 300 mm watermains to the existing 300 mm and 400 mm pipes on Dickenson Rd, Twenty Rd and Upper James St. The southern PD 6 Servicing Phase 1 area will connect to an existing 300 mm and 400 mm watermains on Provident Way and Airport Rd, respectively.

10.2.2 Servicing Phase 2

Servicing Phase 2 will continue to build off the existing infrastructure and introduce new 400 mm trunk watermains within PD18 and PD6. In PD18, 400 mm watermains will extend south along Southcote Rd, ending before Book Rd and east along an internal road parallel to Garner Rd. Within PD6, a 400 mm watermain will follow the Garth St extension alignment to Glancaster Rd and connect with the existing 600 mm watermain on Glancaster Rd. The 400 mm watermain will also run on Glancaster Rd from Twenty Rd to Rymal Rd and on Rymal Rd to Garth St. A 400 mm watermain will also extend west along Book Rd to the extents of the growth area.

10.3 Option C - Split PD6/PD18 Servicing

The overall strategy for water servicing Option C is the split of the pressure zones in order to better balance the demands from Pressure District 6 and Pressure District 18. Under Option C, the areas serviced by PD18 will have elevations between 220 and 250 m and lie north of Book Rd, and will include the corridor between Hwy 6 and Fiddler's Green Rd. Pressure District 6 areas will lie mainly to the south of Book Rd and east of Hwy 6. PD6 will include lands generally south of Book Rd and east of Hwy 6 between elevations of 220 m and 240 m. Pressure District 18 will be serviced by pumping station HD018 and the 400 mm and 750 mm feeder mains along Garner Rd. A looped network of 300 mm and 400 mm water mains lying along existing and future roadways will provide internal water servicing for the district.

PD6

PD 6 will be limited to areas generally southeast of Hwy 6 and Book Rd and will be serviced by water mains fed from pumping station HD06B. These will consist of a 400 mm trunk water main running south and west along the Garth St Extension to Dickenson Rd and a network of looped 300 mm water mains along the existing and future AEGD road alignments. Areas within PD6 at the southern limits of the AEGD will be fed off the existing 300 mm and 400 mm water mains on Airport Rd and White Church Rd.

PD18

Water servicing for PD18 will be provided by a 400 mm trunk water main running south along Southcote Rd to Book Rd, west on Book Rd to the western boundary of the Secondary Plan Area. A network of looped 300 mm water mains will follow the AEGD road alignments and will provide internal servicing for the area. The new growth areas within PD18 will be fed by the Pressure District 18 pumping station HD018 which, under this option, will require upgrades in order to meet the proposed water demands. In addition to the pumping station upgrades, a new PD18 elevated storage facility will be required to service existing PD18 in Ancaster as well as the PD18 growth areas in the AEGD. This elevated tank will provide operational flexibility as well as floating storage within the Pressure District.

10.3.1 Servicing Phase 1

Servicing Phase 1 areas will be serviced by branches from existing water mains throughout the three initial growth areas. The northwest PD18 Servicing Phase 1 area will connect to the

existing 400 mm watermain on Garner Rd with a 300 mm watermain on a new road alignment and a 400 mm watermain on Southcote Rd. The northeast PD6 Servicing Phase 1 area will connect 300 mm watermains to the existing 300 mm and 400 mm pipes on Dickenson Rd, Twenty Rd and Upper James St. The southern PD 6 Servicing Phase 1 area will connect to an existing 300 mm and 400 mm watermains on Provident Way and Airport Rd, respectively.

10.3.2 Servicing Phase 2

Servicing Phase 2 will continue to build off the existing infrastructure and introduce new 400 mm trunk watermains within PD18 and PD6. In PD18, 400 mm watermains will extend south along Southcote Rd to Book Rd and east along an internal road parallel to Garner Rd. Within PD6, a 400 mm watermain will follow the Garth St extension alignment to Glancaster Rd and connect with the existing 600 mm watermain on Glancaster Rd. The 400 mm watermain will also run on Glancaster Rd from Twenty Rd to Rymal Rd and on Rymal Rd to Garth St.

10.4 Evaluation of Water Servicing Options

The Water Options Evaluation Criteria was prepared based on triple bottom line approach. A comparison of technical, economic, legal, environmental and socio-economic factors has been developed. The evaluation of Water Servicing Options is shown in Table 3.

The Triple Bottom Line evaluation demonstrates that Option B is the Preferred Servicing Option. This option best utilizes the capacity of the existing water network and maximizes the Pressure District 6 Service Area. This option can be provide a high level of service to both Pressure Districts 6 and 18 by extending from existing infrastructure.

A technical hydraulic capacity analysis was undertaken for all three options. This analysis led to the infrastructure sizing and preliminary profiles for the infrastructure. Confirmation of proposed flows and the impact on existing pumping stations was undertaken. In addition, a flow analysis utilizing the sensitivity on design criteria was undertaken which further confirmed the infrastructure sizing. Our recommended program provides adequate levels of service with respect to fire flow and pressure for the new and existing pipes.

The recommended infrastructure program is based on the AEGD criteria and recommended 2031 boundary. On a go-forward basis, ongoing monitoring of actual development and its

relationship to the assumed criteria and development boundary should be undertaken. Any variance to the assumptions in this report could impact the servicing strategy (sizing, location, etc) and as such, the servicing analysis would need to be confirmed and updated in the future.

TABLE 3 - WATER OPTIONS EVALUATION

Criteria		Water Servicing Option A Maximize Pressure District 18	Water Servicing Option B Maximize Pressure District 6	Water Servicing Option C Balanced Servicing by Pressure District 18 and Pressure District 6	Do Nothing
Technical	Technically Feasible	- Watermains will be connected to existing system - Diameters are within normal range - Increase in operational flexibility by adding PD18 Elevated Tank Rank: 2	- Watermains will be connected to existing system - Diameters are within normal range - Minimal servicing from HD018 - Complete Pressure District 6 looping achieved from Upper James St to Hwy 6, Book Rd and Glancaster Rd - Increase in operational flexibility by adding PD18 Elevated Tank Rank: 1	- Watermains will be connected to existing system - Diameters are within normal range - Increase in operational flexibility by adding PD18 Elevated Tank Rank: 2	- The Do Nothing Alternative does not address the objectives of the project given that the AEGD is an approved service area and requires new infrastructure and upgrades for servicing - The Do Nothing Alternative has been screened out and not carried further in evaluation
	Maximizes existing infrastructure	- Supports initial phasing by connecting to existing system - Utilizes all existing capacity in HD018, will require upgrades at this station Rank: 3	- Supports initial phasing by connecting to existing system - Utilizes some existing capacity in HD018, maximizes capacity in HD006 Rank: 1	- Supports initial phasing by connecting to existing system - Utilizes all existing capacity in HD018, utilizes capacity in HD006 Rank: 2	
	Flexibility for future AEGD and Airport Growth	- Growth can be initiated from both pressure districts - PD18 pumping capacity could be a constraint in servicing future growth Rank: 3	- Growth can be initiated from both pressure districts and servicing from Pressure District 6 allows for a complete looping in the area (from Upper James to White Church, north on Highway 6 and east on Book Rd and Glancaster Rd) - There is sufficient pumping capacity to service Airport Area from PD6 Rank: 1	- Growth can be initiated from both pressure districts - There is sufficient pumping capacity to service Airport Area from PD6 but this Option does not maximize the existing capacity Rank: 2	
	Constructability	- May require additional space at Pumping Station HD018 - All infrastructure is within reasonable depths and alignments - No major constructability issues identified All options equal	- All infrastructure is within reasonable depths and alignments - No major constructability issues identified All options equal	- All infrastructure is within reasonable depths and alignments - No major constructability issues identified All options equal	
	Impacts to existing service areas	- Growth is limited to expansion at HD018 to minimize impact - No watermain upgrades identified Rank: 2	- No major impact to existing service areas - No watermain upgrades identified Rank: 1	- No major impact to existing service areas - No watermain upgrades identified Rank: 1	
Economic	Capital Cost	- Pumping station upgrade required - Pressure District 18 Elevated Storage required - Overall capital cost: Approximately \$31M Rank: 3	- Pressure District 18 Elevated Storage required - Overall capital cost: Approximately \$29M Rank: 1	- Pressure District 18 Elevated Storage required - Overall capital cost: Approximately \$30M Rank: 2	
	Operation and Maintenance Cost	- Will require additional pumping capacity, however, overall AEGD pumping requirements and O&M costs will be similar for all options - All options have similar lengths of linear works All options equal	- Will require additional pumping capacity, however, overall AEGD pumping requirements and O&M costs will be similar for all options - All options have similar lengths of linear works All options equal	- Will require additional pumping capacity, however, overall AEGD pumping requirements and O&M costs will be similar for all options - All options have similar lengths of linear works All options equal	
	Cash Flow	- Upgrade to Pumping Station HD018 required for servicing Pressure District 18 - All other projects to be constructed with development Rank: 2	- Projects will be constructed with development; cash flow will be in line with growth Rank: 1	- Projects will be constructed with development; cash flow will be in line with growth Rank: 1	
Natural Environment	Aquatic	- Limited major crossings and limited impacts to natural environment including Aquatic Areas, Terrestrial Areas and ESA - Only typical mitigative measures will be required for implementation and are equally applicable to Aquatic Areas, Terrestrial Areas and ESA All options equal	- Limited major crossings and limited impacts to natural environment including Aquatic Areas, Terrestrial Areas and ESA - Only typical mitigative measures will be required for implementation and are equally applicable to Aquatic Areas, Terrestrial Areas and ESA All options equal	- Limited major crossings and limited impacts to natural environment including Aquatic Areas, Terrestrial Areas and ESA - Only typical mitigative measures will be required for implementation and are equally applicable to Aquatic Areas, Terrestrial Areas and ESA All options equal	
	Terrestrial				
	ESA				
Legal	Land Acquisition	- Similar land requirements for all Options - Alignments to be within existing and/or future road allowances All options equal	- Similar land requirements for all Options - Alignments to be within existing and/or future road allowances All options equal	- Similar land requirements for all Options - Alignments to be within existing and/or future road allowances All options equal	
Socio-Economic	Community impacts during development	- Temporary impact to adjacent landowners during construction - Similar alignments and facility locations for all options and projects being located within existing and future road allowances; all options will have similar impacts during development All options equal	- Temporary impact to adjacent landowners during construction - Similar alignments and facility locations for all options and projects being located within existing and future road allowances; all options will have similar impacts during development All options equal	- Temporary impact to adjacent landowners during construction - Similar alignments and facility locations for all options and projects being located within existing and future road allowances; all options will have similar impacts during development All options equal	
	Infrastructure/facility locations	- Similar watermain alignments for all options, projects located within existing and future road allowances; all options will have similar impacts during development - Final location for Proposed elevated storage servicing Pressure District 18 will require further investigation. Current location is within Ancaster Industrial Park All options equal	- Similar watermain alignments for all options, projects located within existing and future road allowances; all options will have similar impacts during development - Final location for Proposed elevated storage servicing Pressure District 18 will require further investigation. Current location is within Ancaster Industrial Park All options equal	- Similar watermain alignments for all options, projects located within existing and future road allowances; all options will have similar impacts during development - Final location for Proposed elevated storage servicing Pressure District 18 will require further investigation. Current location is within Ancaster Industrial Park All options equal	
	Archaeological/Cultural Heritage/Agricultural	- Similar alignments and facility locations for all options - All linear works to be located within existing or proposed road right of way and will be coordinated with roads at the time of development - Additional archaeological assessment will be required during development - Context for existing land uses was addressed in Phase 1 Report All options equal	- Similar alignments and facility locations for all options - All linear works to be located within existing or proposed road right of way and will be coordinated with roads at the time of development - Additional archaeological assessment will be required during development - Context for existing land uses was addressed in Phase 1 Report All options equal	- Similar alignments and facility locations for all options - All linear works to be located within existing or proposed road right of way and will be coordinated with roads at the time of development - Additional archaeological assessment will be required during development - Context for existing land uses was addressed in Phase 1 Report All options equal	
	Impacts on existing service areas (facilities, expansions, etc)	- Increased flow required from HD018 will trigger a pumping station expansion - No major impacts are identified on existing watermains Rank: 2	- Increased flow will be required from HD06A and HD06B - No major impacts are identified on existing watermains Rank: 1	- Increased flow will be required from HD06A and HD06B - No major impacts are identified on existing watermains Rank: 1	
OVERALL RANK		3	1	2	Screened Out

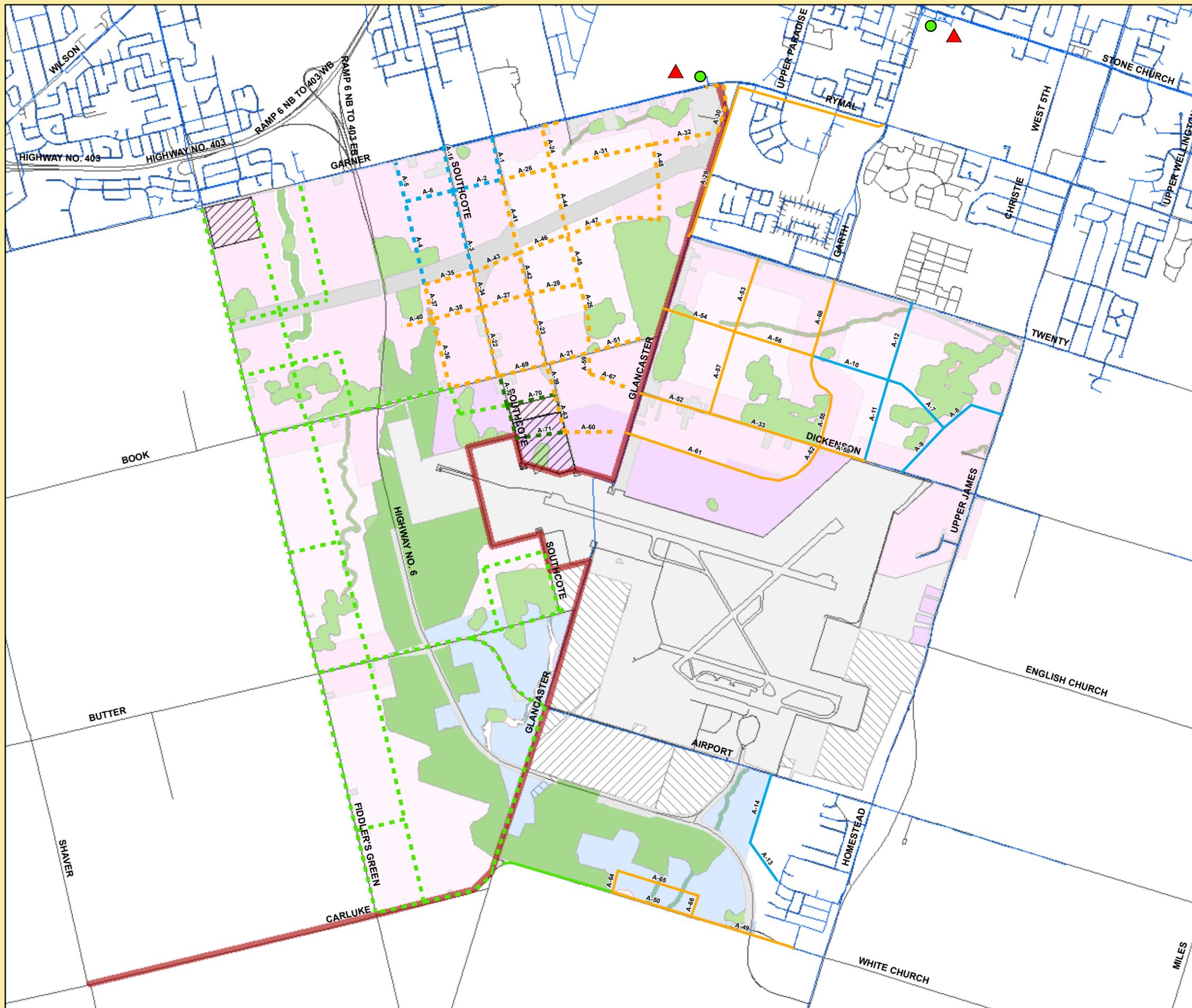


Hamilton

Hamilton AEGD Study

Figure 7
Water Servicing
Option A

- Legend**
- Existing Reservoir
 - Existing Pump
 - Proposed Watermains**
 - PD 18 Servicing Phase 1
 - PD 18 Servicing Phase 2
 - PD 18 Additional Study Area
 - PD 18 Smith Farm
 - PD 6 Servicing Phase 1
 - PD6 Servicing Phase 2
 - PD 6 Additional Study Area
 - Proposed Pressure District 6/18 Boundary
 - Existing Watermains
 - Roads
 - Council Directed Additional Lands



Map Created By: MZ
 Map Checked By: CH
 Date Created: Sept 10, 2009
 Date Modified: Feb 2, 2011



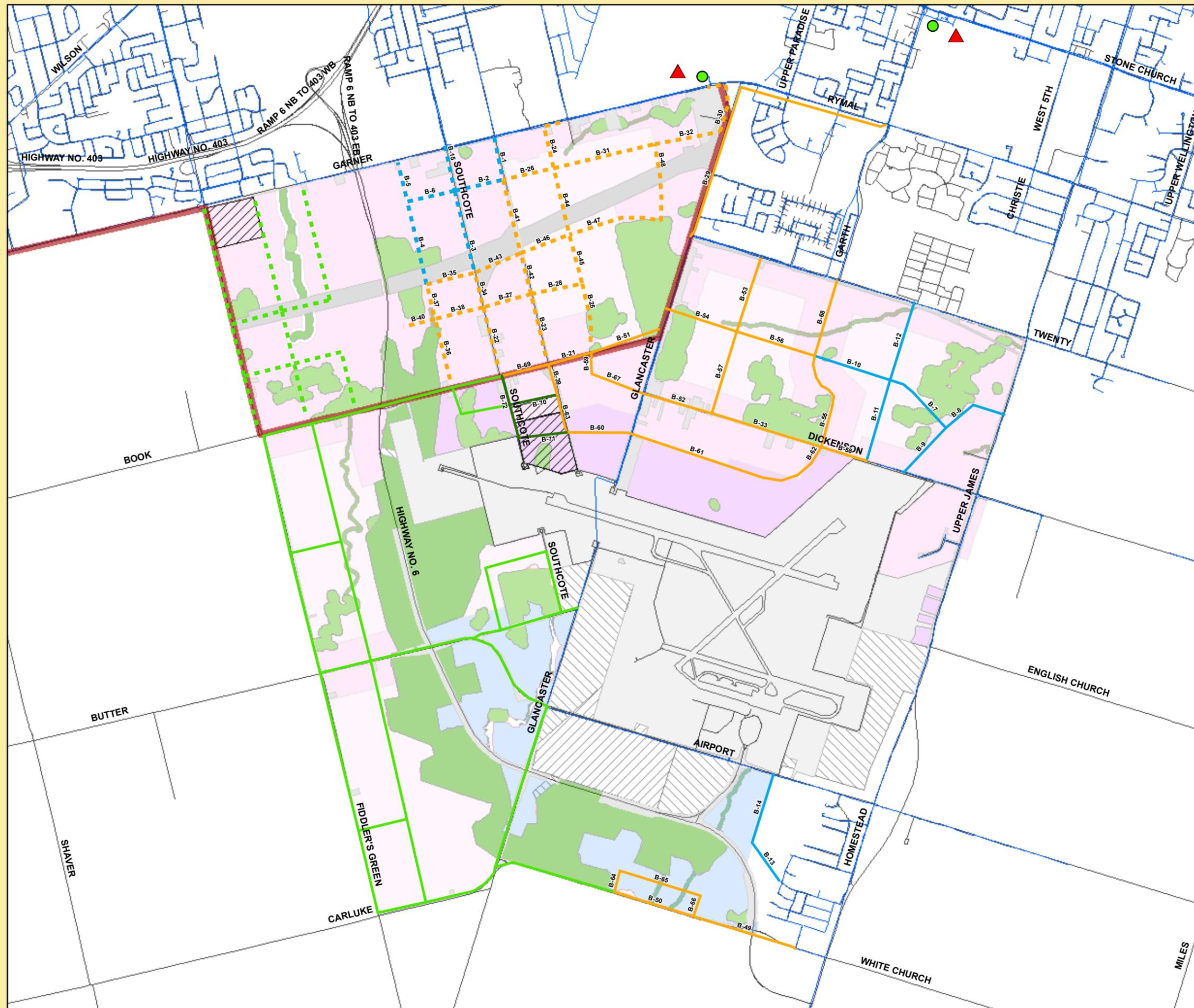
Hamilton

Hamilton AEGD Study

Figure 8
Water Servicing
Option B

Legend

- Existing Reservoir
- Existing Pump
- Proposed Watermains**
 - PD 18 Servicing Phase 1
 - PD 18 Servicing Phase 2
 - PD 18 Additional Study Area
 - PD 6 Servicing Phase 1
 - PD 6 Servicing Phase 2
 - PD 6 Additional Study Area
 - PD 6 Smith Farm
 - Proposed Pressure District 6/18 Boundary
 - Existing Watermains
 - Roads
 - Council Directed Additional Lands



Map Created By: MZ
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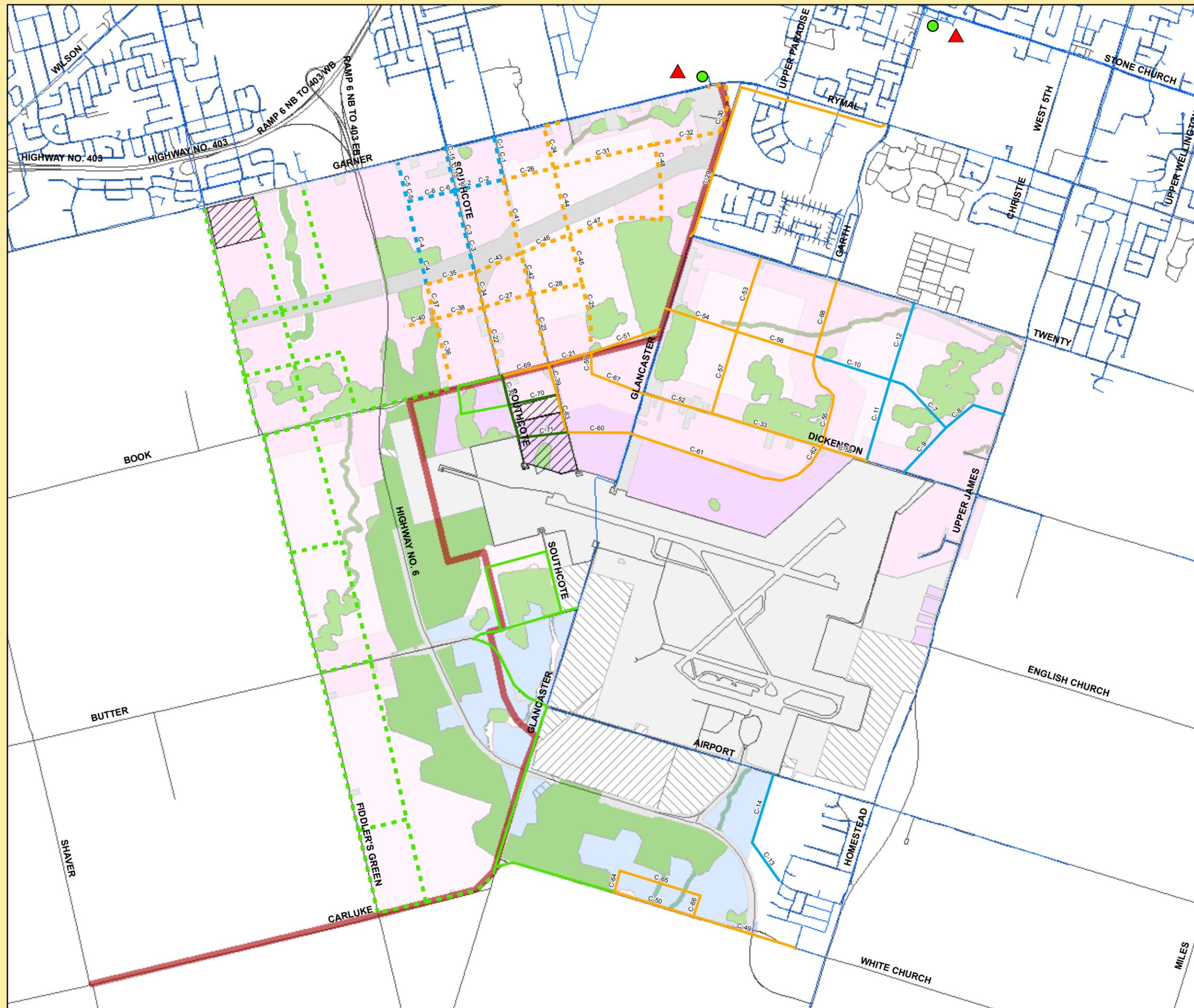
Hamilton

Hamilton AEGD Study

Figure 9
Water Servicing
Option C

Legend

- Existing Reservoir
- Existing Pump
- Proposed Watermains**
- PD 18 Servicing Phase 1
- PD 18 Servicing Phase 2
- PD 18 Additional Study Area
- PD 6 Servicing Phase 1
- PD 6 Servicing Phase 2
- PD 6 Additional Study Area
- PD 6 Smith Farm
- Proposed Pressure District 6/18 Boundary
- Existing Watermains
- Roads
- Council Directed Additional Lands



Map Created By: MZ
 Map Checked By: CH
 Date Created: Sept 10, 2009
 Date Modified: Feb 2, 2011

11.0 Existing Wastewater System

Wastewater flow from most areas within the City of Hamilton is treated at the Woodward Ave WWTP on Woodward Ave in the City of Hamilton. This Wastewater Treatment Plant is currently approaching its rated capacity. Consequently, the City of Hamilton is implementing a plant expansion which is intended to support growth within the City including the anticipated flows generated by the AEGD. The Airport and surrounding areas are serviced by a series of sewage pumping stations along Upper James St which ultimately convey flow to the 1,500 mm – 1,950 mm Red Hill Creek Sanitary Interceptor. Flows in Ancaster are picked up by the Ancaster Fennell Trunk sewer which splits and sends flow east to the Fennell Trunk and north to the Hwy 403 Trunk. Additional wastewater system details can be found in Phase 1 report in Appendix A

11.1 Upper James St Infrastructure

Wastewater from the southern end of the airport is conveyed to the existing trunk sewer system on the Hamilton Mountain via a series of sewage pumping stations and gravity sewers along Upper James St. The Homestead Dr SPS (HC027) is situated southeast of the Airport at Homestead Dr and Strathearne Pl. The station has a firm capacity of 182 L/s, forcemain capacity of 250 L/s which discharges to a 600 mm and 675 mm gravity sewer on Upper James St that leads to the English Church Road SPS.

The English Church Rd SPS (HC019) is located at Upper James St, approximately 150 m south of English Church Rd. The station has a firm capacity of 210 L/s and forcemain capacity of 320 L/s. Wastewater flows are pumped further north along Upper James St to a 675 mm gravity sewer which increases in diameter to 750 mm at Dickenson Rd and 1050 mm at Twenty Rd before discharging to the Twenty Rd SPS.

The Twenty Rd SPS (HC018) is located at Twenty Rd and Upper James St. The station receives flow from gravity sewers to the south, east and west. The station and forcemain both have been recently upgraded; the station has a current firm capacity of 88 L/s and discharges to a gravity sewer approximately 900 m to the north via a new 600 mm forcemain.

11.2 Miller Dr/Calvin St SPS

The Miller Dr sewer and Calvin St Sewage Pumping Station lie adjacent to the northwest corner of the AEGD, north of Garner Rd and west of Highway 6. This infrastructure makes up part of the Ancaster sewage network which drains to the Ancaster-Fennell Trunk System. The Miller Dr Sewer is an existing 450 mm sewer on Miller Dr from Garner Rd flowing north to HC011 – Calvin St Sewage Pumping Station with a theoretical limiting capacity of 116 L/s. Connected to the Miller Dr sewer is a 600 mm sewer on Melange Dr with a theoretical capacity of approximately 350 L/s which joins the Miller Dr sewer just south of the 403. The Calvin St SPS currently has two 82 L/s (firm capacity 82 L/s) pumps with space for a third pump. It pumps flows westerly, through a 715 m 300 mm forcemain to a 600 mm sewer at the discharge point on Fiddlers Green Rd.

11.3 Meadowlands Infrastructure

Residential development in the Meadowlands area of Ancaster has extended south from Golf Links Rd towards Garner Rd E to Dilorio Circle. A 675 mm - 825 mm gravity extends north on Raymond Rd from Garner Rd to Dilorio Circle and is sized to service a large catchment area within the AEGD south of Garner Rd. A gravity sewer of varying diameters is also planned for Garner Rd between Raymond Rd and Southcote Rd. This will be the main collection sewer for the northwest AEGD catchment north of the existing hydro corridor which will flow to the Meadowlands gravity sewer system.

11.4 Dickenson Rd & Upper Centennial Pkwy Trunk Sewer

The 2006 City of Hamilton Water and Wastewater Master Plan recommended a solution for servicing the AEGD that consisted of a new sewage pumping station at the southern limits of the area on White Church Rd, a new forcemain along White Church Rd/Upper James St and a new trunk gravity sewer, sewage pumping station and forcemain along Dickenson Rd, Golf Club Rd and Upper Centennial Pkwy. The 1,200 mm trunk sewer along Centennial Pkwy/Upper Centennial Pkwy is currently in the detailed design phase and is estimated to be constructed in 3 to 5 years. The extension of the trunk sewer along Golf Club Rd and Dickenson Rd to the extents of the AEGD at Upper James St is proposed to have a diameter of 900 mm and will be required in order to service the majority of the study area. The conceptual design phase for this section has been completed and the first phase of construction will be completed this year. The

overall estimated construction date is anticipated to coincide with the Servicing Phase 2 growth within the AEGD.

12.0 Wastewater Design Criteria

The 2006 City of Hamilton Water and Wastewater Master Plan developed wastewater flow criteria using monitored flow and rain data from over 50 monitoring sites within the City. Unique flow generation rates were observed for residential and employment users in each local municipality. However, for the purposes of long term infrastructure planning, overall residential and employment usage rates were established based on the historical data. Table 4 shows the wastewater design criteria used for the analysis.

Table 4 Wastewater Design Criteria

Criteria	Value
Average Day Residential Consumption	360 L/cap/d
Average Day Employment Consumption	260 L/emp/d
Peaking Factor	Peaking Factor $M = 5/P^{0.2}$ ($2 \leq M \leq 5$) (P = Population in thousands)

This criteria is being utilized uniquely for the AEGD service area only for conformance with the Master Plan and overall GRIDS process. As noted previously, the employment criteria is consistent with the anticipated type of employment designated within the AEGD.

As described in the Water Design Criteria analysis, additional billing analysis was conducted for the following existing employment areas: East Hamilton between Barton St and the QEW, southwest Clappison’s Corners, Ancaster Business Park at Wilson St W and Garner Rd W, Upper James St between the Lincoln Alexander Pkwy and Rymal Rd and the Meadowlands along Golf Links Rd. Our analysis validated and confirmed that the existing employment water demand criteria is accurate and applicable for use in the AEGD analysis. The current practice of relating water use to wastewater generation was maintained through this Master Plan process. Given that the water use through the water billing analysis was validated, consequently the current City wastewater criteria are similarly validated.

In addition to planning for the base flows generated by the recommended AEGD employment densities, consideration was also given to the risk of higher flow generating uses (Hotels, Conference Centres, etc) within the Airport Related Business area as well as customer driven flows within the Employment Supportive Centres. This sensitivity analysis did not result in the need to increase the criteria and flows.

12.1 Eco-Industrial Considerations

The potential for reduction of the wastewater flow generation criteria was reviewed through this study by the project team in the same way that it was for water consumption. Current trends towards water conservation and wastewater reduction along with numerous successful case studies around the world have made water efficiency and conservation an important aspect of this study. The analysis conducted by the project team indicated that future wastewater flows have the potential to be indirectly reduced through the same site specific measures taken to reduce water demand. However, there has been no demonstration of area wide reduction of wastewater flows which would warrant a reduction in design criteria. There may be opportunity for wastewater flow reduction on a site by site basis only as the service areas develop over time. While reduction and conservation measures will continue to be encouraged across the City, projecting reduced wastewater flow and planning infrastructure on that basis may cause risk to the system security.

12.2 Future Airport Flow

Given that the airport is located within the AEGD, flows within the airport boundary needed to be considered. Recent readings from airport water meters were taken in order to determine the current water demand and in order to estimate the future water demands. For the period of July 2008 to July 2009, the total average daily water use was less than 0.15 ML/d. Long term detailed planning within the airport itself has not yet been finalized; however, the projected ultimate size is estimated to be approximately 9.5 million passengers per year. Analysis was conducted that examined the water consumption of comparable airports around the world in order to establish approximate design criteria that would be applicable to the Hamilton International Airport. The upper range of water demand per passenger that was observed ranged from 30 – 33 L/passenger. This consumption criteria yields an estimated ultimate peak water demand of approximately 2.4 – 2.6 ML/d for the airport and immediate surrounding uses.

The airport is currently serviced by a 450 mm gravity sewer on Airport Rd with a slope of 0.2% and capacity of approximately 133 L/s. Peak discharge from the airport is limited by the City of Hamilton to 53 L/s (Source: 2004 Airport Master Plan Update).

12.3 Wastewater Infrastructure Unit Costs

For the purposes of the AEGD Water and Wastewater Servicing Master Plan, the sewer projects were based on linear unit costs approved through the 2009 Development Charges Update. The Development Charges Update broke out urban versus rural costs per metre of constructed pipe. Because the AEGD consists primarily of new development and also due to anticipated timing of infrastructure installation in coordination with road work and watermain installation, the Greenfield unit cost was applied in most cases. However, stand alone projects may require increased budget. Where applicable, the preliminary analysis of infrastructure depths and major crossings was performed in order to determine any necessary additional costs. The cost for linear sewer infrastructure can be found in Table 5.

Table 5 Linear Sewer Unit Costs

		2009 \$/m	
		Greenfield	Urban
250	mm	345	856
300	mm	465	889
375	mm	485	923
450	mm	498	989
525	mm	531	1,089
600	mm	584	1,188
675	mm	730	1,387
750	mm	810	1,520
825	mm	903	1,653
900	mm	1,022	1,819
975	mm	1,089	1,951
1050	mm	1,181	2,117
1200	mm	1,527	2,316

Source: 2009 City of Hamilton Water and Wastewater Development Charges Update. Unit costs include restoration and appurtenances (Valves, Chambers, Hydrants, Blow-offs, Manholes, etc)

13.0 Description and Evaluation of Wastewater Servicing Options

The 2006 City of Hamilton Water & Wastewater Master Plan recommended a high-level wastewater servicing strategy that will service the 2031 GRIDS employment growth numbers within the AEGD boundary. This strategy consisted of wastewater flows being conveyed to the south end of the AEGD by gravity sewers to a new Sewage Pumping Station on White Church Rd. This proposed 500 L/s station would pump the majority of the flows generated in the AEGD through a new 4,700 m, 600 mm forcemain along White Church Rd and Upper James St to the new Dickenson/Centennial Trunk Sewer on Upper James St, 1 km south of Dickenson Rd. The Master Plan strategy also recommended upgrades to the Twenty Rd Sewage Pumping Station, which would be required to service the northeast extents of the AEGD.

The wastewater servicing options that are introduced through the AEGD Study were developed using a more refined and detailed approach than the previous 2006 City of Hamilton Water and Wastewater Master Plan. Separate options were developed that would maximize the use of available capacity within existing infrastructure, while remaining consistent with Master Plan's overall servicing strategy.

Generally, the overall objectives for the Wastewater Servicing Options are:

- Provide a high level of service to growth areas while minimizing impacts to existing users
- Review and mitigate impacts to natural, social and economic environments
- Best meet policy statements
- Ensure servicing meets technical criteria
- Optimize use of existing infrastructure
- Ensure strategies are cost-effective
- Where possible, remain consistent with 2006 Master Plan approved strategy

In total, three wastewater servicing options were developed:

- Option A – Dickenson Trunk/Twenty Rd SPS
- Option B – Dickenson Trunk/Twenty Rd SPS/New AEGD SPS
- Option C – Dickenson Trunk

The three options are depicted in Figure 10 to Figure 12 found at the end of this section.

13.1 Option A - Dickenson Trunk/Twenty Rd SPS

Wastewater Servicing Option A splits the flow that is generated within the AEGD between existing serviced areas and the Dickenson/Centennial Trunk sewer. In general, areas in the northwest will be serviced by the existing Ancaster sewers while areas in the northeast will be serviced by the existing Twenty Rd SPS and the existing Hamilton Mountain sewers. A portion of the flow produced by the central area of the AEGD will flow north to the Twenty Rd SPS while the majority of the flows from the central area will be fed by gravity directly to the Dickenson/Centennial trunk sewer. Flow from the western area of the AEGD will flow south by gravity before being pumped to the Dickenson/Centennial trunk sewer. This option makes efficient use of natural topography to maximize the amount of flow received by the existing infrastructure to the northwest, northeast and south. It also utilizes the trunk sewer to service numerous adjacent catchment areas.

13.1.1 Servicing Phase 1

Servicing Phase 1 areas in the northwest flow north by gravity to the existing Miller Dr and Meadowlands sewer systems in Ancaster. Servicing Phase 1 areas in the northeast flow by gravity to the existing Twenty Rd Sewage Pumping Station, which pumps into the existing Hamilton Mountain gravity drainage area. The Twenty Rd SPS will require pump and electrical upgrades in order to accommodate these flows. Servicing Phase 1 south area flows will be sent to the east to the existing Homestead Sewage Pumping Station where they will be pumped north along the Upper James St sewer infrastructure.

13.1.2 Servicing Phase 2

Flows generated in the central Servicing Phase 2 area will be split primarily between Twenty Rd Sewage Pumping Station and a new AEGD Dickenson Trunk sewer which will run from Southcote Rd to Upper James St and will discharge to the Dickenson/Centennial trunk sewer at Upper James St. Northeast areas that lie between Dickenson Rd and Twenty Rd will be serviced to the north to the Twenty Rd SPS. Northern areas between the existing hydro corridor and Garner Rd will be serviced by the Meadowlands and Ancaster sewer infrastructure north of Garner Rd. Southern Servicing Phase 2 area flows will be pumped via the new AEGD Pumping Station and Forcemain sized to pump the 2031 AEGD employment flows. The forcemain will

run along White Church Rd and Upper James St to English Church Rd before discharging to the Dickenson/Centennial Trunk Sewer.

13.2 Option B – Dickenson Trunk/Twenty Rd SPS/New AEGD SPS

Wastewater Servicing Option B splits the flow that is generated within the AEGD between existing serviced areas, the new AEGD SPS and the Dickenson/Centennial Trunk sewer. In general, areas in the northwest will be serviced by the existing Ancaster sewers while areas in the northeast will be serviced by the existing Twenty Rd SPS and the Hamilton Mountain sewers. A portion of the flow produced by the central area of the AEGD will flow north to the Twenty Rd SPS while the majority of the flows from the central area will flow by gravity to the west, then south around the airport to the new AEGD SPS before being pumped to the north and discharged to the Dickenson/Centennial trunk sewer. Flow from the western area of the AEGD will also be collected by gravity and sent south to the new AEGD SPS to be pumped to the Dickenson/Centennial trunk sewer. This option maximizes the benefits of a new AEGD sewage pumping station by bringing additional flows from the central AEGD by gravity to the south. It also maximizes the capacities of the existing infrastructure in the northwest, northeast and south areas.

13.2.1 Servicing Phase 1

Servicing Phase 1 areas in the northwest flow north by gravity to the existing Miller Dr and Meadowlands sewer systems in Ancaster. Servicing Phase 1 areas in the northeast flow by gravity to the existing Twenty Rd Sewage Pumping Station, which pumps into the existing Hamilton Mountain gravity drainage area. The Twenty Rd SPS will require pump and electrical upgrades in order to accommodate these flows. Servicing Phase 1 south area flows will be sent to the east to the existing Homestead Sewage Pumping Station where they will be pumped north along the Upper James St sewer infrastructure.

13.2.2 Servicing Phase 2

Flows generated in the central Servicing Phase 2 area will be split primarily between Twenty Rd Sewage Pumping Station, the new Hwy 6 Trunk Sewer/AEGD SPS and a new AEGD Dickenson Trunk sewer which will run from Southcote Rd to Upper James St and will discharge to the Dickenson/Centennial trunk sewer at Upper James St. Northeast areas between Dickenson Rd and Twenty Rd will be serviced to the north to the Twenty Rd SPS. Northern

areas between the existing hydro corridor and Garner Rd will be serviced by the Meadowlands and Ancaster sewer infrastructure north of Garner Rd. Southern Servicing Phase 2 area flows will be pumped via the new AEGD Pumping Station and Forcemain sized to pump the 2031 AEGD employment flows. The forcemain will run along White Church Rd and Upper James St to English Church Rd before discharging to the Dickenson/Centennial Trunk Sewer.

13.3 Option C – Dickenson Trunk

Wastewater Servicing Option C splits the flow that is generated within the AEGD between existing serviced areas and the new Dickenson/Centennial trunk sewer. In general, areas in the northwest will be serviced by the existing Ancaster sewers while areas in the northeast will be serviced by the existing Twenty Rd SPS and the Hamilton Mountain sewers. All of the flow produced by the central area of the AEGD will flow to the east, and be discharged to the Dickenson/Centennial trunk sewer. Flow from the western area of the AEGD will flow south by gravity before being pumped north to the Dickenson/Centennial trunk sewer. This alternative best utilizes the capacity within the new trunk sewer and provides flexibility at existing northeast AEGD infrastructure. It also maximizes the capacities of existing infrastructure in the south and northwest.

13.3.1 Servicing Phase 1

Servicing Phase 1 areas in the northwest flow north by gravity to the existing Miller Dr and Meadowlands sewer systems in Ancaster. Servicing Phase 1 areas in the northeast flow by gravity to the existing Twenty Rd Sewage Pumping Station, which pumps into the existing Hamilton Mountain gravity drainage area. The Twenty Rd SPS will require pump and electrical upgrades in order to accommodate these flows. Servicing Phase 1 south area flows will be sent to the east to the existing Homestead Sewage Pumping Station where they will be pumped north along the Upper James St sewer infrastructure.

13.3.2 Servicing Phase 2

Flows generated in the central Servicing Phase 2 area will be sent to the east by gravity via a new AEGD Dickenson Trunk sewer which will run from Southcote Rd to Upper James St and will discharge to the Dickenson/Centennial trunk sewer at Upper James St. Northeast areas between Dickenson Rd and Twenty Rd will also flow to the new AEGD Dickenson trunk. Northern areas between the existing hydro corridor and Garner Rd will be serviced by the

Meadowlands and Ancaster sewer infrastructure north of Garner Rd. Southern Servicing Phase 2 area flows will be pumped via the new AEGD Pumping Station and Forcemain sized to pump the 2031 AEGD employment flows. The forcemain will run along White Church Rd and Upper James St to English Church Rd before discharging to the Dickenson/Centennial Trunk Sewer.

13.4 Evaluation of Wastewater Servicing Options

The Wastewater Options Evaluation Criteria was prepared based on triple bottom line approach. A comparison of technical, economic, legal, environmental and socio-economic factors has been developed. Table 6 shows the Wastewater Options Evaluations.

The Triple Bottom Line evaluation demonstrates that Option C is the Preferred Servicing Option. This option will allow Servicing Phase I to connect to the existing sanitary sewer infrastructure and provide a gravity solution for the majority of Servicing Phase II via the new Dickenson/Centennial Trunk Sewer. This strategy will maximize the use of gravity sewers and minimize overall pumping station costs.

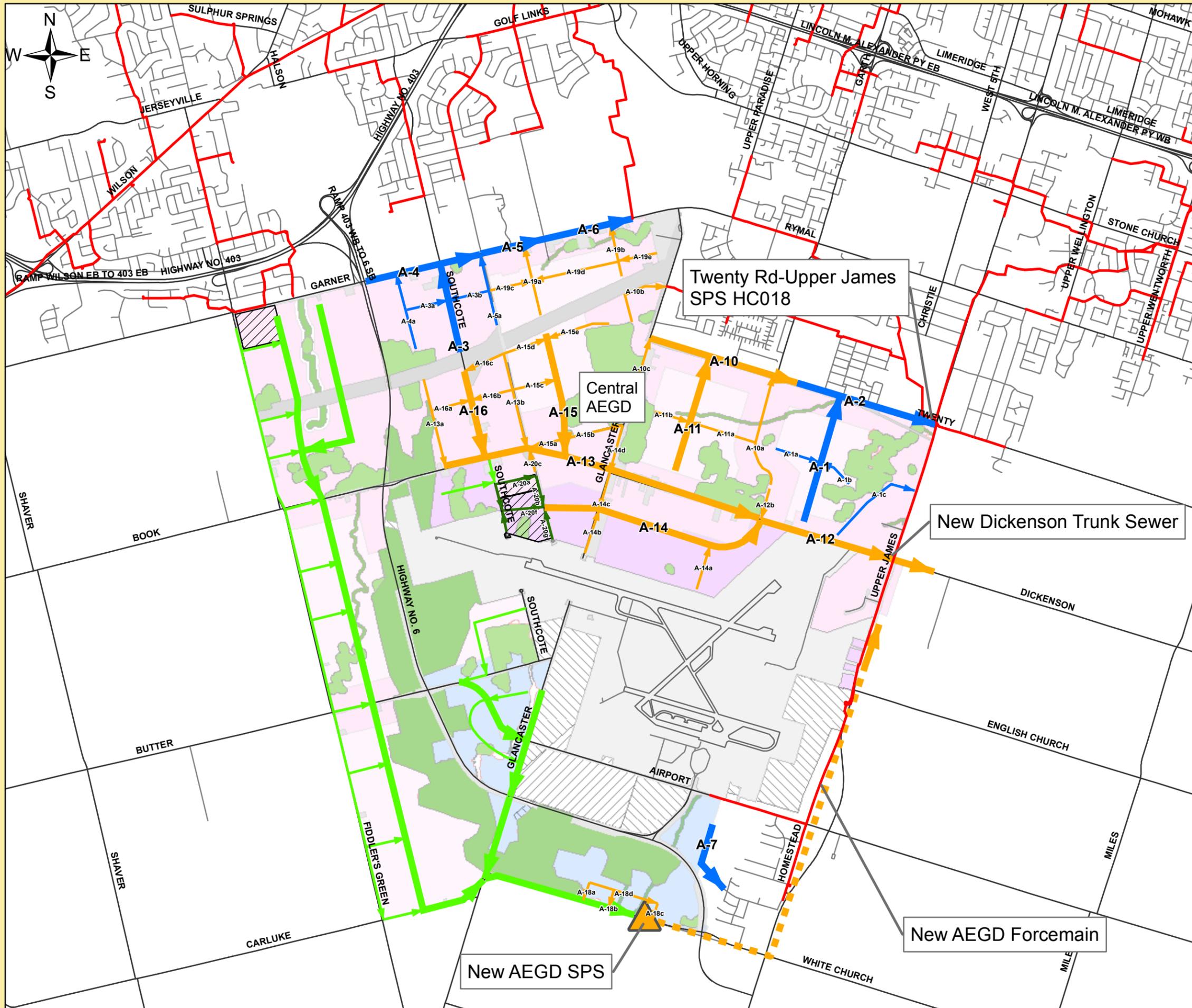
A technical hydraulic capacity analysis was undertaken for all three options. This analysis led to the infrastructure sizing and preliminary profiles for the infrastructure. Confirmation of proposed flows and the impact on existing and future sewage pumping stations was undertaken. In addition, a flow analysis utilizing the sensitivity on design criteria was undertaken which further confirmed the infrastructure sizing. Our recommended program provides adequate levels of service with respect to flow (pressure, fire flows) and velocity for the new and existing pipes.

The recommended infrastructure program is based on the AEGD criteria and recommended 2031 boundary. On a go-forward basis, ongoing monitoring of actual development and its relationship to the assumed criteria and development boundary should be undertaken. Any variance to the assumptions in this report could impact the servicing strategy (sizing, location, etc) and as such, the servicing analysis would need to be confirmed and updated in the future.

TABLE 6 - WASTEWATER OPTIONS EVALUATION

Criteria		Wastewater Servicing Option A New Dickenson Trunk/Twenty Rd SPS	Wastewater Servicing Option B New AEGD SPS/New Dickenson Trunk/Twenty Rd SPS	Wastewater Servicing Option C New Dickenson Trunk	Do Nothing
Technical	Technically Feasible	- Sewers generally follow natural landscape - Sewers are within reasonable depths - Additional flow to Twenty Rd SPS Rank: 2	- Sewers generally follow natural landscape - Sewers are within reasonable depths - Additional flow to Twenty Rd SPS - Additional flow south will require SPS with larger capacity Rank: 3	- Sewers generally follow natural landscape - Sewers are within reasonable depths - Maximizes gravity sewer solution to new Dickenson trunk sewer Rank: 1	
	Maximizes existing infrastructure	- Supports initial phasing by using existing Upper James St, Mount Hope, Twenty Rd and Ancaster Infrastructure - Additional flow to Twenty Rd SPS in Stage 1 Servicing Phase 2 Rank: 1	- Supports initial phasing by using existing Upper James St, Mount Hope, Twenty Rd and Ancaster Infrastructure - Additional flow to Twenty Rd SPS in Stage 1 Servicing Phase 2 Rank: 1	- Supports initial phasing by using existing Upper James St, Mount Hope, Twenty Rd and Ancaster Infrastructure - No additional flow to Twenty Rd SPS in Stage 1 Servicing Phase 2 Rank: 2	
	Flexibility for future AEGD and Airport Growth	- Southern AEGD growth areas could potentially flow to existing Upper James St infrastructure in short term before larger SPS and Forcemain would be required - Limits flexibility for flow along Upper James St by increasing flow to Twenty Rd SPS Rank: 3	- Southern AEGD growth areas could potentially flow to existing Upper James St infrastructure in short term before larger SPS and Forcemain would be required - Hwy 6 trunk sewer constructed in Stage 1 Servicing Phase 2 facilitates growth along Book Rd and Hwy 6 - Limits flexibility for flow along Upper James St by increasing flow to Twenty Rd SPS Rank: 2	- Southern AEGD growth areas could potentially flow to existing Upper James St infrastructure in short term before larger SPS and Forcemain would be required - Maximizes flows to Dickenson trunk sewer, potentially leaving spare capacity at AEGD SPS and Twenty Rd SPS Rank: 1	
	Constructability	- All options are within reasonable depths and alignments - No major constructability issues identified - Deep sewer sections on new sewer south of Dickenson Rd All options equal	- All options are within reasonable depths and alignments - No major constructability issues identified - Deep sewer sections on new sewer south of Dickenson Rd All options equal	- All options are within reasonable depths and alignments - No major constructability issues identified - Deep sewer sections on new sewer south of Dickenson Rd All options equal	
	Impacts to existing service areas	- Additional flow to Twenty Rd SPS will require capacity upgrades - Upgrades required to service southern Stage 1 Servicing Phase 1 ARC lands Rank: 2	- Additional flow to Twenty Rd SPS will require capacity upgrades - Upgrades required to service southern Stage 1 Servicing Phase 1 ARC lands Rank: 2	- Additional flow to Twenty Rd SPS will require capacity upgrades; Option C adds less flow to Twenty Rd SPS than A or B - Upgrades required to service southern Stage 1 Servicing Phase 1 ARC lands Rank: 1	
Economic	Capital Cost	- Overall capital cost: Approximately \$45M Rank: 2	- Overall capital cost: Approximately \$47M Rank: 3	- Overall capital cost: Approximately \$44M Rank: 1	
	Operation and Maintenance Cost	- All Options include one new Pumping Station/Forcemain and have similar lengths of linear works All options equal	- All Options include one new Pumping Station/Forcemain and have similar lengths of linear works All options equal	- All Options include one new Pumping Station/Forcemain and have similar lengths of linear works All options equal	
	Cash Flow	- Hwy 6 trunk sewer deferred to post-2031 Rank: 1	- Servicing Phase 2 requires extensive gravity sewer along Hwy 6 to service central AEGD. Options A & C require similar project post 2031 Rank: 2	- Hwy 6 trunk sewer deferred to post-2031 Rank: 1	
Natural Environment	Aquatic	- Limited major crossings and limited impacts to natural environment including Aquatic Areas, Terrestrial Areas and ESA - Only typical mitigative measures will be required for implementation an are equally applicable to Aquatic Areas, Terrestrial Areas and ESA All options equal	- Limited major crossings and limited impacts to natural environment including Aquatic Areas, Terrestrial Areas and ESA - Only typical mitigative measures will be required for implementation an are equally applicable to Aquatic Areas, Terrestrial Areas and ESA All options equal	- Limited major crossings and limited impacts to natural environment including Aquatic Areas, Terrestrial Areas and ESA - Only typical mitigative measures will be required for implementation an are equally applicable to Aquatic Areas, Terrestrial Areas and ESA All options equal	
	Terrestrial				
	ESA				
Legal	Land Acquisition	- Similar land requirements for all Options - Alignments to be within existing and/or future road allowances - Easement rights may be required to service southern Stage 1 - Servicing Phase 1 ARC Lands All options equal	- Similar land requirements for all Options - Alignments to be within existing and/or future road allowances - Easement rights may be required to service southern Stage 1 - Servicing Phase 1 ARC Lands All options equal	- Similar land requirements for all Options - Alignments to be within existing and/or future road allowances - Easement rights may be required to service southern Stage 1 - Servicing Phase 1 ARC Lands All options equal	
Socio-Economic	Community impacts during development	- Temporary impact to adjacent landowners during construction - Similar alignments for all options and projects being located within existing and future road allowances; all options will have similar impacts during development All options equal	- Temporary impact to adjacent landowners during construction - Similar alignments for all options and projects being located within existing and future road allowances; all options will have similar impacts during development All options equal	- Temporary impact to adjacent landowners during construction - Similar alignments for all options and projects being located within existing and future road allowances; all options will have similar impacts during development All options equal	
	Infrastructure/facility locations	- Similar alignments for all options and projects being located within existing and future road allowances; all options will have similar impacts during development All options equal	- Similar alignments for all options and projects being located within existing and future road allowances; all options will have similar impacts during development All options equal	- Similar alignments for all options and projects being located within existing and future road allowances; all options will have similar impacts during development All options equal	
	Archaeological/Cultural Heritage/Agricultural	- Similar alignments and facility locations for all options - All linear works to be located within existing or proposed road right of way and will be coordinated with roads at the time of development - Additional archaeological assessment will be required during development - Context for existing land uses was addressed in Phase 1 Report All options equal	- Similar alignments and facility locations for all options - All linear works to be located within existing or proposed road right of way and will be coordinated with roads at the time of development - Additional archaeological assessment will be required during development - Context for existing land uses was addressed in Phase 1 Report All options equal	- Similar alignments and facility locations for all options - All linear works to be located within existing or proposed road right of way and will be coordinated with roads at the time of development - Additional archaeological assessment will be required during development - Context for existing land uses was addressed in Phase 1 Report All options equal	
	Impacts on existing service areas (facilities, expansions, etc)	- Increased flow to existing Twenty Rd Sewage Pumping Station will require larger upgrades Rank: 2	- Increased flow to existing Twenty Rd Sewage Pumping Station will require larger upgrades Rank: 2	- Lower flow to existing Twenty Rd Sewage Pumping Station will require smaller upgrades Rank: 1	
OVERALL RANK		2	3	1	Screened Out

- The Do Nothing Alternative does not address the objectives of the project given that the AEGD is an approved service area and requires new infrastructure and upgrades for servicing
- The Do Nothing Alternative has been screened out and not carried further in evaluation

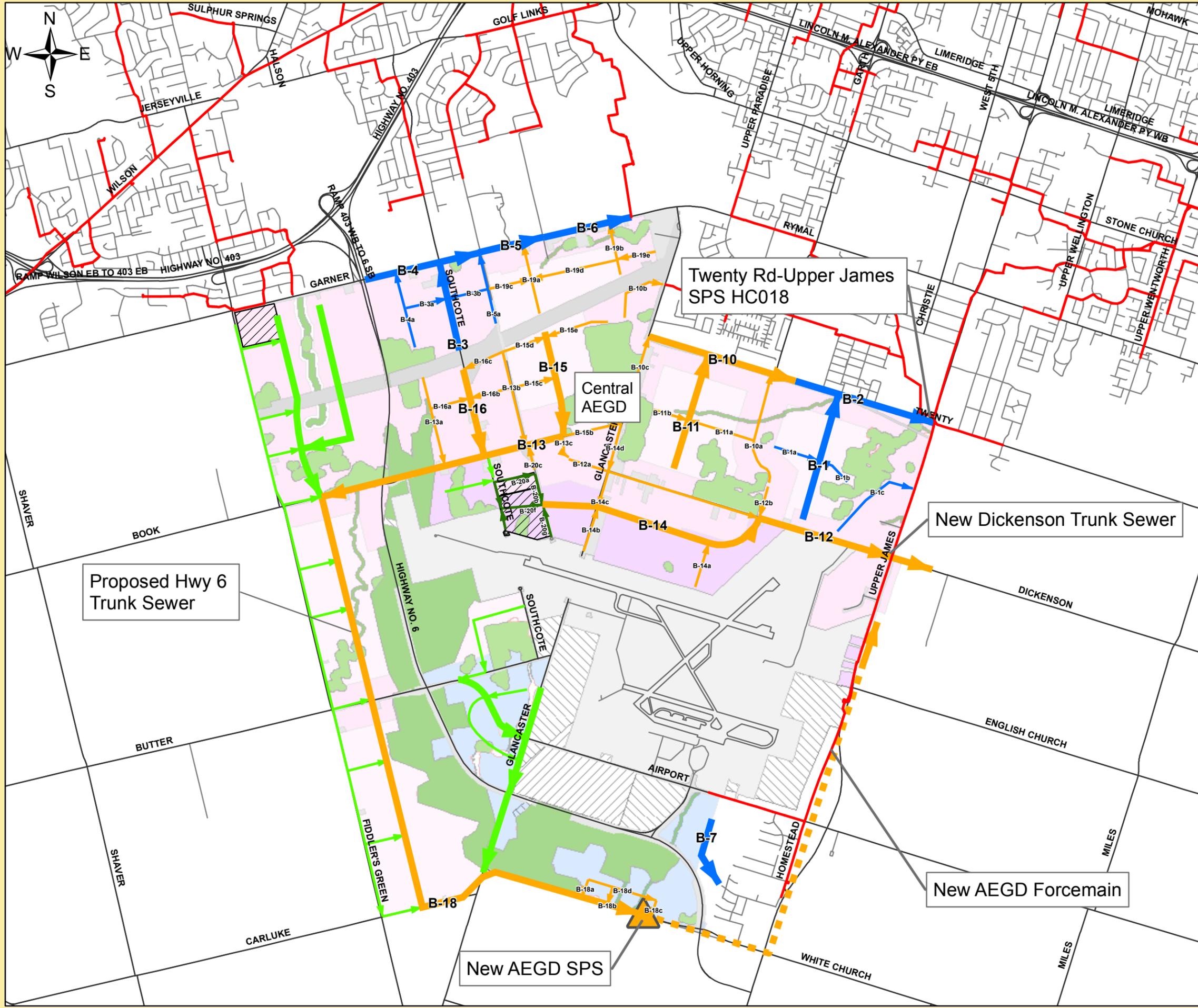


Hamilton

Hamilton AEGD Study
 Figure 10
 Wastewater Servicing
 Option A

Legend

- Existing Trunk Sewers
- Proposed Sewers**
- Trunk Sewers - Servicing Phase 1
- Sub-Trunk Sewers - Servicing Phase 1
- Trunk Sewers - Servicing Phase 2
- Sub-Trunk Sewers - Servicing Phase 2
- Trunk Sewers - Additional Study Area
- Sub-Trunk Sewers - Additional Study Area
- Sewers - Smith Farm
- Roads
- Council Directed Additional Lands



Hamilton

Hamilton AEGD Study
 Figure 11
 Wastewater Servicing
 Option B

Legend

- Existing Trunk Sewers
- Proposed Sewers**
- Trunk Sewers - Servicing Phase 1
- Sub-Trunk Sewers - Servicing Phase 1
- Trunk Sewers - Servicing Phase 2
- Sub-Trunk Sewers - Servicing Phase 2
- Trunk Sewers - Additional Study Area
- Sub-Trunk Sewers - Additional Study Area
- Sewers - Smith Farm
- Roads
- Council Directed Additional Lands

Proposed Hwy 6
Trunk Sewer

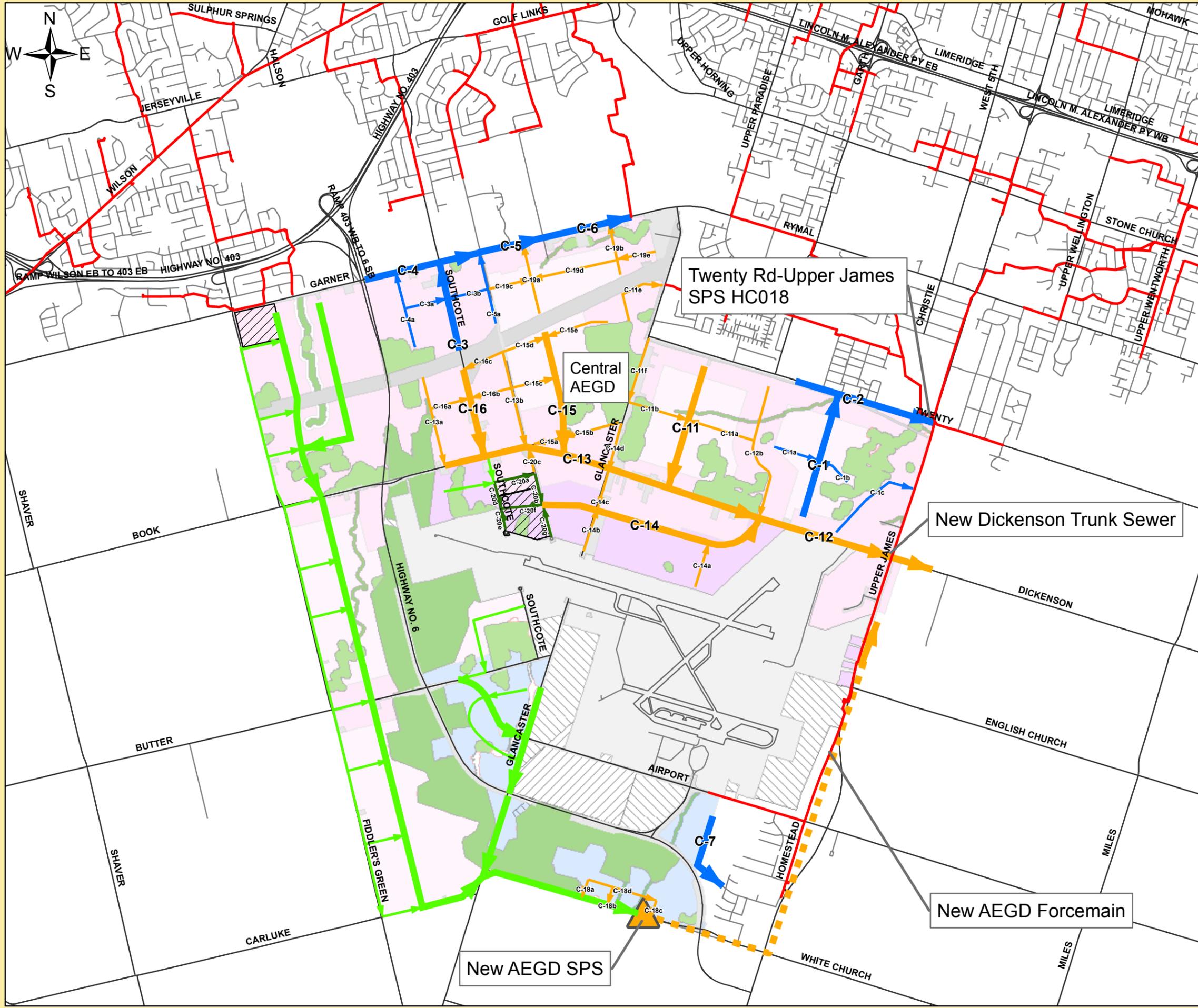
Twenty Rd-Upper James
SPS HC018

Central
AEGD

New Dickenson Trunk Sewer

New AEGD Forcemain

New AEGD SPS



Hamilton

Hamilton AEGD Study
 Figure 12
 Wastewater Servicing
 Option C

Legend

- Existing Trunk Sewers
- Proposed Sewers**
- Trunk Sewers - Servicing Phase 1
- Sub-Trunk Sewers - Servicing Phase 1
- Trunk Sewers - Servicing Phase 2
- Sub-Trunk Sewers - Servicing Phase 2
- Trunk Sewers - Additional Study Area
- Sub-Trunk Sewers - Additional Study Area
- Sewers - Smith Farm
- Roads
- Council Directed Additional Lands



Map Created By: MZ
 Map Checked By: CH
 Date Created: Sept 22, 2009
 Date Modified: Feb 2, 2011

14.0 Preferred Servicing Solution

Based on the evaluations in the previous sections, the following figures depict the preferred water and wastewater servicing solution. These strategies incorporate the preferred phasing option shown in Section 7.0, which include minimizing initial capital expenditures while maximizing available capacity in existing servicing.

The Preferred Water Servicing Strategy that was selected is Option B. This option maximizes the Pressure District 6 service area. This Option takes advantage of the available capacity within the existing system to provide watermain looping and security of supply to both Pressure Districts 6 and 18. This option does not require significant additional upgrades to the water system and can be implemented concurrently with the anticipated phasing of development.

The Preferred Wastewater Servicing Strategy that was selected is Option C. This Option maximizes the gravity service area and, consequently, minimizes the capital cost of a pumping station facility as well as the overall pumping station life cycle, operation and maintenance costs. This strategy has been established and phased such that it will coincide with the future construction of the Dickenson/Centennial Trunk Sewer.

The Water and Wastewater Capital Programs are presented in Table 7 on Page 62 and Table 8 on Page 64 below.

The Water and Wastewater Capital Programs reflect the infrastructure costs generally within the AEGD boundary only. The servicing of the AEGD is also dependent on the currently planned City Wide Water and Wastewater Capital Program established through the Master Plan and Development Charges. The Master Plan infrastructure costs have not been presented in this report.

14.1 Implementation

Notwithstanding the overall water and wastewater servicing strategy for the buildout of the Secondary Plan Area, growth within the AEGD and construction of the AEGD infrastructure will be dependent on available capacity in the existing City infrastructure, timing of completed

upgrades to key facilities in the City, and potential infill rates within the AEGD development area.

For water servicing, there is currently sufficient overall treatment plant capacity at the Woodward Ave. WTP to support the timing of the AEGD development. Buildout of the 2031 GRIDS boundary, including the AEGD will be dependent on the continued capital and maintenance improvements scheduled at the WTP. Continued monitoring of treated flows and performance of the WTP should be undertaken to confirm release of new development.

The water distribution system currently has sufficient transmission and distribution capacity to support Stage 1 of the AEGD. The current City of Hamilton Master Plan has planned upgrades to the Pressure District PD5 pumping station and new feedermain up the escarpment to support development as a whole on the Hamilton Mountain. Timing of currently approved development through the Staging of Development, plus timing of new development in the Hamilton Mountain will also need to be monitored to confirm scheduling of these upgrades. The PD5 pumping station upgrades and new escarpment crossing feedermain will be required for full buildout of the AEGD Secondary Plan Area.

For water storage to the AEGD, PD6 storage will continue to be pumped. There is sufficient storage to support both Phases of the AEGD growth in PD6. There is currently adequate pumped storage for PD18, and does not require expansion for AEGD servicing. However, future elevated storage for PD18 has been recommended. It is recommended that this future elevated storage for PD18 be in service for Phase 2 to provide improved operational benefit.

Water servicing of the Council Directed Additional Lands can be accomplished by extensions from existing and future planned AEGD infrastructure. The Smith Farm can be serviced within Pressure District 6 by the extension of looped watermains along Southcote Rd and on new east-west road alignments. The Ancaster Christian Reform Church lies within the PD18 boundary and can be serviced from the existing 150 mm watermain on Garner Rd or future Master Plan recommended 600 mm watermain on Garner Rd.

For wastewater servicing, there is not currently sufficient overall treatment capacity at the Woodward Ave WWTP to support buildout of the AEGD development. However, the planning

process for expansion of the WWTP has been completed and the City is currently implementing several upgrade stages to achieve the 2031 treatment requirements. It is anticipated at this time that the 2031 treatment capacity will be available in 2014. Once the WWTP upgrades are complete, there will be sufficient capacity to allow all Phases of the AEGD Secondary Plan Area to proceed.

In order to consider allowing Phase 1 of the AEGD Secondary Plan Area to proceed prior to the completion of the Woodward Ave WWTP upgrades, additional monitoring of existing average and peak flows to the plant would need to be undertaken. In addition, monitoring of already committed development through the City's Staging of Development plan would also need to be undertaken. However, based on the requirements and duration of the planning process for the AEGD, the rate for construction of the development and ultimate timing for occupancy, it is anticipated that the overall schedule may coincide with the WWTP commissioning of the new upgrades.

For the wastewater collection system, only the Twenty Road SPS requires upgrades to support Phase 1 of the AEGD Secondary Plan Area. The balance of the existing sewers and pumping stations has sufficient capacity to support Phase 1. However, development within Phase 2 of the AEGD is dependent on the Dickenson/Centennial trunk sewer infrastructure being in service. Based on a potential infill period of approximately 7 years for Phase 1, it is anticipated that the current timing of the Dickenson/Centennial trunk sewer infrastructure will coincide with the Phase 2 development.

Wastewater servicing of the Council Directed Additional Lands can be accomplished similarly to that of water, which is mainly by extensions of the existing infrastructure and future planned AEGD infrastructure. The Smith Farm can be serviced by local sewers sending flows to the Garth St Extension Trunk Sewer, which travels east and north to the New Dickenson Trunk sewer, ultimately draining to the Dickenson/Centennial Trunk. Servicing of the Ancaster Christian Reform Church will require extension of the Ancaster sewer network. Connection to the existing network can be achieved along Garner Rd where a new sewer will be required. In addition, there are potential upgrades required to the Calvin St SPS, forcemain and possibly the downstream sewers in order to service the area. It is recommended that further analysis be

completed to determine the proposed peak flows from the Ancaster Christian Reform Church as well as the current spare capacities of the downstream infrastructure.

In addition, it is anticipated that the construction of the AEGD watermains and sewers will be coordinated with the road works and overall timing of development in the area.

As a follow on process related to the AEGD, the servicing program has been cross-referenced against the current Development Charges capital program. The AEGD Capital Program has been analyzed to determine Development Charges eligible, Direct Developer Contribution and Post-Period Benefit costs. The cost analysis did not result in an increase in Development Charge eligible costs. As part of the development process throughout the City, the program implementation will require frequent development charges updates to re-evaluate the projects and costs. This will establish the Development Charges and Direct Developer financing portions of the infrastructure.

Should AEGD employment densities or boundaries change during development, there is the potential for water and wastewater infrastructure impacts. Consequently, ongoing monitoring of development and additional servicing analysis would be required.

TABLE 7 - WATER CAPITAL PROGRAM

Project ID	Servicing Phase	PD	EA SCH.	Size (mm)	Length (m)	Unit Cost (2009 \$/m)	Base Cost (2009 \$)	Additional Cost (2009 \$)	Engineering / Contingency (25%) (2009 \$)	Total Cost (2009 \$)	Direct Developer Cont. (2009 \$)	Development Charges (2009 \$)	Post Period Benefit (2009 \$)	Overizing (2009 \$)	Benefit to Existing (2009 \$)	Comments
B-1	1	18	A+	300	389	398	\$ 155,000	\$ -	\$ 39,000	\$ 194,000	\$ -	\$ 194,000	\$ -	\$ -	\$ -	Existing Rd Allowance - 100% DC
B-2	1	18	B	400	417	664	\$ 277,000	\$ -	\$ 69,000	\$ 346,000	\$ 207,564	\$ 138,438	\$ -	\$ -	\$ -	
B-3	1	18	A+	400	700	664	\$ 465,000	\$ -	\$ 116,000	\$ 581,000	\$ -	\$ 581,000	\$ -	\$ -	\$ -	Existing Rd Allowance - 100% DC
B-4	1	18	B	300	705	398	\$ 281,000	\$ -	\$ 70,000	\$ 351,000	\$ 351,000	\$ -	\$ -	\$ -	\$ -	
B-5	1	18	B	300	358	398	\$ 143,000	\$ -	\$ 36,000	\$ 179,000	\$ 179,000	\$ -	\$ -	\$ -	\$ -	
B-6	1	18	B	300	420	398	\$ 167,000	\$ -	\$ 42,000	\$ 209,000	\$ 209,000	\$ -	\$ -	\$ -	\$ -	
B-7	1	6	B	300	621	398	\$ 247,000	\$ -	\$ 62,000	\$ 309,000	\$ 309,000	\$ -	\$ -	\$ -	\$ -	
B-8	1	6	B	300	565	398	\$ 225,000	\$ -	\$ 56,000	\$ 281,000	\$ 281,000	\$ -	\$ -	\$ -	\$ -	
B-9	1	6	B	300	512	398	\$ 204,000	\$ -	\$ 51,000	\$ 255,000	\$ 255,000	\$ -	\$ -	\$ -	\$ -	
B-10	1	6	B	300	659	398	\$ 262,000	\$ -	\$ 66,000	\$ 328,000	\$ 328,000	\$ -	\$ -	\$ -	\$ -	
B-11	1	6	B	300	700	398	\$ 279,000	\$ -	\$ 70,000	\$ 349,000	\$ 349,000	\$ -	\$ -	\$ -	\$ -	
B-12	1	6	B	300	675	398	\$ 269,000	\$ -	\$ 67,000	\$ 336,000	\$ 336,000	\$ -	\$ -	\$ -	\$ -	
B-13	1	6	B	300	856	398	\$ 341,000	\$ -	\$ 85,000	\$ 426,000	\$ -	\$ 426,000	\$ -	\$ -	\$ -	Existing Rd Allowance - 100% DC
B-14	1	6	B	300	594	398	\$ 236,000	\$ -	\$ 59,000	\$ 295,000	\$ 295,000	\$ -	\$ -	\$ -	\$ -	
B-15	1	18	A+	400	383	664	\$ 254,000	\$ -	\$ 64,000	\$ 318,000	\$ -	\$ 318,000	\$ -	\$ -	\$ -	Existing Rd Allowance - 100% DC
B-20	2	18	B*	7 ML			\$ -	\$ -	\$ 6,265,820	\$ -	\$ 3,132,910	\$ -	\$ -	\$ -	\$ 3,132,910	El. Tank split 50/50 with ex. Z18
B-21	2	6	B*	400	372	664	\$ 247,000	\$ -	\$ 62,000	\$ 309,000	\$ -	\$ 185,179	\$ 123,821	\$ -	\$ -	Zone 6 Trunk - DC with PP Benefit
B-22	2	18	A+	300	590	398	\$ 235,000	\$ -	\$ 59,000	\$ 294,000	\$ -	\$ 294,000	\$ -	\$ -	\$ -	Existing Rd Allowance - 100% DC
B-23	2	18	A+	300	603	398	\$ 240,000	\$ -	\$ 60,000	\$ 300,000	\$ -	\$ 300,000	\$ -	\$ -	\$ -	Existing Rd Allowance - 100% DC
B-24	2	18	B	300	354	398	\$ 141,000	\$ -	\$ 35,000	\$ 176,000	\$ 176,000	\$ -	\$ -	\$ -	\$ -	
B-25	2	18	B	300	579	398	\$ 231,000	\$ -	\$ 58,000	\$ 289,000	\$ 289,000	\$ -	\$ -	\$ -	\$ -	
B-26	2	18	B	400	421	664	\$ 280,000	\$ -	\$ 70,000	\$ 350,000	\$ 209,744	\$ 140,256	\$ -	\$ -	\$ -	
B-27	2	18	B	300	418	398	\$ 166,000	\$ -	\$ 42,000	\$ 208,000	\$ 208,000	\$ -	\$ -	\$ -	\$ -	
B-28	2	18	B	300	436	398	\$ 174,000	\$ -	\$ 44,000	\$ 218,000	\$ 218,000	\$ -	\$ -	\$ -	\$ -	
B-29	2	6	B*	400	2559	664	\$ 1,698,000	\$ -	\$ 425,000	\$ 2,123,000	\$ -	\$ 2,123,000	\$ -	\$ -	\$ -	Zone 6 Trunk - 100% DC
B-30	2	18	B	400	568	664	\$ 377,000	\$ -	\$ 94,000	\$ 471,000	\$ 282,677	\$ 188,323	\$ -	\$ -	\$ -	
B-31	2	18	B	400	863	664	\$ 573,000	\$ -	\$ 143,000	\$ 716,000	\$ 429,594	\$ 286,406	\$ -	\$ -	\$ -	
B-32	2	18	B	400	552	664	\$ 366,000	\$ -	\$ 92,000	\$ 458,000	\$ 274,781	\$ 183,219	\$ -	\$ -	\$ -	
B-33	2	6	A+	300	953	398	\$ 380,000	\$ -	\$ 95,000	\$ 475,000	\$ -	\$ 475,000	\$ -	\$ -	\$ -	Existing Rd Allowance - 100% DC
B-34	2	18	A+	400	293	664	\$ 195,000	\$ -	\$ 49,000	\$ 244,000	\$ 146,025	\$ 97,975	\$ -	\$ -	\$ -	
B-35	2	18	B	300	416	398	\$ 166,000	\$ -	\$ 42,000	\$ 208,000	\$ 208,000	\$ -	\$ -	\$ -	\$ -	
B-36	2	18	B	300	586	398	\$ 233,000	\$ -	\$ 58,000	\$ 291,000	\$ 291,000	\$ -	\$ -	\$ -	\$ -	
B-37	2	18	B	300	295	398	\$ 117,000	\$ -	\$ 29,000	\$ 146,000	\$ 146,000	\$ -	\$ -	\$ -	\$ -	
B-38	2	18	B	300	412	398	\$ 164,000	\$ -	\$ 41,000	\$ 205,000	\$ 205,000	\$ -	\$ -	\$ -	\$ -	
B-39	2	6	A+	300	259	398	\$ 103,000	\$ -	\$ 26,000	\$ 129,000	\$ -	\$ 129,000	\$ -	\$ -	\$ -	Existing Rd Allowance - 100% DC
B-40	2	18	B	300	268	398	\$ 107,000	\$ -	\$ 27,000	\$ 134,000	\$ 134,000	\$ -	\$ -	\$ -	\$ -	
B-41	2	18	A+	300	627	398	\$ 250,000	\$ -	\$ 63,000	\$ 313,000	\$ -	\$ 313,000	\$ -	\$ -	\$ -	Existing Rd Allowance - 100% DC
B-42	2	18	A+	300	350	398	\$ 139,000	\$ -	\$ 35,000	\$ 174,000	\$ -	\$ 174,000	\$ -	\$ -	\$ -	Existing Rd Allowance - 100% DC
B-43	2	18	A+	300	416	398	\$ 166,000	\$ -	\$ 42,000	\$ 208,000	\$ 208,000	\$ -	\$ -	\$ -	\$ -	Existing Rd Allowance - 100% DC
B-44	2	18	B	300	569	398	\$ 227,000	\$ -	\$ 57,000	\$ 284,000	\$ 284,000	\$ -	\$ -	\$ -	\$ -	
B-45	2	18	B	300	416	398	\$ 166,000	\$ -	\$ 42,000	\$ 208,000	\$ 208,000	\$ -	\$ -	\$ -	\$ -	
B-46	2	18	B	300	432	398	\$ 172,000	\$ -	\$ 43,000	\$ 215,000	\$ 215,000	\$ -	\$ -	\$ -	\$ -	
B-47	2	18	B	300	784	398	\$ 312,000	\$ -	\$ 78,000	\$ 390,000	\$ 390,000	\$ -	\$ -	\$ -	\$ -	
B-48	2	18	B	300	645	398	\$ 257,000	\$ -	\$ 64,000	\$ 321,000	\$ 321,000	\$ -	\$ -	\$ -	\$ -	
B-49	2	6	A+	300	896	398	\$ 353,000	\$ -	\$ 89,000	\$ 441,000	\$ -	\$ 441,000	\$ -	\$ -	\$ -	Existing Rd Allowance - 100% DC
B-50	2	6	A+	300	697	398	\$ 274,000	\$ -	\$ 69,000	\$ 343,000	\$ -	\$ 343,000	\$ -	\$ -	\$ -	Existing Rd Allowance - 100% DC
B-51	2	6	B*	400	595	664	\$ 395,000	\$ -	\$ 99,000	\$ 494,000	\$ -	\$ 296,186	\$ 197,814	\$ -	\$ -	Zone 6 Trunk - DC with PP Benefit
B-52	2	6	A+	300	598	398	\$ 238,000	\$ -	\$ 60,000	\$ 298,000	\$ -	\$ 298,000	\$ -	\$ -	\$ -	Existing Rd Allowance - 100% DC
B-53	2	6	B	300	636	398	\$ 253,000	\$ -	\$ 63,000	\$ 316,000	\$ 316,000	\$ -	\$ -	\$ -	\$ -	
B-54	2	6	B	300	624	398	\$ 248,000	\$ -	\$ 62,000	\$ 310,000	\$ 310,000	\$ -	\$ -	\$ -	\$ -	
B-55	2	6	B*	400	837	664	\$ 556,000	\$ -	\$ 139,000	\$ 695,000	\$ -	\$ 695,000	\$ -	\$ -	\$ -	Zone 6 Trunk - 100% DC
B-56	2	6	B	300	680	398	\$ 271,000	\$ -	\$ 68,000	\$ 339,000	\$ 339,000	\$ -	\$ -	\$ -	\$ -	
B-57	2	6	B	300	709	398	\$ 282,000	\$ -	\$ 71,000	\$ 353,000	\$ 353,000	\$ -	\$ -	\$ -	\$ -	
B-58	2	6	A+	300	870	398	\$ 346,000	\$ -	\$ 87,000	\$ 433,000	\$ -	\$ 433,000	\$ -	\$ -	\$ -	Existing Rd Allowance - 100% DC
B-59	2	6	B	300	177	398	\$ 70,000	\$ -	\$ 18,000	\$ 88,000	\$ 88,000	\$ -	\$ -	\$ -	\$ -	
B-60	2	6	B	300	514	398	\$ 205,000	\$ -	\$ 51,000	\$ 256,000	\$ 256,000	\$ -	\$ -	\$ -	\$ -	
B-61	2	6	B*	400	1181	664	\$ 784,000	\$ -	\$ 196,000	\$ 980,000	\$ -	\$ 980,000	\$ -	\$ -	\$ -	Zone 6 Trunk - 100% DC
B-62	2	6	B*	400	607	664	\$ 403,000	\$ -	\$ 101,000	\$ 504,000	\$ -	\$ 504,000	\$ -	\$ -	\$ -	Zone 6 Trunk - 100% DC
B-63	2	6	A+	300	322	398	\$ 128,000	\$ -	\$ 32,000	\$ 160,000	\$ -	\$ 160,000	\$ -	\$ -	\$ -	Existing Rd Allowance - 100% DC
B-64	2	6	B	300	180	398	\$ 72,000	\$ -	\$ 18,000	\$ 90,000	\$ 90,000	\$ -	\$ -	\$ -	\$ -	
B-65	2	6	B	300	700	398	\$ 279,000	\$ -	\$ 70,000	\$ 349,000	\$ 349,000	\$ -	\$ -	\$ -	\$ -	
B-66	2	6	B	300	180	398	\$ 72,000	\$ -	\$ 18,000	\$ 90,000	\$ 90,000	\$ -	\$ -	\$ -	\$ -	
B-67	2	6	B	300	450	398	\$ 179,000	\$ -	\$ 45,000	\$ 224,000	\$ 224,000	\$ -	\$ -	\$ -	\$ -	
B-68	2	6	B*	400	662	664	\$ 439,000	\$ -	\$ 110,000	\$ 549,000	\$ -	\$ 549,000	\$ -	\$ -	\$ -	Zone 6 Trunk - 100% DC
B-69	2	6	B*	400	397	664	\$ 263,000	\$ -	\$ 66,000	\$ 329,000	\$ -	\$ 197,623	\$ 131,377	\$ -	\$ -	Zone 6 Trunk - DC with PP Benefit
SUBTOTAL - SECONDARY PLAN AREA						37,083	\$ 17,797,000	\$ -	\$ 4,458,000	\$ 28,528,820	\$ 10,358,385	\$ 14,576,513	\$ 453,012	\$ -	\$ 3,132,910	
B-67	-	6	B	300	400	398	\$ 159,000	\$ -	\$ 40,000	\$ 199,000	\$ 199,000	\$ -	\$ -	\$ -	\$ -	
B-68	-	6	B	300	530	398	\$ 211,000	\$ -	\$ 53,000	\$ 264,000	\$ 264,000	\$ -	\$ -	\$ -	\$ -	
B-69	-	6	A+	300	400	398	\$ 159,000	\$ -	\$ 40,000	\$ 199,000	\$ -	\$ 199,000	\$ -	\$ -	\$ -	Existing Rd Allowance - 100% DC
SUBTOTAL - SMITH PROPERTY						1,330	\$ 529,000	\$ -	\$ 133,000	\$ 662,000	\$ 463,000	\$ 199,000	\$ -	\$ -	\$ -	
TOTAL						38,413	\$ 18,326,000	\$ -	\$ 4,591,000	\$ 29,182,820	\$ 10,821,385	\$ 14,775,513	\$ 453,012	\$ -	\$ 3,132,910	

Note: EA Schedule B projects will be on future road alignments and will be re-classified as A+ once road right-of-ways are established. Schedule B* projects were previously approved under 2006 City Wide Water and Wastewater Master Plan



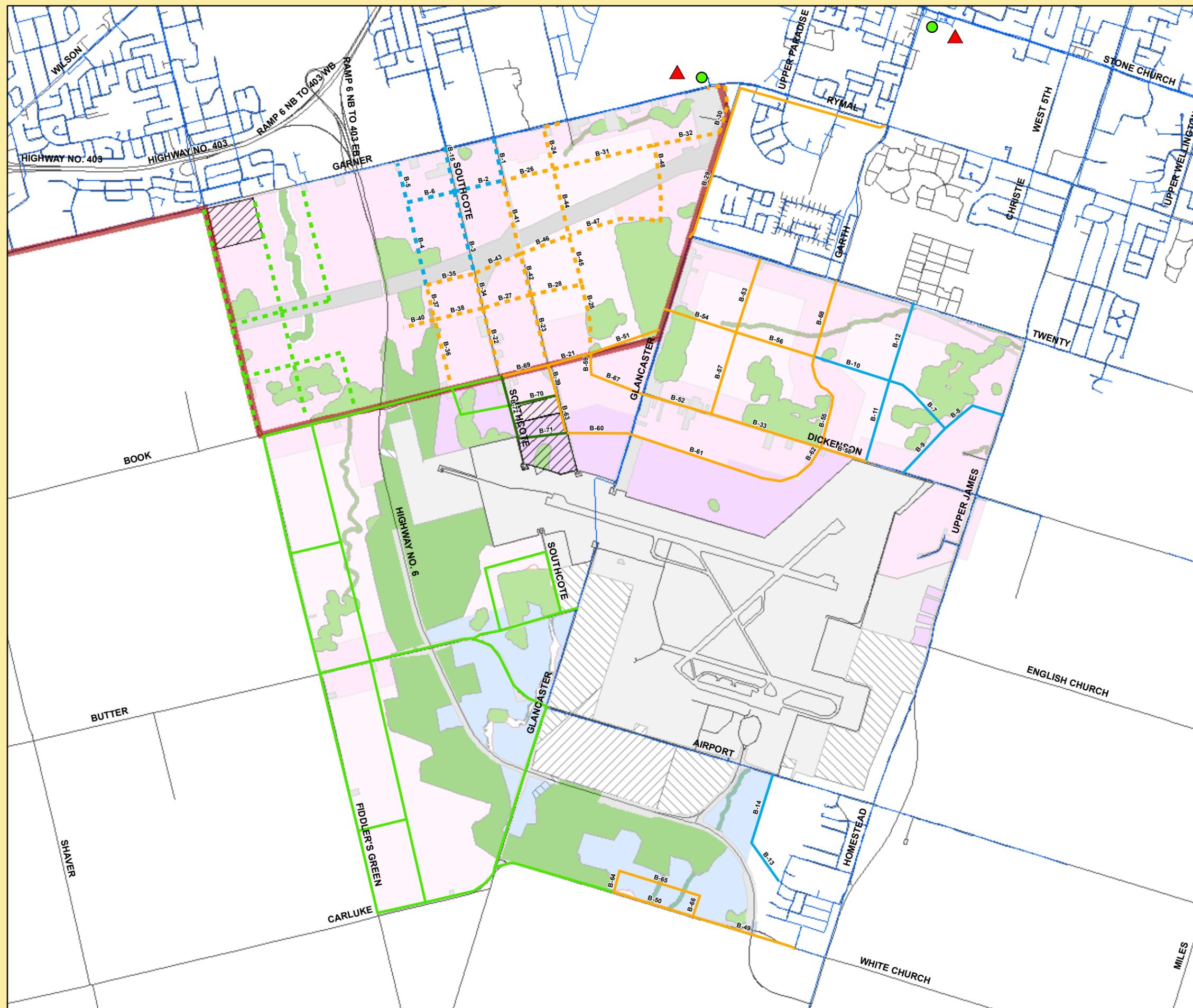
Hamilton

Hamilton AEGD Study

Figure 13 Preferred Water Servicing Option

Legend

- Existing Reservoir
- Existing Pump
- Proposed Watermains**
 - PD 18 Servicing Phase 1
 - PD 18 Servicing Phase 2
 - PD 18 Additional Study Area
 - PD 6 Servicing Phase 1
 - PD 6 Servicing Phase 2
 - PD 6 Additional Study Area
 - PD 6 Smith Farm
 - Proposed Pressure District 6/18 Boundary
 - Existing Watermains
 - Roads
 - Council Directed Additional Lands



Map Created By: MZ
 Map Checked By: CH
 Date Created: Sept 10, 2009
 Date Modified: Feb 2, 2011

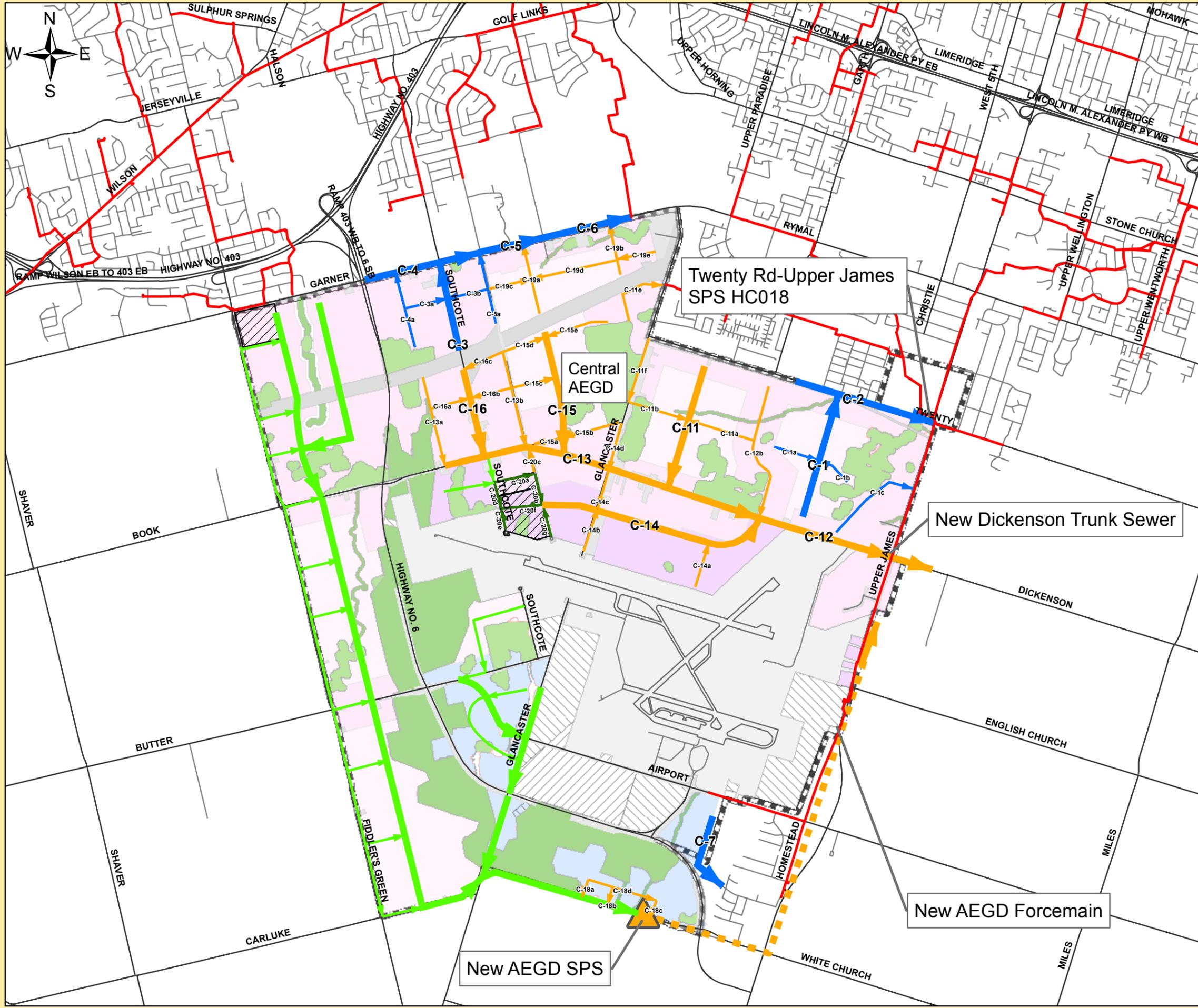
TABLE 8 - WASTEWATER CAPITAL PROGRAM

SERVICING OPTION C

Project ID	Servicing Phase	EA SCH.	Size	Length	Unit Cost	Base Cost	Additional Cost	Engineering / Contingency (25%)	Total Cost	Direct Developer Cont.	Development Charges	Post Period Benefit	Oversizing	Benefit to Existing	Comments
			(mm)	(m)	(2009 \$/m)	(2009 \$)	(2009 \$)	(2009 \$)	(2009 \$)	(2009 \$)	(2009 \$)	(2009 \$)	(2009 \$)	(2009 \$)	
C-1	1	B	375	1,275	485	\$ 618,000	\$ -	\$ 155,000	\$ 773,000	\$ 773,000	\$ -	\$ -	\$ -	\$ -	
C-1a	1	B	375	450	485	\$ 218,000	\$ -	\$ 55,000	\$ 273,000	\$ 273,000	\$ -	\$ -	\$ -	\$ -	
C-1b	1	B	375	350	485	\$ 170,000	\$ -	\$ 43,000	\$ 213,000	\$ 213,000	\$ -	\$ -	\$ -	\$ -	
C-1c	1	B	375	950	485	\$ 460,000	\$ -	\$ 115,000	\$ 575,000	\$ 575,000	\$ -	\$ -	\$ -	\$ -	
C-2	1	A+	375	1,400	485	\$ 678,000	\$ -	\$ 170,000	\$ 848,000	\$ -	\$ 848,000	\$ -	\$ -	\$ -	Existing Rd Allowance - 100% DC
C-3	1	A+	375	875	485	\$ 424,000	\$ -	\$ 106,000	\$ 530,000	\$ -	\$ 530,000	\$ -	\$ -	\$ -	Existing Rd Allowance - 100% DC
C-3a	1	B	375	400	485	\$ 194,000	\$ -	\$ 49,000	\$ 243,000	\$ 243,000	\$ -	\$ -	\$ -	\$ -	
C-3b	1	B	375	425	485	\$ 206,000	\$ -	\$ 52,000	\$ 258,000	\$ 258,000	\$ -	\$ -	\$ -	\$ -	
C-4	1	A+	375	1,150	1427	\$ 1,641,000	\$ -	\$ 410,000	\$ 2,051,000	\$ -	\$ 2,051,000	\$ -	\$ -	\$ -	Deep Section - Increased unit cost
C-4a	1	B	375	750	485	\$ 363,000	\$ -	\$ 91,000	\$ 454,000	\$ 454,000	\$ -	\$ -	\$ -	\$ -	
C-5	1	A+	450	630	1615	\$ 1,017,000	\$ -	\$ 254,000	\$ 1,271,000	\$ -	\$ 1,271,000	\$ -	\$ -	\$ -	Deep Section - Increased unit cost
C-6	1	A+	600	880	584	\$ 514,000	\$ -	\$ 129,000	\$ 643,000	\$ -	\$ 643,000	\$ -	\$ -	\$ -	Existing Rd Allowance - 100% DC
C-6a	1	A+	375	700	485	\$ 339,000	\$ -	\$ 85,000	\$ 424,000	\$ -	\$ 424,000	\$ -	\$ -	\$ -	Existing Rd Allowance - 100% DC
C-7	1	B	375	850	485	\$ 412,000	\$ -	\$ 103,000	\$ 515,000	\$ -	\$ 515,000	\$ -	\$ -	\$ -	Existing Rd Allowance - 100% DC
SPS2	1	A+							\$ 700,000	\$ -	\$ 700,000	\$ -	\$ -	\$ -	Twenty Rd SPS Upgrades
C-11	2	B	375	1,200	485	\$ 581,000	\$ -	\$ 145,000	\$ 726,000	\$ 726,000	\$ -	\$ -	\$ -	\$ -	
C-11a	2	B	375	675	485	\$ 327,000	\$ -	\$ 82,000	\$ 409,000	\$ 409,000	\$ -	\$ -	\$ -	\$ -	
C-11b	2	B	375	350	485	\$ 170,000	\$ -	\$ 43,000	\$ 213,000	\$ 213,000	\$ -	\$ -	\$ -	\$ -	
C-11e	2	B	375	670	485	\$ 325,000	\$ -	\$ 81,000	\$ 406,000	\$ 406,000	\$ -	\$ -	\$ -	\$ -	
C-11f	2	A+	375	600	485	\$ 291,000	\$ -	\$ 73,000	\$ 364,000	\$ -	\$ 364,000	\$ -	\$ -	\$ -	Existing Rd Allowance - 100% DC
C-12	2	A+	750	3,339	2379	\$ 7,943,000	\$ -	\$ 1,986,000	\$ 9,929,000	\$ -	\$ 9,929,000	\$ -	\$ -	\$ -	Deep Sewer (7-10m) - Increased Unit Cost
C-12b	2	B	375	1,500	485	\$ 727,000	\$ -	\$ 182,000	\$ 909,000	\$ 909,000	\$ -	\$ -	\$ -	\$ -	
C-13	2	A+	600	1,175	2049	\$ 2,408,000	\$ -	\$ 602,000	\$ 3,010,000	\$ -	\$ 3,010,000	\$ -	\$ -	\$ -	Deep Sewer (7-10m) - Increased Unit Cost
C-13a	2	B	375	900	485	\$ 436,000	\$ -	\$ 109,000	\$ 545,000	\$ 545,000	\$ -	\$ -	\$ -	\$ -	
C-13b	2	A+	375	950	485	\$ 460,000	\$ -	\$ 115,000	\$ 575,000	\$ -	\$ 575,000	\$ -	\$ -	\$ -	Existing Rd Allowance - 100% DC
C-14	2	B	525	2,275	1926	\$ 4,154,000	\$ -	\$ 1,039,000	\$ 5,193,000	\$ -	\$ 4,592,666	\$ 600,344	\$ -	\$ -	Deep Sewer (6-10m) - Increased Unit Cost
C-14a	2	B	375	450	485	\$ 218,000	\$ -	\$ 55,000	\$ 273,000	\$ 273,000	\$ -	\$ -	\$ -	\$ -	
C-14b	2	A+	375	450	485	\$ 218,000	\$ -	\$ 55,000	\$ 273,000	\$ -	\$ 273,000	\$ -	\$ -	\$ -	Existing Rd Allowance - 100% DC
C-14c	2	A+	375	375	485	\$ 182,000	\$ -	\$ 46,000	\$ 228,000	\$ -	\$ 228,000	\$ -	\$ -	\$ -	Existing Rd Allowance - 100% DC
C-14d	2	A+	375	500	485	\$ 242,000	\$ -	\$ 61,000	\$ 303,000	\$ -	\$ 303,000	\$ -	\$ -	\$ -	Existing Rd Allowance - 100% DC
C-15	2	B	375	1,225	485	\$ 594,000	\$ -	\$ 149,000	\$ 743,000	\$ 743,000	\$ -	\$ -	\$ -	\$ -	
C-15a	2	A+	375	350	485	\$ 170,000	\$ -	\$ 43,000	\$ 213,000	\$ -	\$ 213,000	\$ -	\$ -	\$ -	Existing Rd Allowance - 100% DC
C-15b	2	A+	375	575	485	\$ 279,000	\$ -	\$ 70,000	\$ 349,000	\$ -	\$ 349,000	\$ -	\$ -	\$ -	Existing Rd Allowance - 100% DC
C-15c	2	B	375	450	485	\$ 218,000	\$ -	\$ 55,000	\$ 273,000	\$ 273,000	\$ -	\$ -	\$ -	\$ -	
C-15d	2	B	375	450	485	\$ 218,000	\$ -	\$ 55,000	\$ 273,000	\$ 273,000	\$ -	\$ -	\$ -	\$ -	
C-15e	2	B	375	625	485	\$ 303,000	\$ -	\$ 76,000	\$ 379,000	\$ 379,000	\$ -	\$ -	\$ -	\$ -	
C-16	2	A+	375	875	485	\$ 424,000	\$ -	\$ 106,000	\$ 530,000	\$ -	\$ 530,000	\$ -	\$ -	\$ -	Existing Rd Allowance - 100% DC
C-16a	2	B	375	400	485	\$ 194,000	\$ -	\$ 49,000	\$ 243,000	\$ 243,000	\$ -	\$ -	\$ -	\$ -	
C-16b	2	B	375	425	485	\$ 206,000	\$ -	\$ 52,000	\$ 258,000	\$ 258,000	\$ -	\$ -	\$ -	\$ -	
C-16c	2	B	375	425	485	\$ 206,000	\$ -	\$ 52,000	\$ 258,000	\$ 258,000	\$ -	\$ -	\$ -	\$ -	
C-18a	2	B	375	175	485	\$ 85,000	\$ -	\$ 21,000	\$ 106,000	\$ 106,000	\$ -	\$ -	\$ -	\$ -	
C-18b	2	B	375	175	485	\$ 85,000	\$ -	\$ 21,000	\$ 106,000	\$ 106,000	\$ -	\$ -	\$ -	\$ -	
C-18c	2	B	375	175	485	\$ 85,000	\$ -	\$ 21,000	\$ 106,000	\$ 106,000	\$ -	\$ -	\$ -	\$ -	
C-18d	2	B	375	700	485	\$ 339,000	\$ -	\$ 85,000	\$ 424,000	\$ 424,000	\$ -	\$ -	\$ -	\$ -	
C-19a	2	B	375	699	485	\$ 339,000	\$ -	\$ 85,000	\$ 424,000	\$ 424,000	\$ -	\$ -	\$ -	\$ -	
C-19b	2	B	375	518	485	\$ 251,000	\$ -	\$ 63,000	\$ 314,000	\$ 314,000	\$ -	\$ -	\$ -	\$ -	
C-19c	2	B	375	435	485	\$ 211,000	\$ -	\$ 53,000	\$ 264,000	\$ 264,000	\$ -	\$ -	\$ -	\$ -	
C-19d	2	B	375	859	485	\$ 416,000	\$ -	\$ 104,000	\$ 520,000	\$ 520,000	\$ -	\$ -	\$ -	\$ -	
C-19e	2	B	375	381	485	\$ 185,000	\$ -	\$ 46,000	\$ 231,000	\$ 231,000	\$ -	\$ -	\$ -	\$ -	
C-20c	2	A+	375	275	485	\$ 133,000	\$ -	\$ 33,000	\$ 166,000	\$ -	\$ 166,000	\$ -	\$ -	\$ -	Existing Rd Allowance - 100% DC
SPS1	2	B*	40 L/s			\$ 1,478,000	\$ -	\$ 370,000	\$ 1,848,000	\$ -	\$ 1,848,000	\$ -	\$ -	\$ -	SPS to service ARC lands to 2031 in south AEGD
FM	2	B*	300	4,700	398	\$ 2,340,000	\$ -	\$ 585,000	\$ 2,925,000	\$ -	\$ 2,925,000	\$ -	\$ -	\$ -	FM from SPS1 to Dickenson/Cent Trunk Sewer
SUBTOTALS - SECONDARY PLAN AREA				41,386		\$ 34,695,000	\$ -	\$ 8,685,000	\$ 44,080,000	\$ 15,784,656	\$ 28,295,344	\$ -	\$ -	\$ -	
C-20a	-	B	375	400	485	\$ 194,000	\$ -	\$ 49,000	\$ 243,000	\$ 243,000	\$ -	\$ -	\$ -	\$ -	
C-20b	-	A+	375	300	485	\$ 145,000	\$ -	\$ 36,000	\$ 181,000	\$ -	\$ 181,000	\$ -	\$ -	\$ -	Existing Rd Allowance - 100% DC
C-20d	-	A+	375	260	485	\$ 126,000	\$ -	\$ 32,000	\$ 158,000	\$ -	\$ 158,000	\$ -	\$ -	\$ -	Existing Rd Allowance - 100% DC
C-20e	-	A+	375	210	485	\$ 102,000	\$ -	\$ 26,000	\$ 128,000	\$ -	\$ 128,000	\$ -	\$ -	\$ -	Existing Rd Allowance - 100% DC
C-20f	-	B	375	400	485	\$ 194,000	\$ -	\$ 49,000	\$ 243,000	\$ 243,000	\$ -	\$ -	\$ -	\$ -	
C-20g	-	A+	375	325	485	\$ 157,000	\$ -	\$ 39,000	\$ 196,000	\$ -	\$ 196,000	\$ -	\$ -	\$ -	Existing Rd Allowance - 100% DC
SUBTOTALS - SMITH PROPERTY				1,895		\$ 918,000	\$ -	\$ 231,000	\$ 1,149,000	\$ 486,000	\$ 663,000	\$ -	\$ -	\$ -	
TOTALS				43,281		\$ 35,613,000	\$ -	\$ 8,916,000	\$ 45,229,000	\$ 16,270,656	\$ 28,958,344	\$ -	\$ -	\$ -	

Notes:

- EA Schedule B projects will be on future road alignments and will be re-classified as A+ once road right-of-ways are established. Schedule B* projects were previously approved under 2006 City Wide Water and Wastewater Master Plan
- Wastewater main diameters are preliminary and are subject to further detailed analysis and sizing during the detailed design stage



Hamilton

Hamilton AEGD Study
 Figure 14
 Preferred Wastewater Servicing
 Option

Legend

- Existing Trunk Sewers
- Proposed Sewers**
- Trunk Sewers - Servicing Phase 1
- Sub-Trunk Sewers - Servicing Phase 1
- Trunk Sewers - Servicing Phase 2
- Sub-Trunk Sewers - Servicing Phase 2
- Trunk Sewers - Additional Study Area
- Sub-Trunk Sewers Additional Study Area
- Sewers - Smith Farm
- Roads
- Council Directed Additional Lands