BLOCK SERVICING STRATEGY

FRUITLAND-WINONA SECONDARY PLAN
BLOCK 1

City of Hamilton

Hamilton Conservation Authority

Project #: 20-263W

Final Submission: June 2025

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EXECUTIVE SUMMARY

On May 14, 2014, the City of Hamilton Council passed Amendment No. 17 to incorporate the Fruitland Winona Secondary Plan into the Urban Hamilton Official Plan.

The Secondary Plan has identified three blocks: Block 1, Block 2 and Block 3, for the completion of the servicing strategies (as shown in **Appendix A-2**). The Fruitland-Winona Block 1 Secondary Plan Servicing Strategy (BSS1) presents the servicing strategy for Block 1, which is bounded by Barton Street to the north, Watercourse 6.0 (WC6.0) to the east, Highway 8 to the south, and Fruitland Road to the west.

The recommended concept plan (FIG-3) included with this report has been prepared to support the BSS1 and is consistent with the Secondary Plan.

Stormwater Management and Storm Sewers

The Stoney Creek Urban Boundary Expansion Subwatershed Study (SCUBE SWS) was undertaken in support of the Secondary Plan. The BSS1 references the SCUBE SWS for the overall strategy and recommended works for the Block 1 lands. Stormwater drainage for Watercourse 5.0 (WC5.0) within Block 1 will be directed to two new centralized SWM Ponds which will provide quantity, quality, and erosion control for the area. Stormwater drainage for WC6.0 within Block 1 will be directed to a new centralized SWM Pond which will provide quantity, quality, and erosion control for the area.

For areas that cannot be routed through SWM ponds, on-site controls or the release of uncontrolled flows are proposed.

The Block plan contemplates reconstruction and naturalization of WC5.0 From Barton Street to Fruitland Road. It is anticipated that the channel may be constructed in stages. Interim conditions will be studied in support of draft plan approval and will be subject to approval of the City and the HCA.

Culvert improvements on Barton Street at WC5.0 and WC6.0 are assumed to be completed (if required) in conjunction with the Barton Street and Fifty Road Improvements Phases 3 and 4 and CN Rail Phases 1 and 2 Municipal Class Environmental Assessment process.

Natural Heritage

Colville Consulting was retained by the Fruitland-Winona Block 1 Owners to provide a natural heritage characterization of the lands included in the BSS1. The primary natural heritage features in the Block 1 land include WC5.0 and WC6.0. The Colville study supports the relocation of

WC5.0 with appropriate buffering, riparian enhancements, and improvement to in-stream habitat features, which will result in an overall net environmental benefit to the watercourse.

Sanitary Sewers

Block 1 will be serviced via extensions of existing sanitary sewers on Barton Street. Existing sanitary sewers situated south of Barton Street on Jones Road and Fruitland Road are adequate to serve Block 1. Theoretical capacity constraints exist in sanitary sewers situated north of Barton Street on Fruitland Road and Jones Road which have been attributed to future development areas outside of the secondary plan area. Monitoring of sewers downstream of Barton is recommended in the future to firm up improvements need for lands outside of the Secondary plan areas.

Watermains

Water servicing will be accomplished by connections to existing local watermains within the boundary roads. The modelling results indicate that the water supply distribution system is capable of providing adequate flows and pressures to support the proposed development. No external servicing improvements are required for the provision of watermain servicing to Block 1.

Traffic

The Block 1 plan incorporates the findings of the Gordon Dean Municipal Class Environmental Assessment (EA). Development of Block 1 requires a variety local intersection improvement (increased left turn storage) where the block impacts intersections within the boundary roads. Signal timing adjustments will also be required at current signalized intersections. Fruitland Road is proposed to have an ultimate 26.0m wide road allowance; reduced from the existing 36 m. An extension

Conceptual designs of both Fruitland Road and Jones Road have been developed based on a right-of-way (ROW) width of 26 m (ROW-1 and ROW-2). An objective of this study is to gain City acceptance of 26m ROW for Fruitland Road.

Air Drainage

An air drainage analysis was undertaken by WSP consultants which indicates that the proposed development is not expected to block the south-westerly to north-easterly direction air flow or significantly impede the natural air movement in the area due to the alignment of the current and proposed roads and watercourses. Fruitland Road, Gordon Dean Avenue, and Jones Road, in collaboration with Street B and Street C are considered the main channels to facilitate the air flow within the development.

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Fluvial Geomorphology

GEO Morphix conducted a Fluvial Geomorphology Study to investigate the potential for excess erosion to occur in the receiving watercourse associated with the SWM pond outflows from the proposed development within the subject property. Assessments of the receiving WC5.0 were completed to characterize the system and identify erosion-sensitive locations within the zone of impact. A reduction in erosion potential is predicted for the 25 mm, and a moderate increase in erosion potential was predicted for the larger, less-frequent storms. It was determined that the assimilative capacity of the receiving watercourse is sufficient for the proposed changes to the hydrological regime.

Hydrogeology

WSP carried out a hydrogeological assessment of Block 1. Field investigation was undertaken including groundwater level monitoring, groundwater sampling, surface water flow measurements and slug tests. Water balance calculations were carried out based on existing and proposed conditions and indicated a reduction in infiltration and an increase in runoff values. It is proposed that low impact development (LID) measures be implemented, where adequate separation from the groundwater table exists, to decrease the infiltration deficit.

Future Studies for Block 1

Through collaborative discussions with the City and Hamilton Conservation Authority (HCA) from May to October 2024, it has been agreed that updates will be required to address technical items at a greater level of detail to support draft plan applications and to meet expectations of the BSS1 to ensure that it conforms with Secondary Plan policies. The following deliverables are anticipated to be updated at the draft plan approval stage:

- *Detailed development and infrastructure Staging and Phasing Plan*
- *Functional Design of WC5.0 and implementation plan*
- **Fluvial Geomorphological Report**
- **Environmental Impact Statement**
- *Functional Servicing Report(s)- Including hydraulic grade line analysis*
- **Updated BSS1 Watershed models (hydrologic and hydraulic)**
- *Core Servicing Functional Design*
- **Traffic Impact Study**

Italicized reports indicate new studies to be completed
Bold reports indicate studies to be updated

Table ES1 below provides additional information on future study requirements.

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Table ES1: Summary of Highlights of Outstanding Issues for BSS1 - October 10, 2024

	Description	Comment	Response
1	**Planning & Implementation**		
1.1	Implementation Plan (Staging and Phasing of Development)	The study lacks substantive details concerning the staging and phasing of both internal/external infrastructure (including parks) and development of subdivision plans. The strategy should detail an order of priority of infrastructure that will allow for orderly development of all lands within the Block. For example, what is required for lands abutting Jones Road to redevelop?	A **Detailed Staging and Phasing Plan** will be prepared to accompany draft plans of subdivision that will present anticipated phasing and staging of the block development. Reference to this requirement is detailed in Section 8.1 of the BSS1.
1.2	Future Studies to Support BSS1 Report	Version 3 of the Block Study shall include a comprehensive list of studies and additional work that will be completed during the subdivision development phase.	Each contemplated study that will be required to support draft plans of subdivision is identified in **bold typeface** in response to the major issues. A list has been provided in Section 9 of the BSS1.
2	**Design Criteria**	The design criteria need to be clearly defined and documented for all relevant design components.	Design criteria are well established by the City of Hamilton, HCA and other governmental regulations and requirements. Future design work will conform to relevant standards. A statement to this effect is found in Section 1.2 of the report.
3	**Watercourse (WC) 5**		
3.1	WC5.0 Design	With the understanding that that Fruitland Landowners Group (FLOG) does not currently represent all owners of WC5.0, a feasible interim design will need to be submitted as part of future subdivision planning that is able to demonstrate containment of the floodplain and no adverse upstream or downstream impacts prior to any realignment proceeding. The inability to construct the channel contiguously will have significant transitional grading issues and impact on the ability to build out the west side of Block 1.	In support of draft plan applications, the Group will submit a **Functional Design of WC5.0** addressing land ownership constraints, interim measures, grading constraints, and impacts.

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	Description	Comment	Response
3.2	WC5.0 Implementation	The BSS1 needs to appropriately reference and follow direction provided in the SCUBE SWS Phase 3 Implementation Report as it relates to post-construction wait times for WC5.0 etc.	Report Section 8.1 refers to this requirement.
		HCA has advised that a comprehensive and coordinated approach to the design and realignment (construction) of WC5.0 must be demonstrated to ensure a functional and stabilized watercourse is established prior to development. Realignment of WC5.0 on a reach by reach (draft plan by draft plan) basis will not be supported.	Acknowledged. In support of draft plan applications, the Group will submit a **Functional Design of WC5.0** presenting a comprehensive and coordinated approach to the design and implementation of the watercourse.
3.3	Natural Channel Design	**COH Staff and HCA**: The Block1 Servicing Strategy Report needs to clearly indicate that the proposed channel realignment detailed design will be prepared by a Fluvial Geomorphologist in consultation with an ecologist following the principles of Natural Channel Design to the satisfaction of the City of Hamilton and HCA. The realigned channel is to include the creation of different habitats, habitat features, and plantings.	The Functional design of WC5.0 will be accompanied by a **Fluvial Geomorphological Report** and an **Environmental Impact Statement** following the principles of Natural Channel Design.
4	**Stormwater Management (SWM) Ponds/Outlet Design**		
4.1	100-year HGL - All Ponds	The 100-year HGL analysis has not been completed in accordance with the BSS1 Terms of Reference. The 100-year HGL is needed to determine to verify functionality/operation of the storm management system (outlet-pond-sewer). While the storm sewer system has been designed for a 5-year design flow conveyance according to the City guidelines, without the 100-year HGL, it remains unclear how the sites' stormwater system will function with respect to the 100-year pond elevation.	The Functional and Detailed Design of the core and subdivision services will include **HGL Studies** in accordance with City design requirements.
4.2	Block Area / Access - All Ponds	The proposed pond designs do not include adequate provisions for accessing and maintaining the facility in accordance with City standards. This may affect the proposed sizing of the ponds.	In conjunction with draft plan approval pond blocks will be firmed up to ensure conformance with City standards as it relates to access and documented in **Functional Servicing Reports.**

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	Description	Comment	Response
4.3	Permanent Pool (PP) Elevations - All Ponds	The current proposed designs do not meet the City's standard with regard to permanent pool elevations. **The 100-year high water level in the receiving creek (WC5.0/WC6.0) must be lower than the permanent pool (PP) elevation in the SWM Pond.** Meeting this requirement may affect the proposed sizing of the pond, width of the channel, and/or over all grading and drainage of the block.	In conjunction with draft plan approval specific pond hydraulics will be firmed up to the satisfaction of the City documented in **Functional Servicing Reports.**
4.4	West Pond Implementation	Implementation of the west pond will be restricted by the ability to demonstrate appropriate transitional grading and removal of the floodplain through construction/realignment of WC5.0.	In conjunction with draft plan approval ponds grading will be demonstrated to be compatible with grading constraints which will be documented in **Functional Servicing Reports.**
5	**Watercourse Analysis & Floodplain Mapping**		
5.1		The hydrologic and hydraulic analysis needs be updated/documented to address/reflect: model assumption transparency; e.g. calibration, existing culverts, expected increase in impervious area from 50 to 65%, etc.	In conjunction with draft plan applications the **BSS1 Watershed Model** will be updated to the satisfaction of HCA.
5.2		The floodplain analysis of WC6.0 and associated study recommendations need to clearly account for the potential outcomes(s) of the ongoing appeal process related to the extend of the natural heritage areas is still outstanding.	The outcome of the WC6.0 appeal is unknown at this time. Any development in the vicinity of WC6.0 will require new studies including **Functional Servicing, Fluvial Geomorphology, Environmental Impact Statement** and others as dictated by the City.
5.3		**HCA:** the Block Study should include supplementary modelling details as previously requested in the comment matrix, to ensure that the assessment is fully understood and reproduceable by others. Inconsistencies in the assessment, as previously noted in the comment matrix need to be addressed.	In conjunction with draft plan applications the **BSS1 Watershed Model** will be updated to the satisfaction of HCA.
6	**Environmental Impact Statement**	The Environmental Impact Statement included as part of the Block Servicing Strategy has not yet been approved. There is the expectation that an updated EIS will need to be submitted during the development application process.	The **EIS** will be updated and submitted in to support the draft plans applications.

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	Description	Comment	Response
7	**Functional Servicing and Grading Plan**	The grading and servicing plan needs to account for all interconnected design/implementation components, e.g. outcome of the Barton Street EA Study including cross culvert needed for the channel and the north pond outlet, planned upgrades to Jones Road and Fruitland Road, landownership, any transitional grading issues abutting existing land uses, and transitional grading required to address the phased implementation of infrastructure (e.g. SWM ponds, community park blocks, etc.)	**Functional Servicing Reports** and/or the **Core Servicing Designs** and/or **Detailed Subdivision Design** will consider the findings of approved EAs, and document design requirements to
8	**Transportation**		
8.1	Traffic Impact Study	TIS needs to be updated to reflects comments provided to date.	The **TIS** will be updated to reflect the outstanding comments in support of the draft plan applications.
8.2	Cycling/pedestrian infrastructure	A statement should be included confirming that the proposed Right-Of-Way (ROW) supports the planned cycling and pedestrian infrastructure within the network. If it can not be accommodated, alternative solutions should be assessed that can address cyclists and pedestrian connectivity in accordance with best practices and City standards.	The **TIS** will make a statement that the road cross sections will take cycling and pedestrian infrastructure into consideration.
8.4	Jones Road and Fruitland Road	Future Jones Road urbanization needs to be appropriately documented as do planned upgrades for Fruitland Road that correspond with the narrowing of the ROW from 36m to 26m. The functional design shall include consideration for: drainage, utilities, upgrades to any underground municipal infrastructure, and shall reflect the City's Complete Street Design Guidelines.	The details of boundary road improvements triggered by development will be determined at the **Detailed Design** stage as draft plan conditions may dictate.
8.3	Fruitland Road Cross-Section	The cross-section as submitted needs to be revised to reflect a 3-lane road with a sidewalk on the west side of the road and Multi-Use-Path (MUP) on the east side. All dimensioning need to conform with City of Hamilton standards.	The details of boundary road improvements triggered by development will be determined at the **Detailed Design** stage as draft plan conditions may dictate.

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	Description	Comment	Response
8.5	Highway 8 and Barton Street	The future expansion of these roads to be appropriately documented including any upgrades to infrastructure in the corridor needed for Block 1 to develop and how Block 1 development/redevelopment with interface with these roads. For example, upgrading of the culvert for WC5.0 and the outlet for the north pond must be completed prior to channelization and pond construction. These upgrades will drive the need to complete Barton Street upgrades.	The details of boundary road improvements including drainage works triggered by development will be determined at the **Detailed Design** stage as draft plan conditions may dictate.
A	New Item	Outstanding technical comments of June 21, 2024	New reports to be prepared in support of draft plan applications will provide additional detail requested in the comments. These comments have been appended to the BSS1 and referred to in Appendix K.
B	New Item	Bullets 1-3, Slide 5-City Slide Deck 10-9-2024	In support of draft plan applications, the Group will submit a **Functional Design of WC5.0** that satisfies land ownership and technical requirements associated with watercourse improvements.
C	New Item	Road and servicing connection along Street B Collector to East of Jones Road connecting into the Block 2 study area local road.	The land plan has been updated to reflect this road connection.

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1 INTRODUCTION

On May 14, 2014, the City of Hamilton Council passed Amendment No. 17 to incorporate the Fruitland Winona Secondary Plan into the Urban Hamilton Official Plan.

“The Secondary Plan establishes the land use, transportation network, infrastructure requirements, development standards and protection of natural areas and heritage resources to guide the development of lands in the Secondary Plan Area over the next 20 years.” (City of Hamilton Website – Fruitland Winona Secondary Plan)

The Fruitland-Winona Secondary Plan (Secondary Plan) requires that a Block Servicing Strategy (BSS) be prepared so that development proceeds in a coordinated and comprehensive manner. The Secondary Plan has identified three blocks, Block 1, Block 2 and Block 3 for the completion of the servicing strategies (as shown in **Appendix A -** Figure 2-1 / Map B.7.4-3 - Block Servicing Strategy Area Delineation). This study pertains to the Block 1 area within the Secondary Plan.

Urbantech was retained in December of 2020 by the Block 1 Landowners Group to prepare the final BSS in support of Draft Plan applications for their lands in Block 1 of the Fruitland-Winona Secondary Plan Area. The Block Servicing Strategy for the Fruitland-Winona Secondary Plan Block 1 (BSS1) will address development requirements for the entire Block 1 area Concept Plan.

Urbantech’s first submission of the BSS1 was made to the City of Hamilton and Hamilton Conservation Authority (HCA) in May 2022. Comments were provided by the City and HCA. This report has been updated to address comments received from the approval agencies. Detailed responses have been included in **Appendix K.**

1.1 STUDY AREA

The Block 1 study area can be described as the area bound by Fruitland Road to the west, Barton Street to the North, Highway 8 to the south and Watercourse 6.0 (WC6.0) to the east. The area is comprised mainly of undeveloped agricultural lands, with some residential and commercial buildings fronting on the existing arterial Road network. **Figure 1** illustrates the Block 1 area lands.

The total land area included in Block 1 is approximately 100 ha.

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1.2 PURPOSE

BSS1 has been completed in accordance with policy B.7.4.14 of the Fruitland-Winona Secondary Plan and Stoney Creek Urban Boundary Expansion Subwatershed Study (SCUBE SWS). The proposed design will comply with applicable City of Hamilton, HCA and provincial design criteria and standards.

In compliance with the SCUBE SWS the objectives for this study are as follows:

- Demonstrate how the requirements illustrated in the subwatershed study are to be fulfilled in all the Draft plans for the proposed development.
- Provide sufficient level of conceptual design that integrates the natural environment components with municipal infrastructure.
- Ensure servicing requirements are met.
- Identify detailed development constraints or conflicts and options to resolve them.
- Supply implementation details if required.
- Streamline the Draft Plan approval process.
- Facilitate the development of Draft Plan conditions.
- Demonstrate consultation and general landowner support for lands within the BSS1 area.

In compliance with policy B.7.4.14 of the Fruitland-Winona Secondary Plan, this study is intended to demonstrate how development of the subject lands will meet the requirements of the policy as it relates to:

- Land Use.
- Geology and Hydrogeology.
- Stream system and terrestrial features.
- Air Drainage.
- Grading, Drainage and Storm Servicing.
- Stormwater Management (SWM) and Water Balance.
- Wastewater and Water Servicing.
- Traffic/Transportation.
- Implementation and Phasing.

The Terms of Reference (TOR) for the study as provided by the City are included in **Appendix A**.

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1.3 CONCEPT PLAN

The City of Hamilton Fruitland-Winona Secondary plan identifies the proposed land use plan and associated densities to be used in the BSS1 concept plans. The Secondary Plan land use is shown on **Figure 2** which is reproduced from the City of Hamilton Official Plan Map B.7.4-1. **Figure 3** shows the Development Concept Plan for BSS1. The original Secondary plan was appealed and subsequently revised as described further on in this study.

The concept plan enclosed in this report represents one way in which the subject lands could be developed in keeping with the principals established in the Secondary Plan. Final property limits, lot fabric, road alignments, park boundaries, etc. will be established through the relevant planning applications as individual property owners proceed with their Draft Plans of Subdivision.

It is anticipated that the final draft plans may vary from the Development Concept Plan. At the draft planning stage, each plan will need to demonstrate compliance with BSS1.

1.4 STUDY TEAM

A multidisciplinary team has studied the environmental and servicing components of BSS1. The team and their responsibilities include:

- Urbantech Consulting (Urbantech)
    - Lead BSS1 consultant responsible for overall coordination of the study Team preparation of the Overall BSS report.
    - Lead BSS1 consultant addressing municipal servicing, SWM and site grading;
- Paradigm – Traffic and Transportation Planning
- WSP – Hydrogeology
- Wood – Air Drainage
- WSP – Water Distribution
- Colville Consulting Inc. – Natural Environment and Ecology
- GEO Morphix Ltd. – Fluvial Geomorphology

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1.5 AGENCY, LANDOWNER AND PUBLIC CONSULTATION

Public and landowner consultation has been carried out at various times throughout the study. For details refer to **Appendix L**.

The following is a summary of the methods included in the project's public consultation:

- **Public Information Centre** – Two Public Information Centres (PIC) were held in 2017 on April 4, 2017, and June 8, 2017. A third PIC was also held on September 21, 2023.
- **Website –** The city maintained a website to provide updates in relation to all three Blocks within the Secondary Plan (www.hamilton.ca/blockservicingstrategies).
- **Meetings** – Numerous meetings were held with project proponents, City and agency staff.
- **Public Comment** – Final materials will be made available on the City's website, City Hall and the Stoney Creek Municipal for a 30-day public review.

Public Information Centre

The three PICs were held at the Stoney Creek Municipal Building at 777 Highway 8, Stoney Creek, which provided an opportunity for the public to review the proposed information and ask questions or submit questions via email to the project team. The PICs included presentation boards on the Development Concept Plan along with the supporting overall Servicing, Grading, SWM, Natural Heritage and Secondary Land Use Plans. Open house PIC boards are attached in **Appendix L**. In general, the information was well received by the public and in support of the proposed Development Concepts Plan.

Display panels were available at the meeting and continue to be available on the BSS page of the City of Hamilton website - https://www.hamilton.ca/block-servicing-strategies-stoney-creek-and-gordon-dean.

Landowners Group

The Block 1 landowner group is comprised of 7 individual properties ranging from 0.8 to 14.9ha in size. The owners that are participating in this study represent approximately 44.5 ha of the 100 ha study area as shown on **Figure 4**.

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1.6 BACKGROUND INFORMATION AND STUDIES

Background reports reviewed in the preparation of this document include:

- SCUBE SWS (Aquafor Beech Limited, May 2013)
- Terms of Reference (TOR) (City of Hamilton, November 4, 2013)
- Fruitland Winona Secondary Plan
- Gordon Dean Avenue – Schedule 'C' Municipal Class Environmental Assessment (Wood, June 12, 2020)
- Block 2 Servicing Strategy for the Fruitland – Winona Secondary Plan Lands (Aquafor Beech, September 11, 2018)

Further details regarding the SCUBE Subwatershed Study are provided below as it is the principal reference material guiding the direction of the BSS1 study.

1.7 SCUBE SUBWATERSHED STUDY

A subwatershed study was completed by Aquafor Beech Ltd. (May 2013) in support of the Secondary Plan. This study provides guidance for the City and developers' use in development of the subject lands related to SWM, Natural Heritage and Groundwater Resources.

The SCUBE SWS (May 2013) provided the management and implementation strategy for the Fruitland-Winona Secondary Plan area. The Secondary Plan area includes four parcels: SCUBE West, SCUBE Central, SCUBE East - Parcel A and SCUBE East - Parcel B. The limits and bounding streets of the parcels are shown in Figure 1.1 (provided in **Appendix A**). The City of Hamilton has also provided a Block Servicing Schedule for this area (Map B.7.4-4 - Fruitland-Winona Secondary Plan-Block Servicing Strategy Area Delineation, provided in **Appendix A**). The Secondary Plan identifies three blocks that require Block Servicing Studies. Block 1 is located within SCUBE West.

SCUBE SWS aims at preserving a sustainable Natural Heritage System (NHS) for preserving landscape diversity within an urban context. It has provided recommendations for management of natural heritage and stream systems. There are certain lands, including watercourses, that are restricted from development and have specified limitations or constraints.

During the Phase 1 study, investigations were carried out to identify environmental constraints and opportunities for natural resources. A management strategy was developed to protect and enhance significant natural features at the Phase 2 study level. This strategy also provided requirements regarding SWM, land use policies and servicing.

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The SCUBE SWS identified three SWM ponds within the subject lands:

- Pond-1 on the south-east corner of Fruitland Road and Barton Street,
- Pond-2 on the south-west corner of Barton Street and Gordon Dean Road, and;
- Pond-3 on the south-east corner of Barton Street and Jones Road

The original SCUBE SWS Storm Water Management Facility (SWM pond) naming convention has been maintained for the BSS1. The original recommendations for the location and sizing of these SWM ponds have been considered for the subject lands, with an excerpt provided in **Appendix A**. However, volumetric sizing and outflow targets have been revised through new hydrologic modelling scenarios described in **Section 6**.

1.8 CONSULTANT TEAM STUDIES

The findings of the various reports prepared by the consultant team are summarized within the text of this report with the detailed studies being included in the Appendices:

- Air Drainage Analysis for Block 1 (Wood, November 2021)
- Fluvial Geomorphic and Meander Belt Width Assessment (GEO Morphix, April 2024)
- BSS1 Water Servicing Study (WSP, April 2024)
- Hydrogeological Investigation (WSP, March 2024)
- Natural Heritage (Colville Consulting Inc, April 2024)
- Traffic Study (Paradigm, April 2024)

1.9 THE FRUITLAND – WINONA SECONDARY PLAN

The BSS1 Study Area is located within the Fruitland-Winona Secondary Plan (the Secondary Plan), which was approved and adopted by City Council on May 14, 2014. It was subsequently approved, except for five site specific appeals, by the Ontario Land Tribunal (formerly Local Planning Appeal Tribunal) on June 22, 2018.

The vision for the Secondary Plan indicates two distinct areas with different characteristics. These areas are to be designed together to achieve a safe, clean community with green canopy neighbourhoods connected by transportation corridors. The community of Fruitland-Winona will accommodate people of all ages within a variety of housing choices that will be supported by schools, parks and trail systems. People-oriented focal points are to be provided within the heart of the community and include activities such as a farmer's market, recreation centre and other community activities. Fruitland-Winona is generally planned to be a low-density community that will support neighbourhood commercial and other higher density housing at appropriate locations. The community is to provide a balance between a forward-looking community and a small-town place to live.

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Figure 5 presents the land use designations applicable to the Fruitland-Winona Secondary Plan area within Block 1. The following land uses are contemplated within the Block:

- Low Density Residential 2
- Low Density Residential 3
- Medium Density Residential 2
- Neighborhood Park
- Institutional
- Elementary School
- Community Park
- Employment Areas
- Arterial Commercial

As required by City of Hamilton staff, the land uses in the BSS1 concept plan have been designed in general accordance with Land Use Plan Map B.7.4-1. Refinements to the concept plan will be required to be made through the development application process to reflect actual conditions within the Secondary Plan area.

1.9.1 POPULATIONS

Populations have been estimated for the community based on the land designations in the Secondary Plan. **Table 1-1** summarizes a range of units and estimated residential population densities for the community based on the minimum and maximum permissible units that could be developed. The allowable unit densities are in keeping with **Appendix B** of the City of Hamilton Official Plan.

Table 1-1 Population Densities Residential

Land Use	Minimum uph/ppha	Maximum uph //ppha
Low Density Residential 2	20/60	40/120
Low Density Residential 3	40/120	60/180
Medium Density Residential 2	60/180	75/225

Residential population densities assume 3.0 persons per unit.

Applying the population densities in **Table 1-1** to the land use designations in the secondary plan yields a total residential population for the community from 6,481 to 9,304. Refer to **Appendix A-3** for detailed population calculations.

The above table is intended to be a guide only. The final built form in the community is to comply with the range of unit densities as per the City's official plan.

The City has advised that an update to the City-Wide Growth Related Integrated Development (GRIDS 1) Study is currently under way. The City has requested that the results of the GRIDS 2 study be compared against the population estimates for the community. This comparison will be undertaken when the GRIDS 2 Study is available to the study team.

1.10 EXISTING CONDITIONS

Currently, the subject lands comprise of predominantly agricultural land and a mixture of developed land uses. South of Barton Street, the lands are primarily agricultural with the roads that bound Block 1 being fronted by a mix of residential, commercial, and institutional land uses. Notably, the Grand Olympia Hospitality and Convention Centre is located at the southeast corner of the Baron Street and Fruitland Road, the City's Public Works Yard and Mountainview Gardens Cemetery is located on Highway 8 west of Jones Road, and the Stoney Creek Municipal Centre is located at the northeast corner of Highway 8 and Jones Road. North of Barton Street the existing land use is mostly local commercial and industrial lands.

The existing topography of the site is gently sloping from south to north with moderate slopes of 1% to 3% and ranges in elevation from 98 m at Highway 8 to elevation 86 m at Barton Street near WC6.0. Topographic mapping with a 0.5 m contour interval used in the study was supplied by HCA. The existing topographic conditions are shown on **Drawing EXC-1**.

Characterization of existing conditions, including discussion of geology, hydrogeology, fluvial geomorphology, terrestrial, hydrology and hydraulics was completed as part of SCUBE SWS and documented in the SCUBE SWS East Phase 1 Report (May 2013).

The following sections outline the existing conditions by discipline. While reported separately by discipline, this work was undertaken and integrated between disciplines to ensure that inter-relationships that exist between surface water, groundwater, receiving watercourse, aquifers and other NHS features were identified.

1.11 GEOLOGY AND HYDROGEOLOGY

WSP Canada Inc. (WSP) has carried out a hydrogeological assessment at Block 1 of the Fruitland-Winona Secondary Plan to fulfil the requirements of the TOR for the Fruitland-Winona Block Servicing Strategy (January 2014). WSP issued a draft Hydrogeological Assessment Report in November 2015. Subsequently, the hydrogeological assessment was updated in 2017 as part of a larger Servicing Strategies Report. Following comments, this Hydrogeological Assessment Report (Rev. 2) has been prepared to update the assessment based on the current understanding for the site.

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The field work associated with the investigation consisted of installation of 6 monitoring wells, monitoring of groundwater levels, sampling and chemical analysis of groundwater from 3 monitoring wells, installation of pressure transducers in 4 monitoring wells, installation of pressure transducers in 4 monitoring wells, slug testing at 5 monitoring wells, and stream flow monitoring.

In the vicinity of Block 1, the surface topography is relatively flat with a gentle slope down towards the north, generally following the bedrock topography. The site is bordered by two permanent watercourses, Watercourse 5.0 (WC5.0), which flows from south to north along the west edge of Block 1 (east of, but roughly parallel to Fruitland Road), and WC6.0, which flows from south to north along the east edge of Block 1 (east of Jones Road). While these are mapped as permanent watercourse features, observed flow in these features tended to be slow to intermittent.

Block 1 is located within the Iroquois Plain Physiographic Region (Chapman and Putnam, 1984) of Southern Ontario. According to Chapman and Putnam, 1984, the region of the Iroquois Plain to the west of Grimsby is characterized by heavy textured, low permeability soil developed on red clay derived from the underlying Queenston Formation. The Queenston Formation Shale is generally compact and dense with poor pore space interconnectivity and poor water yielding capabilities. During drilling on the site, bedrock was found to occur at depths from 1.0 to 2.2 m below ground surface. The surficial soil is identified as Halton Till, a clayey silt-clay till which is in agreement with the observations from boreholes drilled as part of the current field program.

Groundwater level monitoring using automatic pressure transducers indicated a trend of seasonal water level fluctuations with groundwater levels generally rising annually from February to April then generally decreasing between April and December. The range of water level fluctuations observed during the period from June 2015 to April 2017 was approximately 1.5 m at BH-2, 1.9 m at BH-1 and 3.6 m at BH-4.

Hydraulic conductivities determined from slug tests carried out in the monitoring wells ranged from 8.7x 10-5 m/s to 2.8 x 10-8 (geometric mean 8.5 x 10-7 m/s). The degree of variability in hydraulic conductivity is likely a reflection of the variability of the amount of weathering and fracturing occurring at different locations on the site. The groundwater flow direction is generally from the south-southwest towards the north-northeast with an average gradient of approximately 1.9%.

Groundwater sampling was carried out at monitoring wells BH/MW-1, BH/MW-2, and BH/MW-5 on August 4, 2015. In general, the water chemistry analyses show values typically found in groundwater derived from the Queenston Shale formation. The analysis results were compared with standards obtained from the Ontario Provincial Water Quality Objectives (PWQO) and from Table 7 – Non-potable groundwater, Generic Site Condition Standards for Shallow Soils in a Non-Potable Ground Water Condition. No values were obtained which exceed the Table 7 values. Results in excess of the PWQO were obtained for Boron and Uranium at all locations, and for

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Cobalt and Silver at BH/MW-1 and BH/MW-2. These results are likely naturally occurring as they are typical of the underlying Shale bedrock found in the area.

Surface water flow measurements and observations were carried out at WC5.0 and WC6.0 at two locations each (upstream – Regional Road 8 and downstream – Barton Street) on September 4, 2015. Low flows were measured at the upstream locations (12 m3/day at WC5.0 and 6.9 m3/day at WC6.0). Both watercourses were observed to be dry at the downstream locations.

Water balance calculations for Block 1 were carried out based on existing conditions and proposed post-development conditions. Comparison between the pre- and post-development calculations indicates a reduction in evapotranspiration and infiltration and an increase in runoff volumes resulting from the increase in impervious surfaces. In order to address the deficit of infiltration due to development a number of low impact development (LID) measures can be used. The measures most likely to be implemented on this site would be downspout disconnection; increased topsoil depths (200 mm minimum); grassed swales to promote infiltration and TSS removal; infiltration trenches/swales (rear yard drainage swales with 150 mm topsoil rock gallery/storage median and perforated underdrain; soak away pits (rock filled galleries or chambers to store and infiltrate runoff; enhanced tree pits (enlarged chamber to receive direct runoff from streets); and bioswales (enhanced vegetative swale with filtration, attenuation and infiltration capabilities.

Development of Block 1 will tend to reduce the amount of infiltration of precipitation towards the water table primarily due to reduction in the amount of permeable area. Other factors which could contribute to this effect include increased compaction of the subsurface soils due to heavy vehicle traffic during construction, effects due to changes in site grading and changes in surface soils and vegetation type. Additionally, the excavation of trenches to accommodate underground utilities could create more permeable pathways for groundwater flow. Taken together, these factors would tend to result in a lowering of the water table in the vicinity of the development.

In the southern half of the Block 1 area, the low permeability of the surficial materials over which the watercourses flow (Halton Till) allow for very little interaction between the surface water and groundwater in these areas. Additionally, the watercourses do not transport large volumes of water and are observed to become dry during periods with low precipitation (such as during the summer months).

Groundwater levels near ground surface were measured at some locations during the field investigation, therefore it is likely that foundation drainage and sump pumps will be required for buildings having basements.

Refer to **Appendix B** for the detailed WSP Hydrogeological Assessment for Block 1 – Fruitland Winona Block Servicing Strategy.

1.12 NATURAL ENVIRONMENT

Colville Consulting was retained by the Fruitland-Winona Block 1 Owners to undertake an Environmental Impact Statement (EIS) for the lands included in the BSS1. This characterization report was prepared in the context of a TOR that was provided to the City of Hamilton as part of our assessment work in 2018, and includes additional updates to field data requested by the City of Hamilton, and also incorporates 2020-21 aquatic survey information and analysis completed by Wood PLC. The report also addresses specific concerns raised by City of Hamilton Staff related to the following.

- WC5.0: Since the watercourse is proposed to be realigned, it is important to characterize it and assess the following:
    - Aquatic assessment: this was missing from the original Dougan report (only a small section was included as part of the Gordon Dean Environmental Assessment).
    - Vegetation-1 season survey to ensure that the current conditions on the landscape are represented.

- Area east of Jones Road associated with Block 1
    - Vegetation-1 season survey to ensure that the current conditions on the landscape are represented.
    - Amphibian surveys-due to changing conditions there now may be areas that would support amphibians; if access is not provided, these surveys could be completed from roadside.

Natural heritage features within the Block 1 lands were delineated using data collected during detailed field works completed by Dougan and Associates and Colville Consulting between 2015 and 2023. Based on the results of these inventories, the primary natural heritage features in the Block 1 land include WC5.0 and WC6.0. Several small and isolated woodland communities are also located at the north end of the lands, as well as two wetland vegetation communities.

From the assessment of WC5.0 within the Study Area, this watercourse appears to be a good candidate for future relocation. It is likely that relocation of the watercourse on these lands will provide an opportunity to increase the current buffer associated with WC5.0, as well as incorporate instream habitat features, which could potentially be utilized by fish when downstream barriers are mitigated. Riparian habitat adjacent to WC5.0 can be easily replicated or enhanced through the relocation process, which will provide an overall benefit to this watercourse and the adjacent Core Area. It is recommended that a 15m buffer be incorporated as part of future development and relocation designs (see extents in Figure 4 in Appendix C).

Similar to WC5.0, WC6.0 also appears to be a good candidate for future relocation and enhancement. Since this watercourse forms the eastern limit of the Block 1 lands, coordination

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with the Block 2 Servicing Strategy is recommended to ensure proper design and management of this watercourse.

In addition to WC5.0 and WC6.0, four small and isolated pockets of woodland are located at the north end of the Block 1 lands, west of Jones Road. These woodland communities were identified through field works completed by Dougan and Associates, however based on available data, these treed areas do not satisfy UHOP criteria to be considered Significant Woodland and Core Area.

Located in the south-central portion of the Block 1 lands, as well as in association with WC6.0, are two small areas that were identified by Dougan and Associates as wetland vegetation communities. The assessment indicates that these wetlands are too small to evaluate using the Ontario Wetland Evaluation System (OWES) and therefore do not meet the definition of wetland in the UHOP.

A portion of the Subject Lands consists of a cultural meadow/cultivated area that has historically provided potential breeding habitat for Bobolink and Eastern Meadowlark. The extent of potential Open Country habitat is delineated in Figure 5. As this area is less than 30ha in size, it is recommended that MECP be contacted prior to any detailed designs for the Subject Lands to discuss any obligations to remain compliant with the Endangered Species Act.

In summary, field works completed by Dougan and Associates and Colville Consulting adequately identify potential natural heritage features in the Block 1 lands. The results of these assessments indicate that WC5.0 and WC6.0 are the primary natural heritage features within the Block 1 lands. The relocation of WC5.0 will incorporate appropriate buffering, riparian enhancements, and improvement to in stream habitat features, which will result in an overall net environmental benefit to the watercourse.

The below table outlines potential impacts of the development as well as measures to mitigate impacts.

Potential Impact	Recommended Mitigation
Major road crossings of Watercourses 5 and 6, affecting aquatic habitat and riparian areas.	It is recommended that watercourse crossings be designed with the input of a Fluvial Geomorphologist to assist with minimizing impacts to the meander belt associated with Watercourses 5.
	It is recommended that restorations plans be prepared for watercourses and riparian areas as part of future development applications. Restoration plans should consider factors such as incorporating natural channel design elements, improving habitat conditions in riparian areas, incorporating native species into planting plans and implementing aquatic and terrestrial wildlife habitat enhancements.

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Potential Impact	Recommended Mitigation
Potential impacts of road crossings on linkages.	It is recommended that watercourse crossings be designed to incorporate wildlife passage elements to minimize any potential impacts to wildlife movements.
Erosion and sedimentation during construction.	Adequate sediment and erosion controls should be installed prior to the commencement of work to help prevent any off-site movement of soil material during construction. Sediment controls should remain in place until all disturbed areas have been vegetated and stabilized.
Tree and Vegetation Removal	It is recommended that tree preservation and management plans be prepared as part of future applications to assess the potential for retaining trees within the study area. Any tree removals required to facilitate servicing or future development should be replaced with suitable native species and incorporated into landscape plans or installed on public lands.
	Pollinator gardens should be incorporated into public lands and landscape plans where possible and appropriate.
Disturbance or destruction of nesting birds and roosting bats by clearing and grading works	Any required tree removal should be conducted between September 15 and March 30 to avoid impacting nesting birds or roosting bats in the area. Nest sweeps or assessments for use by bats should be conducted prior to any vegetation removal outside of this timing window.
Wildlife impacts associated with lighting	The use of street lighting in the vicinity of watercourses and natural areas should be minimized where possible. Appropriate shading or directional lighting is recommended where needed to minimize light pollution and related impacts on naturalized areas.
Alteration of existing drainage patterns, and introduction of impervious cover affecting runoff rates.	It is recommended that the use of LID technologies be considered where possible to lessen the volume of runoff and promote infiltration.
Encroachment into natural areas	Continuous fencing should be installed at the rear of each lot backing onto the watercourse blocks to limit the potential for encroachment into VPZ's.
	It is recommended that grading be avoided where possible in designated VPZ's. Where grading is required to occur, it is recommended that a restoration plan be prepared to ensure the affected VPZ will continue to function as intended.
Potential impacts to species at risk and species at risk habitats	It is recommended that MECP be engaged early in the design process to discuss Species at Risk requirements and maintain compliance with provincial legislation.
Impacts to locally rare and uncommon species	Several locally rare and uncommon species were documented in the Study Area during our assessments. To help maintain these species in the area, it is recommended that any locally rare or uncommon species be identified and assessed for relocation to parklands and VPZ's within the Block. Further

Potential Impact	Recommended Mitigation
	assessment and planning for relocations should occur as part of future site-specific EIS's.
Potential water quality impairment associated with de-icing compounds	Any relevant recommendations or best management practices from the City of Hamilton Salt Management Plan should be considered during future applications of de-icing compounds.

1.13 AIR DRAINAGE

An Air Drainage Analysis was completed by Wood for the Block 1-Fruitland-Winona Block Servicing Strategy Area, Urban Hamilton Official Plan, Stoney Creek Boundary Expansion Block 1 (the B1-Plan) located within the City of Hamilton in southern Ontario, Canada. The desktop analysis provided in the Wood Air Drainage Analysis for Block 1 – Fruitland Winona Black Servicing Strategy includes a review of the area's topography and an analysis of the area's climatology.

The objective of this analysis was to study the effect of the proposed development within the Block 1 Plan on the micro-climate in the region.

Archived climate data for three nearby weather stations indicates that the predominant winds will be from the west and southwest direction. Furthermore, the data have shown December and February being the months with the highest number of fog occurrences while freezing fog was more frequent during February.

There are two types of frost conditions: advection frost and radiation frost. Advection frost is a regional frost event, and it occurs when winter storm conditions which originate from northern regions move into the area. This kind of event can be understood through the analysis of climatological data and the topography of the region. Radiation frost is a micro-scale climate event and is generally site specific. Radiation frost is typically caused by cold air accumulation near the ground surface, which can occur in the winter, spring or fall.

Tender fruit plants can be damaged in the winter due to very low temperatures. The damage often includes cracking of trunks and branches, the death of flower and leaf buds or total death of grafted parts.

Following the desktop analysis of the microclimate and the topography in the area contained by the current B1-Plan (Figure 3) (refer to **Appendix D** for Figure 3), the proposed development is not expected to block the south-westerly-to-north-easterly direction air flow. The new development is not expected to impede the natural air movement and may assist in mixing the boundary air layer (a layer near the ground) by creating eddies (turbulences), thus aid in streaming any cold air descending from the Niagara Escarpment, i.e. preventing air stagnation. Meanwhile,

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the roads (existing and proposed), the Watercourses and the natural open spaces outlined in the B1-Plan will help to channel the air downstream toward Lake Ontario.

Refer to **Appendix D** for detailed Wood Air Drainage Analysis for Block 1 – Fruitland Winona Black Servicing Strategy.

1.14 FLUVIAL GEOMORPHOLOGY

GEO Morphix Ltd. completed a fluvial geomorphological assessment and conceptual corridor realignment design for WC5.0 within Block 1 area in support of the proposed development and SWM plan. WC5.0 is proposed to be realigned and engineered and will receive outflows from a SWM pond (Pond 1) proposed within the property. The erosion assessment was assessment was completed for WC5.0 to determine if exacerbated rates of erosion could be anticipated within the watercourse as a consequence of development. WC5.0 was also identified for rehabilitation and realignment as part of the SCUBE SWS Phase 3 given the past impacts by agricultural and development activities. A conceptual corridor design was completed to provide an understanding of the design criteria for the existing degraded channel and the future erosion hazard.

The activities completed as part of the fluvial geomorphological assessment included a background review of pertinent documents and information, zone-of-impact and reach delineation, rapid and detailed geomorphological field assessments, an erosion threshold analysis, and an erosion exceedance exercise comparing pre- and post-development hydrology. Field assessments of the receiving watercourse (WC5.0) were completed to characterize the system and identify erosion-sensitive locations within the zone of impact. A detailed geomorphic assessment was completed within the zone of impact along reach WC5.0, from which an erosion threshold was computed and provided as a critical discharge. For reach WC5.0, a critical discharge of 0.116 m^3/s was determined based on a critical velocity of 0.53 m/s acting on the silty-clay bed materials. Erosion exceedance modelling results indicate that the proposed SWM plan adequately addresses the concerns regarding potential excess erosion within WC5.0 in the post-development condition. A reduction in erosion potential was predicted for the more-relevant 25 mm event, and a moderate increase in erosion potential was predicted for the larger, less-frequent storms. No recommendations for any changes to the proposed SWM plan were given, as the assimilative capacity of the receiving watercourse is sufficient for the proposed changes to the hydrological regime.

The activities completed in support of the proposed conceptual corridor realignment included bankfull channel dimension calculations, meander belt width determination for the realigned sections, and recommendations for wetland recreation within designed corridors. The realignment and naturalization provide opportunities for improved riparian conditions and a well-developed bankfull channel with morphological variability. Improvement in morphology and function will provide additional benefits to sediment balance, floodplain storage, vegetation communities and terrestrial habitat features, aquatic habitat, edge impacts, water balance, fish passage and water

quality. Further, the conceptual channel realignment and naturalization serves to ensure channel stability and mitigate potential erosion hazards to the development and surrounding lands.

Based on a proposed valley gradient of 0.61%, and 2-year flow of 1.40 m^3/s, provided by Urbantech Consulting Engineers (2021), the average bankfull width and depth for the proposed channel are 3.22 m and 0.40 m. Given the system is considered unconfined, the predicted bankfull geometries were then used to calculate the erosion hazard (i.e., meander belt width). A meander belt width of 23 m was determined for the realigned channel. Given the proposed valley bottom for WC5.0 is 23 m, the erosion hazard is adequately addressed. Technical details are provided within the full report which outlines the approach used for channel sizing and habitat restoration.

Refer to **Appendix E** for detailed Fluvial Geomorphology Study by GEO Morphix.

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2 FLOODPLAIN MANAGEMENT

The primary watercourses within the Block 1 study area are WC5.0 and WC6.0. A hydraulic analysis for these two (2) watercourses was completed as part of this BSS1 in order to assess the hydraulic impacts of the proposed development within the subject study area. The following sections detail the assumptions, methodology and design criteria used for this assessment to compare hydraulic impacts between the following two scenarios:

Scenario 1:

- For all lands, including the BSS1 lands - Ultimate development land uses that are consistent with the currently adopted Official Plan, as determined by SCUBE SWS, without any flow reductions from SWM ponds.

Scenario 2:

- For the BSS1 lands - Proposed land uses and percent imperviousness, accounting for flow reductions from SWM ponds.
- For all external lands - Ultimate development land uses that are consistent with the currently adopted Official Plan as outlined in SCUBE SWS, without any flow reductions from SWM ponds.

It should be noted that the purpose of the approach outlined in the following sections is intended for a preliminary determination of flood hazards and related development constraints within the Block 1 study area but is not to be considered as official floodplain mapping. An ongoing HCA study to update the official floodplain mapping for the subject area will eventually supersede associated floodplain estimations from this BSS1. As requested by HCA, the status of floodplain mapping and determination of applicable flood hazard limits will need to be reviewed at subsequent detailed design stages at the time of any application for development.

Implementation of the realigned, naturalized watercourse will require a comprehensive and coordinated design which considers riparian rights of non-participatory landowners (drainage law). The watercourse should be constructed in contiguous sections, the design of which will need to demonstrate no impacts to upstream, downstream, or adjacent properties as part of the approval and permitting process (a permit from the HCA is required before work can proceed).

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2.1 WC5.0

WC5.0 originates on the Niagara Escarpment, draining north from Highway 8 joining with two smaller tributaries including a diversion channel from WC6.0 before discharging to Lake Ontario. Portions of WC5.0 have been significantly altered in order to accommodate surrounding land uses.

The segment of WC5.0 within the Block 1 study area between Fruitland Road and Barton Street has been described in detail in the 2013 SCUBE SWS report as exhibiting a more natural form (compared to downstream reaches) and is moderately stable. As described in the SCUBE SWS private channel treatments are intermittent along the reach; however, the majority of the banks are untreated and allowed to adjust naturally.

WC5.0 enters the Block 1 study area through an existing box culvert at Fruitland Road, which is located approximately 215 meters north of Highway 8. WC5.0 continues running adjacent to the east side of Fruitland Road, within a significantly altered existing channel which currently runs through private property. WC5.0 exits the Block 1 study area after crossing under Barton Street through an existing closed box culvert.

The City of Hamilton completed an environmental assessment for WC5.0 in order to assess the existing flood risk and to determine watercourse system improvements for the creek reach between Fruitland Road and Barton Street (CoH, August 2015). The Class EA recommended replacement of culverts with hydraulic and/or structural deficiencies as well as identified channelization of WC5.0 to address flood risk (CoH, 2007).

WC5.0 is proposed to be realigned and channelized under future conditions from Fruitland Road to Barton Street, consistent with the preferred alternative identified within the Class EA (CoH, 2007). The proposed realignment and channelization would improve the watercourse's hydraulic performance, as well as establish the watercourse within a defined creek block.

As part of the study, three alternatives for the Watercourse 5 Natural Channel Enhancements have been evaluated. Each option has been evaluated in terms of flood and erosion control, ecological enhancement, stormwater performance, and alignment with Hamilton's climate and biodiversity objectives. Option 1 ("Do Nothing") offers minimal intervention and fails to meet most project objectives. Option 2 ("Improve in Existing Location") balances ecological benefits with moderate development constraints, while Option 3 ("Channel Re-Alignment") provides the highest development efficiency and ecological value with the fewest constraints on existing properties. Refer to **Appendix M** for the analysis and map of the evaluated options.

In January 2024 the hydraulic HEC-RAS model from the 2013 SCUBE SWS was obtained and used to complete the hydraulic analysis for WC5.0. The 2013 SCUBE SWS model was updated for the Block 1 hydraulic analysis for WC5.0 with current site information, such as the topography data received from HCA as well as the proposed channel alignment.

2.1.1 CHANNEL CROSSINGS

The main existing WC5.0 road crossings as outlined in the SCUBE SWS HECRAS model are summarized below in **Table 2-1**.

Table 2-1 Summary of WC5.0 Crossing Structures

Location	Cross Section	Type	Width (m)	Height (m)	Length (m)	U/S Invert	D/S Invert	Depth Blocked (m)
Fruitland Road	2440.61	Concrete Box Culvert	3	1	32.6	91.903	91.582	0
Barton Street	1307.90	Concrete Box Culvert (at Outlet) with CSP Pipe Extension (at Inlet)	1.86 (Box) 1.56 (circle)	1.00 (Box) 1.56 (circle)	20	85.26	85.211	0
Arvin Avenue	937.1887	Concrete Box Culvert	4.3	1.4	15.2	82.5	82.6	0
CPR	655	Concrete Box Culvert	1.8	1.54	17.8	81.14	81.10	0
South Service Road	503.04	Concrete Box Culvert	3.67	1.4	27.2	79.97	80.00	0
QEW	215	Concrete Box Culvert	5.0	1.7	111.9	76.71	76.44	0

A culvert crossing is proposed for the WC5.0 channel realignment at proposed Street B. The Street B crossing is proposed to be a 1500 x 3000 mm box culvert, which was designed to adequately convey the 100-year flow under post-development conditions. In the ultimate condition, when the channel is fully constructed, it is proposed that the existing Barton culvert will be replaced with a 1500 x 3000 mm box culvert to remove backwater and flooding on Barton Street.

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2.1.2 MODEL PARAMETERS

The proposed channel realignment has the following characteristics as determined in consultation with the multi-disciplinary project team as well as standard modelling practices:

- Channel top width of 40 m
- Appropriate setbacks from the top of channel slope
- Channel bottom width of 23 m to accommodate the meander belt width
- Sinuosity of 1.1 in the low flow channel
- Conveyance of the 100-year regulatory flood event with a minimum 0.3 m freeboard from 100-year water surface elevation to the channel top-of-slope
- Proposed low flow channel to be designed in accordance with geomorphological principles with 2:1 embankment slope
- Proposed trail to be accommodated within the channel width on the east side.
- Manning's roughness coefficient, n, for the proposed channel realignment was used as follows to be consistent with the approved SCUBE SWS HECRAS modelling:
    - 0.035 within the main low flow channel along the length of the proposed realignment; and
    - 0.08 for the overbank upstream

The grading design of the ultimate channel is shown on grading **Drawing GRD-1**. A profile of the channel is provided on **Drawing FP-3** and representative sections through the channel are provided on **Drawings GRD-2 and GRD-3**. The need for impervious liners within the channel due to existing high groundwater will be determined as part of detailed design.

2.1.3 DESIGN FLOWS

Scenario 1

Flows for the ultimate development land uses that are consistent with the currently adopted Official Plan as determined by SCUBE SWS, without any flow reductions from SWM ponds were taken from the SCUBE SWS hydrology model as shown in **Table 2-2**.

Table 2-2 HECRAS Flows - Scenario 1

WC5.0	Flow (m^3/s)				
	Barton	Arvin	CNR	SSR	QEW
NYHD	102	104	114	108	120
Storm/XS	2388.964	1320.692	951.897	680.8133	518.7136
100-Year	13.58	16.52	21.77	24.44	23.86
5-Year	5.46	6.43	8.75	9.83	11.06
2-Year	3.14	3.81	5.29	5.94	6.88

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Scenario 2

Flows for the ultimate development land uses that are consistent with the currently adopted Official Plan as determined by SCUBE SWS for the external lands, with proposed land uses and percent imperviousness for the BSS1 lands being modelled as well as accounting for flow reductions from SWM ponds.

As the regulatory storm for WC5.0 is the 100-year and proposed SWM Ponds 1 and 2 within Block 1 which both outlet to WC5.0 were designed to accommodate the 100-year storm, the controlled post-development flows were used to simulate proposed conditions for WC5.0. This approach was agreed upon with HCA and the City of Hamilton. The Scenario 2 flow inputs are summarized below in **Table 2-3**.

Table 2-3 HECRAS Flows – Scenario 2

WC5.0	Flow (m^3/s)				
	Barton	Arvin	CNR	SSR	QEW
NHYD	102	104	114	108	120
Storm/XS	2388.964	1320.692	951.897	680.8133	518.7136
100-Year	7.66	11.37	15.28	18.86	20.10
5-Year	3.23	4.82	6.65	8.07	9.73
2-Year	1.81	2.88	4.12	4.97	6.06

2.1.4 MODEL RESULTS

The proposed conditions floodline for WC5.0 for both scenarios are presented on **Drawings FP-1** and **FP-2**. The proposed conditions modelling results for WC5.0 are provided in **Appendix G-2**, which are summarized in **Table 2-4** below for the BSS1 lands. As shown on **Drawing FP-2**, the 100-year floodplain extents under Scenario 2 do not exceed the Scenario 1 water levels and the floodplain is contained within the proposed channel realignment for WC5.0 where a minimum 0.3 m freeboard from the 100-year water surface elevation to the channel top-of-slope is provided.

Table 2-4 Summary of WC5.0 HEC-RAS Model Results (Proposed Conditions)

River Station	100-Year W.S. Elevation (m)		
	Scenario 1	Scenario 2	Δ Water Level (+/-)
2388.964	94.28	93.92	-0.36
2290	93.98	93.55	-0.43
2256	93.59	93.39	-0.2
2240.61	Ex Culvert (Fruitland)	Ex Culvert (Fruitland)	N/A
2221	92.86	92.65	-0.21
2198	92.72	92.57	-0.15
2150	92.37	92.18	-0.19

River Station	100-Year W.S. Elevation (m)		
	Scenario 1	Scenario 2	Δ Water Level (+/-)
2068.437	91.45	91.3	-0.15
2044.707	90.93	90.74	-0.19
1986.134	90.63	90.48	-0.15
1901.03	90.34	89.64	-0.7
1874.583	90.03	89.09	-0.94
1853.265	Pr. Culvert	Pr. Culvert	N/A
1801.453	89.17	88.77	-0.4
1693.967	88.48	88.3	-0.18
1602.883	88.03	87.71	-0.32
1537.467	87.92	87.44	-0.48
1471.795	87.89	87.39	-0.5
1439.675	87.88	87.38	-0.5
1320.692	87.85	87.35	-0.5
1316.508	87.83	87.16	-0.67
1307.9	Ex Culvert (Barton)	Pr. Culvert (Barton)	N/A
1291.617	87.77	86.4	-1.37
1288.054	86.51	86.29	-0.22
1225.493	86.22	86	-0.22

2.1.5 DESIGN CONSIDERATIONS

The ultimate channelization of WC5.0 relies on the participation of numerous landowners that are impacted by WC5.0. The re-development timelines of the future development properties abutting WC5.0 are unknown at this time. For the purpose of orderly and practical development of Block 1, WC5.0 will likely be installed in meaningful stages.

It is anticipated that channel staging and any interim grading conditions are to be addressed in support of draft plan applications.

In the interim condition, no culvert upgrades are proposed to the Barton Street. When channel works are completed adjacent to the culvert, including the City's EA works, the culvert will be upgraded to 1500 x 3000 mm box culvert. This will eliminate the current back water condition in the channel as well existing flooding on Barton Street.

2.1.6 RIPARIAN STORAGE

In order to ensure the proposed channel grading provides sufficient storage volume to convey flows, riparian storage analysis was conducted for the 2-year, 5-year and 100-year storms. The riparian storage provided by the existing channel was set to be the riparian storage target for the proposed channel.

The riparian storage analysis was conducted by running the existing and proposed steady-state geometries with all crossings removed for each return period event. The volume of water contained within the channel for each event (i.e. riparian storage) was extracted from the model output for both scenarios in order to compare the riparian storage provided before and after development.

The existing condition flows were applied to the existing and proposed condition models for the riparian storage scenarios. The existing flows were applied to the proposed condition model at locations approximately equal to the existing model flow nodes. The same boundary conditions were applied to both the existing and proposed conditions models.

Table 2-5 summarizes the existing riparian storage targets and the post-development riparian storage volume for the re-channelized section of WC5.0 within the Block 1 study area from Fruitland Road to Barton Street. The storage volumes provided in this table include the total volume for the entire watercourse (including both overbanks and the main channel) taken as the cumulative volume between river sections 2221 (just downstream of Fruitland Road) and 1320.692 (extent of the proposed channel) for WC5.0. It should be noted that the riparian analysis does not consider flood plain storage in the proposed features such as the pools, wetland pockets, and off-line SWM ponds. The detailed riparian storage results are included in **Appendix G-2**.

Table 2-5 Summary of Existing and Proposed Riparian Storage Volumes (WC5.0)

Return Period	Storage Volume (1000 m^3)			
	Existing	Proposed	Diff. Δ (m^3)	Diff. Δ (%)
100-Year	8.43	8.84	0.41	4.6%
5-Year	3.46	3.82	0.36	9.4%
2-Year	1.94	2.01	0.07	3.5%

As per the results shown in **Table 2-5**, the proposed re-channelization of WC5.0 achieves the same riparian storage as pre-development conditions.

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2.2 WC6.0

2.2.1 EXISTING WATERCOURSE

WC6.0 also originates on the Niagara Escarpment as two small tributary gullies which confluence just upstream from Queenston Road. The WC6.0 channel flows northward until it is diverted to WC-5 at the QEW Highway. As described in the 2013 SCUBE SWS report, WC6.0 has a predominantly natural planform, with minimal channel treatments and impingements on the channel.

WC6.0 enters the Block 1 study area after crossing under Highway 8, east of Jones Road. The existing WC6.0 runs adjacent to Jones Road in a reasonably defined channel. The watercourse exits the Block 1 study area, after crossing under Barton Street through a combination of existing culverts.

There are no channel improvements or modifications are proposed for WC6.0 resulting from the Block 1 development at this time. The area within the existing WC6.0 floodplain limits is to remain in its current condition and is not to be altered as part of the proposed development. Possible channelization of WC6.0 could be contemplated through the results of further studies.

In January 2024 the hydraulic HEC-RAS model from the 2013 SCUBE SWS was obtained and used to complete the hydraulic analysis for WC5.0. The 2013 SCUBE SWS model was updated for the Block 1 hydraulic analysis for WC6.0 with topography data received from HCA.

A hydraulic analysis of WC6.0 was originally completed as part of the approved Block 2 BSS study. The latest approved Block 2 HEC-RAS model was updated as part of the BSS1 hydraulic analysis for WC6.0.

2.2.2 CHANNEL CROSSINGS

WC6.0 enters the Block 1 study area via an existing watercourse crossing at Highway 8 and exits the Block 1 study area via an existing crossing at Barton Street.

The main existing WC6.0 road crossings are summarized below in **Table 2-6** as outlined in in the SCUBE SWS HECRAS modelling.

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Table 2-6 Summary of WC6.0 Crossings

Location	Cross Section	Type	Width (m)	Height (m)	Length (m)	U/S Invert	D/S Invert	Depth Blocked (m)
Barton Street	1598.12	West Culvert: CSP Pipe Arch	1.85	1.3	20.2	84.87	84.68	0.103
		East Culvert: Concrete Box (Inlet) with Circular CSP Extension (Outlet)	Box		18.6	84.817	84.69	0.134
			1.25	1.25				
			Circular CSP					
			1.2					
CPR	939.548	Circular CSP	1.15		24.7	82.08	81.97	0
South Service Road	549.12	Concrete Box	3.05	1.5	23.8	79.63	79.48	0
QEW	315	Concrete Box	3.86	1.13	71	78.50	77.84	0

2.2.3 MODEL PARAMETERS

A brief summary of the model parameters used for WC6.0, as per the approved SCUBE SWS HEC-RAS model, is as follows:

- Manning's 'n' of 0.035 was used for the channel throughout the length of WC6.0;
- For the overbank, Manning's 'n' values of 0.070 were used from Highway 8 to Barton Street within the Block 1 study area.

2.2.4 DESIGN FLOWS

Scenario 1

Flows for the ultimate development land uses that are consistent with the currently adopted Official Plan as determined by SCUBE SWS, without any flow reductions from SWM ponds were taken from the SCUBE SWS hydrology model as shown in **Table 2-7**.

Table 2-7 HECRAS Flows - Scenario 1

WC6.0	Flow (m^3/s)			
	Barton	CNR	SSR	Lake
NHYD	128	139	132	122
Storm/XS	2457.382	1611.292	947.3374	50
100-Year	14.01	8.46	13.90	37.62
5-Year	5.67	3.75	6.29	16.50
2-Year	3.26	2.31	4.0	9.37

Scenario 2

Flows for the ultimate development land uses that are consistent with the currently adopted Official Plan as determined by SCUBE SWS for the external lands, with proposed land uses and percent imperviousness for the BSS1 lands being modelled as well as accounting for flow reductions from SWM ponds.

As the regulatory storm for WC5.0 is the 100-year and proposed SWM Ponds 1 and 2 within Block 1 which both outlet to WC5.0 were designed to accommodate the 100-year storm, the controlled post-development flows were used to simulate proposed conditions for WC5.0. This approach was agreed upon with HCA and the City of Hamilton. The Scenario 2 flow inputs are summarized below in **Table 2-8**.

Table 2-8 HECRAS Flows – Scenario 2

WC6.0	Flow (m^3/s)			
	Barton	CNR	SSR	Lake
NHYD	128	139	132	122
Storm/XS	2457.382	1611.292	947.3374	50
100-Year	9.32	7.83	13.28	33.66
5-Year	3.65	3.49	6.04	15.00
2-Year	2.04	2.19	3.88	8.31

2.2.5 MODEL RESULTS

The proposed conditions floodline for WC6.0 is presented on **Drawing FP-2**. The Scenario 1 and Scenario 2 proposed conditions modelling results for WC6.0 are provided in **Appendix G-2**, which are summarized in **Table 2-9** below. As shown in **Table 2-9**, the 100-year water levels and floodplain extents under post-development conditions do not exceed the existing flood conditions for WC6.0.

Table 2-9 Summary of WC6.0 HEC-RAS Model Results (Proposed Conditions)

River Station	100-Year W.S. Elevation (m)		
	Existing	Proposed	Δ Water Level (+/-)
2457.382	92.68	92.49	-0.19
2408.649	92.35	92.15	-0.2
2359.898	91.9	91.76	-0.14
2308.859	91.65	91.53	-0.12
2232.182	91.34	91.22	-0.12
2193.265	91.11	90.92	-0.19
2135.859	90.44	90.36	-0.08
2096.869	90.18	90.03	-0.15
2000	89.14	89.02	-0.12
1893.02	87.94	87.84	-0.1
1785.033	87.29	86.89	-0.4
1657.344	87.26	86.79	-0.47
1611.292	87.26	86.78	-0.48
1608.895	86.51	86.41	-0.1
1598.12	Ex Culvert (Barton)	Ex Culvert (Barton)	N/A
1587.12	86.08	85.82	-0.26
1584.698	86.01	85.9	-0.11
1501.817	85.95	85.79	-0.16

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3 GRADING AND ROADWORKS

3.1 DESIGN CRITERIA

The proposed lot grading design for Block 1 lands will adhere to the following general principles:

- Match existing road grades at subdivision access points.
- Match existing and proposed boundary grades around the perimeter of the subject lands.
- Provide adequate cover on municipal services to meet municipal standards.
- Direct major storm drainage system flows to SWM facilities.
- Meet municipal standards for minimum and maximum road grades and lot grading criteria.
- Conform with the intent of EA for Gordon Dean and Street B.

Proposed grading will adhere to City policies, meet existing grades at the property lines of all existing developments and not adversely impact drainage.

3.2 PROPOSED GRADING

Drawing GRD-1 presents the preliminary grading plan for the Block 1 lands. **Drawings GRD-2 and GRD-3** presents various representative sections associated with the grading plan to demonstrate relationships between critical elements within the Block. Detailed grading for individual lots/blocks are not provided in the preliminary grading plans. Individual development applications will be required to demonstrate conformance with overall Block grading plan.

The following sections describe noteworthy elements of the grading design.

3.2.1 WC5.0 CHANNELIZATION - ULTIMATE

The Block plan contemplates complete channelization of WC5.0 from Barton Street to Fruitland Road. The grading design of the ultimate channel is shown on grading **Drawing GRD-1**. A profile of the channel is provided on **Drawing FP-3** and **FP-4** and representative sections through the channel are provided on **Drawings GRD-2 and GRD-3.**

3.2.2 WC5.0 CHANNELIZATION – DESIGN CONSIDERATIONS

The ultimate channelization of WC5.0 relies on the participation of numerous landowners that are impacted by WC5.0 (i.e. the watercourse extends through the property) and its floodplain. The redevelopment timelines of the properties abutting WC5.0 are unknown at this time. For the purposes of assuring orderly development, WC5.0 will likely need to be installed in contiguous sections that can demonstrate no negative impacts to surrounding properties.

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It is anticipated that the sequence of the channel construction and any interim grading conditions will be addressed in support of draft plan applications.

3.2.3 FRUITLAND ROAD REAR YARDS AT WC5.0

Proposed lots that front onto Fruitland Road will be designed such that the front ~15m of lots will drain towards Fruitland Road which partially mimics the existing condition. The rear portions of lots will be graded to drain directly to the re-aligned WC5.0. Refer to **Drawings GRD-1, GRD-2,** and **GRD-3** for grading details and sections.

3.2.4 JONES ROAD REAR YARDS AT WC6.0

Lands situated on the east side of Jones Road that are adjacent to WC6.0 have been graded to direct surface drainage in the direction of Jones Road such that runoff to Pond 3 is maximized and uncontrolled flows/on-site storage requirements are reduced. In order to direct drainage towards Jones Road, filling is anticipated adjacent to WC6.0. The potential developable limits adjacent to WC6.0 have been estimated based on the floodplain from the SCUBE SWS HECRAS model.

The precise development limits associated with WC6.0 will be determined at later date likely in support of draft plan approval when detailed studies are advanced. The basic limits of development will be established as the greater of:

- The regulatory floodplain
- The stable top of bank
- The 100-year meander belt
- Ecological constraints

However, buffers will also be applied to the established limits of development in accordance with Secondary plan policies. Grade transitions within buffers will be subject to an updated site-specific EIS. For the purposes of conceptual grading design adjacent to WC6.0, the limits of development have been assumed generally as a line parallel to Jones Road.

Refer to **Drawings GRD-1** and **GRD-2** for grading details and sections.

3.2.5 PARK GRADING

The south-west quadrant of the block plan includes a neighbourhood park. The grading design contemplates that the park will be designed to fall from Street C towards WC5.0.

The north-east corner of Gordon Dean Avenue and Street B contains a community park. The grading design contemplates that the park will be designed to fall from Street B to the north and

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west towards Gordon Dean Avenue. Flows from the park will be conveyed overland or via an onsite storm system to the surrounding boundary road/storm sewers and ultimately Pond 2.

3.2.6 ROAD PROFILES

Preliminary road profiles for Gordon Dean Avenue, Barton Street, Street B, Jones Road, Highway 8, and Fruitland Road are shown on **Drawings PP-1 to PP-12.**

.

For internal roads, centreline gradients have been generally set at a minimum of 0.75% in keeping with City Standards. Portions of Street C have been designed with a “saw-tooth” grading to achieve a centerline gradient of 0.75% as shown on **Drawing GRD-1 and PP-4**. The net gradient through the saw-toothed grading is 0.50%.

The existing centreline gradients on Jones Road and Fruitland Road are variable as shown on **PP-7/8** and **PP-11/12**. It is anticipated that the existing centreline gradients for Jones Road and Fruitland Road will generally be maintained if the roads are urbanized.

Highway 8 and Barton Street profiles will be determined as part of the on-going EA work for these roads. To maximize drainage to WC5.0 on Barton Street and eliminate a low spot on Barton Street west of Sunnyhurst Avenue that has poor drainage, consideration should be given to raising Barton Street in the vicinity of Pond 2 as shown on **Drawing PP-5.**

3.3 ROADWORKS

The Fruitland Winona Secondary Plan and City of Hamilton standards and specifications will guide the design of Block 1 external and internal roads. Subdivision roads will be constructed to a full urban standard including asphalt pavement, concrete curb and gutters, concrete sidewalks, roadway illumination, cycling facilities and boulevard landscaping all in accordance with the City of Hamilton standards.

The Block Plan contemplates the following Road Right of Way widths:

- Barton Street – Major Arterial 40.5m (Draft Barton Street EA proposed to reduce this requirement to 36 m)
- Fruitland Road and Jones Road – Collector 26m
- Gordon Dean – Collector 36m
- Highway 8 – Arterial 36m
- Local Roads – 20m

Typical road cross sections are provided on **Drawing ROW-1** and **ROW-2**. An active transportation plan is provided in **Appendix F**.

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The alignment of Street C, as currently illustrated in the Block 1 Servicing Strategy, may encourage cut-through traffic through the local community. To address this issue, alternative alignment options and potential traffic calming measures should be investigated during the next phases of planning, in accordance with City of Hamilton requirements. The revised design should aim to minimize opportunities for non-local traffic infiltration, while maintaining appropriate access, connectivity, and circulation for all transportation modes. In addition, the design of Street C should be guided by the City of Hamilton's Complete Street Design Guidelines, ensuring the roadway supports safe, inclusive, and multimodal mobility for pedestrians, cyclists, and motorists alike.

Barton Street and Highway 8 are currently undergoing Schedule C Municipal Class Environmental Assessments (EA). A Class EA for Gordon Dean Avenue was completed in September 2020 and approved in 2021.

3.3.1 FRUITLAND ROAD

In the City official Plan, Fruitland Road is designated as a 36 m right of way width. The Block plan proposes to reduce the ROW width to 26.0m. This reduction has been verified by the traffic engineer as Gordon Dean is proposed to replace Fruitland Road as the designated truck route. This approach has been coordinated with City staff. Further details are provided in the Transportation Study in **Appendix F**.

The urbanization of Fruitland Road contemplates an 11.0 m pavement width including active transportation infrastructure. Refer to **PP-12**, **PP-12, ROW-1** and **ROW-2** for plan view layout and typical sections. Land dedications / acquisitions needed to complete the 26 m ROW are shown on **Drawing PP-7**.

The ultimate pavement width and cross-section for Fruitland Road will be determined in accordance with the Complete Street Design Guidelines as part of future subdivision development applications.

Function servicing of Fruitland Road has been included as part of this study; this includes the design of the sidewalks and the road design from Barton Street to HWY 8. Intersection requirements will be determined as part of the City's ongoing EAs. Refer to **Drawing SVC-1**.

3.3.2 JONES ROAD

In the City official Plan, Jones Road is designated as a 26 m right of way width which has been shown on the Block Plan on **FIG-3** and **ROW-2**.

The urbanization of Jones Road contemplates an 8.0 m pavement width. Refer to **Drawings PP-7, PP-8, ROW-1,** and **ROW-2** for plan view layout and typical sections. Land dedications / acquisitions needed to complete the 26 m ROW are shown on **Drawing PP-5**.

The ultimate pavement width and cross-section for Jones Road will be determined in accordance with the Complete Street Design Guidelines as part of future subdivision development applications.

3.3.3 TEMPORARY INTERSECTIONS

It is anticipated that Block 1 lands may develop in advance of the urbanization of the boundary roads. Temporary intersection improvements may be required at boundary road intersections as outlined in the Transportation Study in **Appendix F**. Grading and drainage details of the temporary intersections will be addressed in support of the detailed design as part of a future development application.

4 WASTEWATER

4.1 EXISTING WASTEWATER SERVICES

The lands within Block 1 are currently serviced in two existing sanitary sewersheds out letting to the eastern interceptor on North Service Road, described as follows:

Area 1 - Fruitland Road Sewershed

- Existing 375 mm and 450 mm diameter within Fruitland Road flowing north from Highway 8 to Barton Street;
- Existing 300 mm, 375 mm, and 525 mm diameter within Barton Street flowing west from Kenmore Avenue to Fruitland Road;
- Existing 300 mm and 375 mm diameter within Barton Street flowing east from Meteor Boulevard to Fruitland Road; and,
- Existing 600 mm and 675 mm diameter flowing north within Fruitland Road from Barton Street to South Service Road where flows outlet to a 1650 mm trunk sewer on North Service Road (eastern interceptor).

Area 2 - Jones Road Sewershed

- Existing 375 mm and 475 mm diameter within Jones Road flowing north from Highway 8 to Barton Street;
- Existing 300 mm diameter within Barton Street flowing east from Kenmore Avenue to Jones Road;
- Existing 300 mm, 375mm, and 450 mm diameter within Barton Street from approximate 300 m west of Glover Road to Jones Road; and
- Existing 525 mm and 600 mm diameter within Jones Road flowing north from Barton Street to South Service Road where flows outlet to a 1500 mm trunk sewer on North Service Road (eastern interceptor).

This study analysed flows upstream of the North Service Road trunk sewers.

Refer to **Drawings SAN-1 and SAN-2**.

4.2 WASTEWATER DESIGN CRITERIA

Proposed wastewater infrastructure will be designed in accordance with the latest City of Hamilton design standards and specifications (per *Section E 1.4 Comprehensive Development Guidelines and Financial Policies Manual*, 2019) as follows:

Wastewater Design Criteria

- Average Dry Weather Flow — 360 litres per capita per day
- Infiltration — 0.6 litres per second per hectare
- Peaking Factor — Babbitt Formula – $PF = 5/(p^{0.2})$ where p = population (thousands)
- Capacity — 75% full design capacity of the pipe for sizes up to 450 mm

  Trunk sanitary sewers (525 mm diameter and above) shall be designed to flow at a maximum of 60% full design capacity of the pipe.

Population Criteria – per City Comprehensive Development Guidelines

Land Use	Maximum Units Per Ha	People Per Ha
Single Detached – Low Density 1	20	60
Semi-Detached – Low Density 2	40	75
Townhouse – Low Density 3	60	110
Parks	-	12-25
Apartments-Medium Density 2	75	250
School and Institutional Uses	-	75-125
Commercial	-	125-750
Industrial and Central Business Districts	-	125-750
Rural-NEC Lands-Not Developable	N/A	0

4.3 PROPOSED WASTEWATER SERVICING

Development of the subject lands will be serviced for wastewater through the extension of gravity sewers off of the existing infrastructure.

Refer to **Drawings SAN-1 and SAN-2** for details of the wastewater servicing system and **Appendix I** for the sewer design sheets.

The following sections summarize the results of the analsys for various elements of the proposed and existing wastewater system.

One common principal that has been applied to the wastewater design calculations is that existing rural lands (lands in the greenbelt) situated to the south of Highway 8 have been excluded as the servicing of those lands do not conform with Provincial policy or the City's Official Plan. As such, the analysis has determined the minimum infrastructure needed to service Block 1 and to identify any capacity constraints in existing offsite infastructure (external to Block 1). Notwithstanding, it is City of Hamilton engineering practice is to consider accommodating flows from lands not intended for development. See **Section 4.4** for discussion and recommendations related to potential future flows originating from south of Highway 8.

4.3.1 AREA 1 – FRUITLAND ROAD SEWERSHED

Fruitland Road-South of Barton

The sanitary flows to the sanitary sewer within Fruitland Road have been determined based on a combination of existing conditions (generally west of Fruitland Road) and anticipated redeveloped conditions along Fruitland Road.

It has been found that under full development conditions in Block 1, the existing sanitary sewer within Fruitland Road between Highway 8 and Barton Street will flow no greater than 44% full which satisfies City design standards. See **Drawing SAN-1** and the design sheets in **Appendix I** for details.

Improvements may be required along Fruitland Road to make accommodation for new lots that front on Fruitland Road.

Drainage Area SW8

Drainage Area SW8 (as shown on **Drawing SAN-1**) situated just east of Fruitland Road at Highway 8 is recommended to be serviced along Highway 8 by extending the Fruitland Road sewer easterly from EX MHSI07A015 which is ~ 6.0 m deep.

Barton Street

The majority of Block 1 has been designed to be serviced via an extension of the existing wastewater infrastructure located on Barton Street. A new 450 mm diameter is proposed on Gordon Dean Avenue which will connect to the existing MH SJ05A019 on Barton Street at Sunnyhurst Avenue.

The proposed Gordon Dean Avenue sewer services an area of 52.6 ha with an estimated population of 5,669 persons and a flow is 115.0 L/s.

To accommodate the Block 1 development, the existing 375 mm wastewater main on Barton Street from MH SJ05A019 to MH SJ05A020 will need to be lowered. The 2024 DC background study indicates that a 525mm is to be installed along Barton Street to replace the 375mm from MH SJ05A020 to Gordon Dean Avenue.

Refer to **Drawing SAN-1** and design sheet in **Appendix I** for details.

Fruitland Road-North of Barton

The Fruitland Road and Barton Street sewersheds combine at MH SI05A006 at the intersection of Barton Street and Fruitland Road.

Under full development conditions in Block 1, an approximate population of 6,341 people will contribute 125 l/s to the existing sanitary sewer. The existing sanitary sewer within Fruitland Road from Barton Street to South Service Road is anticipated to flow a maximum of 67% full.

Refer to **Drawing SAN-2** and design sheets in **Appendix I** for details.

No improvements are contemplated for the sanitary sewer located on Fruitland Road north of Barton Street.

4.3.2 AREA 2 - JONES ROAD SEWERSHED

Jones Road-South of Barton

The existing 375 mm to 450 mm sanitary sewer (SJ06A001 to SJ05A008) located on Jones Road was analyzed based on full build out conditions.

Under full development conditions in Block 1, the existing sanitary sewer within Jones Road upstream of Barton Street is anticipated to flow at a maximum of 35% full which satisfies City design standards. The total service area is 25.7 ha with an estimated population of 2,633 persons and a flow is 60.6 L/s. Refer to **Drawing SAN-1** and design sheets in **Appendix I** for details.
No improvements are contemplated for the sanitary sewer located on Jones between Barton and Highway 8 as part of the BSS1. Although not required by the BSS1, the City of Hamilton DC background study contemplates replacement of 230 m of sanitary sewer on Jones Road as a 450 mm between Barton and Highway 8.

Barton Street-East of Jones

The existing 450 mm sanitary sewer located on Barton Street east of Jones Road primarily services Block 2. Population and service area information was derived from the Block 2 Servicing Strategy for the Fruitland – Winona Secondary Plans report by Aquafor Beech Ltd.

Under full development conditions in Block 1 and 2, this sanitary sewer is anticipated to flow at a maximum of 73% capacity which meets City design criteria (maximum 75% full). The total service area is 32.7 ha with an estimated population of 5,271 persons and a flow is 98.4 L/s.

Refer to **Drawing SAN-2** and design sheets in **Appendix I** for details.

Jones Road- North of Barton

At Jones Road and Barton Street, flows from Blocks 1 and 2 combine into an existing 525mm (increases to 600 mm downstream) sanitary sewer that flows north on Jones Road to the 1500 mm trunk sewer at the South Service Road.

Under full development conditions in Block 1 and 2, the existing sanitary sewer within Jones Road north of Barton Street is anticipated to flow at a maximum of 87% full which does not meet City design criteria of maximum 75% full. The locations of the theoretical capacity constraints are shown on **Drawing SAN-2** and indicated in in the design sheet with colored background and red colored typeface in the “Percent Full” column.

Of the total anticipated sanitary sewer flows draining north from Barton Street on Jones Road, 41% are attributed to Block 1 and 59% are attributed to Block 2. Refer to **Drawing SAN-2** and design sheets in **Appendix I** for details.

4.4 LANDS SOUTH OF HIGHWAY 8 (GREENBELT LANDS))

Although currently outside of the urban boundary and in the greenbelt, lands situated south of Highway 8 could be approved for development at some time in the future if current policy changes. In that regard, it is good practice to include lands like in the design of the downstream receiving system. **Drawing SAN-3** depicts the possible service areas south of Highway 8. Sewer design calculations including the future areas are provided in **Appendix I**. **Table 4-1** below compares the results of the design calculations with and without the future lands.

Table 4-1 Sanitary Future Design Calculations

	Sewershed		
	Fruitland (EXT2)	Jones (EXT3 and EXT3.1)	Jones (EXT4)
Added Area	21.6 ha	19.8 ha	24.2
Added Population	2376	2219	2904
Assumed Density	110 ppha	110-125 ppha	120 ppha
Flow	54.6 l/s	51.3 l/s	63.4
Local Sewer Sizing	Oversize sewer on Gordon Dean from 250 and 450 mm to 375 and 525mm	These flows fit in the Jones Road Sewer up to Barton	These flows are assumed to be routed through Block 2 to Barton Street.
Sewer Deepening	Extend and Flatten Sewer on Gordon Dean to provide min 4.0-5.0 m depth at Highway 8.	None	Lowering through Block 2 to deliver a sewer ~ 6 m deep at Highway 8.
Impact-On Barton	Max Capacity utilization 85%		Increase Barton Pipe to 600mm.
Impact North of Barton-	Max Capacity utilization 80%	Max Capacity utilization up to 119%. Increase 1-2 pipe sizes ~14 pipes.	Max Capacity utilization up to 119%. Increase 1-2 pipe sizes ~14 pipes.

As shown in the above table, accommodating lands south of Highway 8 for development results in theoretical capacity exceedances in the existing wastewater infrastructure generally downstream of Barton Street in both the Jones Road and Fruitland Road sewersheds. The following should be considered as it relates to servicing accommodation for the future lands.

- Blocks 1 and 2 to make accommodation for the future lands by oversizing and deepening wastewater mains proposed within each respective block boundaries. Note, population densities assumed for lands south of Highway 8 (110-125 pp/ha) are considered conservative.
- For example, if development is approved south of Highway 8 occurs, consideration may be given to installing a local sanitary sewer on Highway 8 out letting at Gordon Dean Avenue. The sewer on Gordon Dean Avenue would need to extend to Highway 8 at sufficient size an depth.
- Financing of oversized sewers within or external to the Block will be in conformance with City Financial policies. Some of the needed works will qualify for DC reimbursement.

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5 WATER SERVICING

A study entitled Fruitland Winona Block 1-Watermain Hydraulic Analysis was prepared by WSP (provided in **Appendix J**) in support of the proposed development to identify the hydraulic requirements for the subject lands. These include the analysis of the Average Day, Maximum Day, Peak Hour and Maximum Day plus Fire Flow demand conditions of the development under present, and ultimate buildout (2031) planning horizons. The analysis used the WaterCAD model provided by the City of Hamilton, of the Hamilton water distribution network for Pressure District 1 (PD1).

5.1 EXISTING WATER SERVICES

The existing water network in close proximity to the proposed development includes:

- a 900 mm diameter transmission main along Barton Street;
- a 400 mm diameter watermain along Barton Street, parallel to the 900 mm transmission main. The 400 mm watermain connects to the 900 near the northwest and northeast corners of the subject lands;
- a 200 mm diameter watermain along Fruitland Road;
- a 300 mm diameter watermain along Jones Road; and
- a 400 mm diameter watermain along Highway 8

Refer to **Drawing WM-1**.

5.2 DESIGN CRITERIA

- Average Daily Demand:
  - Residential 360 litres per capita per day
  - Employment 260 litres per capita per day
- Max. Daily Peaking Factor: 1.9
- Max. Hour Peaking Factor (Residential): 3.0

Population Criteria – per City Comprehensive Development Guidelines

Land Use	Maximum Units Per Ha	People Per Ha
Semi-Detached – Low Density 2	40	75
Townhouse – Low Density 3	60	110
Parks	-	12-25
Apartments-Medium Density 2	75	250
School and Institutional Uses	-	75-125
Commercial	-	125-750
Industrial and Central Business Districts	-	125-750

5.3 FIRE FLOW DEMANDS

The required fire flow for the proposed development is 250 L/s based on City of Hamilton Water and Wastewater Master Plan.

5.4 THE MODEL

The WaterCAD hydraulic model was updated to include the proposed watermains and demands of Block 1. The model as provided by City of Hamilton had established boundary conditions for Pressure District 1 (PD1) where the development is proposed to be located.

5.5 BOUNDARY CONDITIONS

The boundary conditions provided in the City of Hamilton model contained two scenarios that represented different water levels within three reservoirs:

All pumps at Woodward Wastewater Treatment Plant (HWHLP) OFF.
Two Alternatives:
1. **2021a**: 50% Reservoir only (HDR01, HDR1Band HDR1C @ 129.0m, 128.0m and 129.0m respectively)
2. **2021b**: 75% Reservoir only (HDR01, HDR1Band HDR1C @ 131.2m, 130.7m and 131.2m respectively)

5.6 ANALYSIS

The proposed watermain modelling was carried out for Average Day, Maximum Day, Peak Hour and Maximum Day plus Fire Flow scenario under 2021 and 2031 demand (full build out) condition for the steady state scenarios. Prior to implementing the future watermains and demands, the existing water model steady state scenarios for 2021 and 2031 were run and while the model produced warning messages, most were associated with pressure district (PD) 18. While the model was still able to run, it is worth noting the warning messages for further investigation by the City. The estimated water consumption rate for Block 1 was included in the model to represent the future system demand.

5.7 AVAILABLE FIRE FLOW

The modelling results indicate that the required fire flow of 250 L/s can be achieved under 2021 and 2031 (full build-out) scenario, without the system pressure dropping below 20 psi at any nodes within Block 1. However, the variable speed controls at pump HD018-DLP03 needed to be adjusted to a lower pressure target of 90 psi rather than the existing target of 97 psi for the model to run. The fire flow simulations were conducted at node NW1 and node SW3 individually under

2021 and 2031 scenario with Maximum Day plus Fire Flow Condition. A map of all nodes is provided in the Watermain Hydraulic Analysis in **Appendix J**.

5.8 CONCLUSIONS

- The modelling results indicates that the water supply distribution system is capable of providing adequate flows and pressures to support the proposed development depending on the boundary conditions used in the hydraulic model.
- With one of the Woodward Wastewater Treatment Plant pumps on, the estimated system pressures are between 40 – 62 psi under all normal operating conditions. Under fire flow conditions, the minimum pressure is well above the minimum of 20 psi.
- Required fire flows can be achieved throughout the development; however, the pressure controls for the PD 18 booster pump station need to be adjusted to a lower pressure. Pressures at all nodes within the development were above 20 psi under maximum day demand plus fire flow conditions.

More information has been provided in the WSP report in **Appendix J**.

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6 STORMWATER MANAGEMENT

6.1 SWM REQUIREMENTS & DESIGN CRITERIA

The SWM targets and design criteria for the subject lands have been established by the BSS1 TOR, the SCUBE SWS, MECP guidelines, local and municipal criteria, and discussions with the City and HCAs.

The TOR requires the following items to be completed as part of the BSS1::

- Re-run of hydrology model with updated post-development drainage areas and impervious values;
- Establish peak flows, runoff volumes and erosion threshold impacts;
- Preliminary design of stormwater management facilities;
- Capacity assessment of receiving system(s);
- Identification of drainage constraints;
- Screening of proposed SWM strategies and recommended preferred SWM solutions;
- General drainage plans for pre and post-development conditions;
- Identify opportunities for passive recreation as part of the stormwater management strategy;
- Construction phasing of the proposed SWM ponds; and
- Functional design of proposed watercourse realignments.

The above-mentioned SWM criteria are also required to be consistent with the SCUBE SWS's recommendations for surface water quality control, water quantity control, water balance, and erosion control.

Recommendations include the following:

1) SWM design criteria, including unit storage volumes and unit release rates for both erosion and flood control design of the proposed SWM facilities;
2) Outlet locations;
3) Requirement for Level 2 Normal water quality design of SWM facilities;
4) Infiltration targets for water balance mitigation including 1 mm for residential lands over silt/clay, 2.5 mm for commercial/institutional lands over silt/clay, and 2.5 mm for all land uses over sand/gravel; and
5) 6-hour SCS rainfall distribution based on the Mount Hope IDF parameters as provided in the approved Visual Otthymo modelling.

The following summarizes additional technical design requirements for SWM that have been used to guide the BSS1 SWM designs:

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- Ensure that existing flow rates downstream of the subject lands are not exceeded under post-development conditions, thereby providing flood protection for properties downstream of the subject lands;
- Provide erosion control through extended detention in the proposed SWM facilities based on the erosion threshold target unit flow rate;
- Provide a drawdown time for the required extended detention volume within the SWM facilities that meets MECP criteria, which is a minimum of 24-48 hours, in order to protect the form and function of the watercourse downstream of the SWM facilities;
- Even though SCUBE SWS criteria specified normal water quality protection, MECP Enhanced (Level 1) water quality treatment is proposed to be achieved as the surrounding blocks were previously required to meet this standard by the HCA;
- Maintain overall pre-development site water balance by infiltrating a portion of all runoffs from the rooftops across the site through the use of LID measures and other best management practices in accordance with the approved City of Hamilton Green Standards and Guidelines, which also addresses SCUBE SWS groundwater recharge targets;
- Provide safe conveyance for the Regulatory Storm event, (the 100-year storm event) through subject lands; and
- 6-hour SCS rainfall distribution based on the Mount Hope IDF parameters.
- Ponds are designed in accordance with Section G.5.4.2 of the City of Hamilton Development guidelines.

The following design criteria apply to the storm sewer conveyance system, based on the City of Hamilton Comprehensive Development Guidelines, as referenced below:

- The Intensity-Duration Frequency (IDF) Parameters from City of Hamilton Comprehensive Guidelines Appendix G for Mount Hope have been applied in the storm sewer design sheets and overland flow calculations;
- The runoff coefficients used throughout the storm drainage design are consistent with Table F.1;
- Initial time of Concentration (Tc) is 10 minutes and the time for conveyance of storm flows is based on full pipe flow velocities, as required in Section F.1.4; and
- Storm sewer pipe design is provided in accordance with Section F.1.5.

The following sections also include any revisions to existing drainage patterns and conditions, discussion on the enclosing of a portion of the watercourse through the subject lands, and the design of new road crossings (i.e. culverts). The functional design for the BSS1 will be refined during the detailed design stages as required.

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6.2 EXISTING CONDITIONS

Under existing conditions, Block 1 has three drainage outlets to the north of the block, namely watercourses 5, 5.2 and 6. Refer to **Drawing EXC-1** for the drainage features described in the follow sections.

WC5.0 flows along the west side of Block 1 adjacent to Fruitland Road and collects drainage upstream of Barton Street from 32.49 ha of Block 1, as well as 127.1 ha of drainage external to Block 1 to the south of Highway 8 and west of Fruitland Road.

Watercourse 5.2 (WC5.2) collects drainage from 39.4 ha of Block 1 and concentrates near the intersection of Barton Street and Sunnyhurst Avenue. From Sunnyhurst Avenue and Barton Street, WC5.2 is comprised of a combination of road-side ditches and metal culverts that convey flows northerly across Arvin Avenue to the CNR, then easterly along the CNR to combine with WC5.0.

WC6.0 borders the eastern boundary of Block 1 and collects drainage from 27.71 ha within Block 1, 27.34 ha from Block 2 to the east, and 103.92 ha of external drainage from south of Highway 8. At Highway 8, drainage from the highway as well as 4.37 ha of drainage adjacent to Jones Road that flows south is conveyed easterly to WC6.0 in a combination of ditches and shallow storm sewers. The drainage north of approximately 250 m north of Highway 8 and Jones Road is serviced by a local storm sewer that discharges easterly to WC6.0. The remainder of Jones Road up to Barton Street is comprised of roadside ditches and driveway culverts. At Barton Street flow from Jones Road enter a roadside ditch on the south side of Barton which flows easterly to WC6.0.

The flows at the downstream locations of Barton Street, the CPR, South Service Road, and QEW for WC5.0 and WC6.0 will be used as target rates for post development conditions, as well as the cumulative flow at the Lake.

6.3 PROPOSED LAND USE

The SCUBE SWS provides recommendations for three SWM end-of-pipe pond sizing based on a required unitary storage (m^3 / impervious ha) and unitary release rate (m^3/s / ha). The SCUBE SWS impervious values for the subject site does not align with the proposed land uses, therefore sizing was based on the required volume indicated by the hydrologic model to ensure that post-development flows did not exceed pre-development values downstream.

The catchment imperviousness has been based on a combination of measured impervious values for areas within Block 1 where development concept plans have been prepared using City of Hamilton runoff coefficients based on the Fruitland-Winona Secondary Plan. Similarly to the existing land use, runoff coefficients were converted to impervious values using the following equation:

$$\text{Imperviousness \%} = (C - 0.05) / 0.009$$

Table 6-1 below outlines the impervious coverage for each proposed land use within Block 1.

Table 6-1 Impervious Coverage By Land Use

Land Use	Runoff Coefficient*	Impervious Coverage (%)
Park, Open Space, Channel Corridor	0.25	22
Apartment	0.75	78
Back-to-Back Townhouses	0.86	90
Townhouses	0.65	67
Single Detached	0.65	67
Stormwater Pond	0.59	60
Commercial	0.9	94
Institutional	0.75	78
Road	0.64	65
Industrial	0.8	83
Paved Area	0.95	100
Existing Undeveloped Lands	0.05	0

A comparison of the SCUBE SWS drainage areas and % imperviousness values (From SCUBE SWS Table 5.2) and those used to design the proposed SWM ponds for the BSS1 has been provided below in **Table 6-2**.

Table 6-2 Comparison of SCUBE SWS Area and %IMP to Proposed

	BSS1 – Post Development Scenario		SCUBE SWS	
	Drainage Area (ha)	% Imp	Drainage Area (ha)	% Imp
Pond – 1	33.56	68	39.8	50
Pond – 2	28.29	54	24.5	52
Pond – 3	15.05	69	26.4	48

A breakdown of the impervious coverage based on land-use for each proposed drainage catchment has been included in **Appendix H.**

For areas consisting of parkland or channel corridor, CN numbers were assigned to pervious land cover based on soil type, as summarized below in **Table 6-3**.

Table 6-3 Soil Type Versus SCS Curve Number

Soil Type	SCS Curve Number
Jeddo Sandy Loam	72
Winona Sandy Loam	66
Farmington Loam	66
Chinguacousy Silt Loam	72
Oneida Silt Loam	72
Trafalgar Silty Clay Loam	81
Oneida Loam	72
Chinguacousy Loam	72
Morley Silty Clay Loam	77
Stream Course	65
Escarpment	80

Where a NASHYD catchment included any impervious area, a weighted CN number was calculated using the CN value for the pervious areas (as per **Table 6-2**), and a CN value of 98 for impervious surface. Time to peak was also determined for all drainage catchments represented by NASHYDs using the Upland Method.

The calculations of impervious, CN numbers, and time to peak for existing conditions are provided in **Appendix H.**

Drawings STM-1 illustrates the total drainage area and corresponding imperviousness for the contributing catchments to each SWM pond.

6.4 PROPOSED MAJOR AND MINOR SYSTEM DRAINAGE

6.4.1 LANDS EAST OF WC5.0

For the portion of Block 1 situated to the east of WC5.0 major and minor storm drainage systems are generally designed to convey storm runoff to the two (2) proposed SWM Pond facilities prior to discharging to WC5.0. The minor storm sewer system which is designed to accommodate flow from the 5-year storm at 85% full design capacity, in accordance with the City's design standards.

The minor drainage system is depicted on **Drawings STM-2** including pipe sizes, proposed slopes and rim elevations. Storm sewer outfalls have been set such that the pipe is not submerged in the 5-year event.

The proposed major system drainage scheme and flow path is also shown on **Drawing STM-2**. The major system conveys flows overland to the pond when the capacity of the storm sewer is exceeded.

In some circumstances, 100-year storm sewer capture will be required where the capacity of the road right of way is exceeded or where flows are to be directed to the pond. Areas of anticipated 100-year capture are indicated on **Drawings STM-2**. At the FSR stage, the storm pipes will be re-sized to account for the allowable flows that can be contained on road surfaces versus the flows that need to be captured.

An outfall pipe for Pond 2 is proposed within the Barton Street right of way with a direct connection to WC5.0 culvert. The pipe is sized to convey the 100-year controlled flow from Pond 2, the 5-year flow from Barton where feasible and controlled flows from 2 potential lots that front on to Barton that cannot be captured in nearby ponds (areas 574 and 526). Refer to **Drawing PP-5** and **PP-6** for details of the proposed Barton Street storm sewer. It is recommended that the new storm sewer on Barton be extended as far east as possible.

Barton Street drainage will be further studied as the EA advances. Under existing conditions, the intersection of Sunnyhurst and Barton is poorly drained.

The uncontrolled areas include catchments 508, 569, 502, 606 and 619 (as shown on **Drawing STM-2**). SWM ponds have been sized to over-control the pond discharge flows to accommodate for these uncontrolled areas such that downstream target flow rates are not exceeded.

6.4.2 LANDS WEST OF WC5.0

The rear portions of lots situated to the west of WC5.0 (areas 509 and 510) are intended to drain uncontrolled via the surface directly to the new WC5.0 channel uncontrolled. The front portions of lots fronting Fruitland are assumed to continue to drain to existing storm infrastructure located within the Fruitland Road right of way.

6.4.3 HIGHWAY 8

At Gordon Dean

Proposed Block 1 storm sewers and Pond 2 have been sized to accommodate flows originating from drainage area 580 which is a portion of the Highway 8 right of way south of Block 1. Refer to **Drawing STM-2**.

At Fruitland Road

Topographic mapping and as-built drawings indicated that the western portion of Highway 8 drains towards Fruitland Road through an existing storm sewer which ranges in size from 300 mm to 600 mm and outlets at WC5.0. Much of this drainage area will be diverted into Block 1 as described in the previous section so that it can be conveyed to the proposed ponds, leaving a small drainage area (568) that will continue to drain to WC5.0 due to grading constraints. No improvements are proposed for the existing storm sewer system in this location.

At Jones Road

Topographic mapping and as-built drawing indicated that a portion of the southeast quadrant of Block 1 (drainage area 606 and a portion of area 620) drain south towards Highway 8. Flows from these areas are collected and conveyed by an existing storm sewer which ranges in size from 375 mm to 600 mm which outlets at WC6.0.

The existing storm sewer system on Highway 8 may require upgrading to provide improved service to the properties within Block 1 in the southwest quadrant. Further, Area 620 is proposed to have on-site control and could benefit from a deeper outlet along Highway 8. Refer to PP-8 for a conceptual design of a proposed upgraded storm sewer on Highway 8.

6.4.1 JONES ROAD AND BARTON STREET AT WC6.0

The redevelopment adjacent to Jones Road within Block 1 will require new storm sewers to be installed to service Jones Road proposed as follows:

1. A 0.9 X 1.8 box culvert on Jones Road that out letting to WC6.0.
2. A twin 600mm storm sewer on Barton Street that also outlets to WC6.0 at the existing culvert east of Jones Road.

The proposed storm sewers will be designed to convey a minimum of the 5-year storm from the right of way and adjacent development lands.

Areas tributary to the Barton Street storm sewer that will require on-site controls include areas 610, 624 and 616.

Drawing STM-2 identifies the two proposed storm sewer outlets and associated drainage areas. **Appendix H** provides storm sewer design sheets for the Jones Road and Barton Street storm sewers.

Major system flows originating on Jones Road will follow the street as shown on **Drawing STM-2**. Overland flows originating from Jones Road and the development blocks will need to be

captured in the vicinity of MH 62; catchbasins will need to be designed to capture the flow into Pond 3.

6.4.2 HIGHWAY 8 AND FRUITLAND

Drainage Area 508 is proposed to release uncontrolled flows directly into WC5.0 with quality control being provided through an oil and grist separator (OGS) and/or LIDs. Ponds 1 and 2 have been designed to overcontrol flows such that the uncontrolled flows from Area 508 will not cause an increase in peak flows in WC5.0.

6.4.3 HYDRAULIC GRADE LINE AND FOUNDATION DRAINAGE

When detailed designs are completed for each development, a hydraulic grade line (HGL) analysis will be required to confirm pipe versus surface flows.

Additionally, basements in the influence of high HGL will require sump pumps. The extent of sump pumps will be determined when the final HGL study is completed in support of detailed design.

6.5 SWM POND LOCATION STRATEGY

The future SWM Pond options and locations, including the preliminary locations designated by the SCUBE SWS, were evaluated to determine the best alternative for each outlet. The pond matrix outlining the pond locations and configurations is presented in **Appendix H-2.** It was confirmed that the preliminary locations for Pond 1 (Fruitland and Barton), Pond 2 (Gordon Dean and Barton) and Pond 3 (Jones and Barton) that were designated by the SCUBE SWS, as shown on **Drawing STM-2**, are the best options for proposed pond locations. **Drawings SWM-1** to **SWM-6** show the proposed SWM pond plans and sections for all three facilities, which illustrate preliminary pond grades, water levels, access roads, sediment forebays, and inlet and outlet locations. Pond design information has been provided in the following sections.

The SWM facilities have been situated in the proposed locations for the following reasons:

- To be consistent with the SCUBE SWS study recommendations;
- To make use of existing / natural low points in terrain to minimize earthworks / cut and fill operations and maintain existing drainage patterns as much as possible;
- To maintain a permanent pool while draining into the receiving channel or storm sewer system;
- To maintain flow input locations along the receiving watercourses, where possible;
- To minimize storm sewer infrastructure size and avoid potential servicing crossing conflicts;
- To optimize land-use by maximizing tableland and serviceable area; and
- To provide an aesthetic buffer between residential areas and the external roads.

The proposed BSS1 SWM Plan (**Drawing STM-1**) largely mirrors the SCUBE SWS SWM Plan with minor revisions – the main revisions being refinements to the overall area of the drainage catchments to each SWM pond, as well as the assumed impervious values based on changes in land use. A table showing the original SCUBE SWS flow and volume targets for the sizing of the SWM ponds has been included in **Section 66.4** below. The guiding SWM pond design criteria from the City of Hamilton have also been described further in **Section 6.6.1** below.

6.6 SWM POND DESIGN

6.6.1 SWM POND DESIGN CRITERIA

The following table demonstrates conformance to the City's SWM pond design criteria as per the City of Hamilton's Comprehensive Development Guidelines (2019).

Table 6-4 SWM Pond Design Criteria Conformance

Pond Element	Design Criteria	Conformance
Shape / Size	Incorporate two cells – forebay and main wet cell, separated by a submerged berm	One forebay and main wet cell, separated by a berm. The top of berm is to be 0.3 m above the permanent pool (PP) elevation, with erosion protection provided above the PP. The berm is to have a 3.0 m top width, with 3:1 max. side slopes to the maximum operating water level in the pond. *Please refer to Drawings SWM-2, SWM-4 and SWM-6 for details.*
	Length – based on particle size and settling rate (MOE calculation)	Sufficient length provided *Please refer to Drawings SWM-1, SWM-3 and SWM-5.*
	Shape – Minimum 3:1 length to width ratio in forebay	Minimum L:W ratio of 3:1 has been provided within the forebay area. *Please refer to Drawings SWM-1, SWM-3 and SWM-5 for details*

Pond Depth	Permanent pool: 1.0 - 2.0 m; 2.5 m max. at outlet	Required pond depths provided. *Please refer to Drawings SWM-1 to SWM-6 for details*
	Quantity Control Storage: Max. depth of 2.5 m (from permanent pool up to 100-year water level)	Active storage depth measured from permanent pool to 100-year water level has been limited to 2.5 m. *Please refer to Drawings SWM-1 to SWM-6 for details*
Bottom Lining	Shale / Clay excavation is satisfactory; if not watertight, use clay lining	Liners will be proposed at detailed design if determined necessary by geotechnical studies.
Side Slopes	Minimum 7:1 side slope within planting shelf (1.5 m width above NWL, and 1.5 m width below the NWL)	7:1 slope provided above and below permanent pool level within planting shelf *Please refer to Drawings SWM-1 to SWM-6 for details*
	Minimum 5:1 side slope above planting shelf to top of pond	5:1 slopes above planting shelf have been provided. *Please refer to Drawings SWM-1 to SWM-6 for details*
	Minimum 4:1 side slope below the planting shelf within the permanent pool to the pond bottom	4:1 slope provided below 7:1 zone to pond bottom *Please refer to Drawings SWM-1 to SWM-6 for details*
Pond Block Size	The required pond block size shall be determined at the Draft Plan stage of the planning approval process. (may be refined prior to registration) 1: Determine the pond storage area based on total required flood volume and pond side slope criteria. 2: Add 5 m buffer around entire perimeter of SWM pond starting from pond block property line to commencement of pond	The pond storage area was based on the total required volume, as summarized in Section 6.6.4. Minimum required buffer areas have been applied above the high-water level.

	grading. This 5.0 m buffer zone shall not exceed an average slope of 10:1. Note: Marginal setback area compromises will be allowed to facilitate irregular pond shapes.	*Please refer to Drawings SWM-1, SWM-3 and SWM-5 for details.*
Inlet Structures	Pipe invert to be at NWL or if submerged at NWL, it must be demonstrated that the storm system will operate under free-flow (non-surcharged) conditions during the 5-year storm event.	The storm sewer inverts at all proposed pond inlets will be set at the NWL and will be confirmed at detailed design.
	Erosion protection shall be provided between the inlet headwall and forebay bottom to prevent localized scouring; and shall match the headwall width. The erosion protection shall extend a min. of 1.5 m on either side of the headwall at the forebay bottom. Protection material shall consist of riprap or river stone, underlain with geotextile.	Erosion protection at the inlet(s) to be sized / provided at detailed design.
	All proposed headwalls and grating shall conform to OPSD, with railings as required.	Proposed headwalls and grating in conformance with OPSD. *Please refer to Drawings SWM-2, SWM-4, and SWM-6 for details*
	Flows in excess of the 5-year event (i.e. major flows) are to bypass the sediment forebay and discharge to the main wet cell of the SWM Pond.	The pond layout has been modified such that major system flows bypass to the main wet cell. *Please refer to Drawings SWM-1 to SWM-6 for details*
Outlet Structures	The SWM pond outlet elevation will be set in accordance with Provincial and City policy and to the satisfaction of the City of Hamilton	
	Primary outlet control pipes shall be bottom draw. Mechanical weirs/structures to be designed to manage the 5 through 100 year controlled flows.	A reverse-slope outlet bottom draw pipe with orifice control has been provided for extended detention control. Additional details of the mechanical control structures will be provided

		in support of draft plan approval. *Please refer to Drawings SWM-1 to SWM-6 for details*
	All proposed headwalls and grating shall conform to OPSD, with railings as required.	Outlet headwall details to be provided at detailed design.
	Overflow (emergency/uncontrolled) pond spillway. A minimum 0.10 m freeboard to be provided between the emergency spillway invert and the 100-year pond water level. A minimum 0.3m freeboard to be provided above the emergency weir flow depth.	Emergency flow will discharge through the proposed spillway into the receiving watercourse or road. *Please refer to Drawings SWM-1, SWM-3, and SWM-5 for details.*
	Erosion protection for outfalls shall generally consist of a combination of rip rap or river stone and vegetation.	Rip rap will be provided and will be sized at detailed design.
Maintenance Drain	Maintenance drains to be installed to allow the pond to drain by gravity flow during pond maintenance.	Due to elevation constraints imposed by receiving water courses, gravity drainage of permanent pool is limited. Permanent pool drainage via gravity for maintenance purposes is to be provided on a best-efforts basis.
Maintenance Access Roads	Maintenance access roadways shall be provided from the City's road allowances to all pond inlet and outlet structures and to the bottom of pond within the sediment forebay. Where feasible, two access points to the City's road allowance shall be provided and access roads shall be looped to access points. Dead end access roads shall be avoided and shall be designed with a hammerhead turn around, with a	Access roads have been provided with a 4.0 m width above the high-water level in the pond and shall be designed in accordance with the City's standards. *Please refer to Drawings SWM-1 to SWM-6 for details*

	minimum hammerhead width of 17.0 m, roadway width of 4.0 m and 12.0 m centreline turning radius. A turning area of 12.0 m diameter may be provided instead of a hammerhead. The following dimensions should be considered in the maintenance access design: Min. Roadway Width: 4.0 m Max. Gradient = 10% Max. Crossfall = 2% Min. Centreline Radius = 12.0 m Stormwater pond blocks located between residential / commercial / industrial lots shall have an access road with minimum 6.0m total width with a 4.0 m wide road surface for the purposes of maintenance access or conveyance of overland flows. A curb depression shall be provided at the road allowance and removable, lockable, vehicle barriers shall be installed at the ROW limit to prohibit public vehicular access.	
Pond Landscaping	A landscape plan shall be prepared to the satisfaction of the City and HCA and in conformance with the City of Hamilton Stormwater Management Landscaped Design Guidelines. A landscaping plan shall be prepared by a full member of the Ontario Association of Landscape Architects to City's approval. Acceptable plant species for SWM facilities have been provided within Appendix E – List of Approved Planting Species (ref. MOE, 2003). Species have been classified within the categories of deep water, shallow water, shoreline fringe, flood fringe and upland.	A pond landscaping plan will be prepared at detailed design.

Perimeter Fencing	Fencing shall be required where residential areas are located adjacent to the SWM pond block. Where the SWM pond block abuts open space, ESA lands, industrial and commercial lands, or a right-of-way, fencing will not be required. Fencing will be 1.5 m high, chain link fence, in accordance with City Standards. Fencing shall be located at an offset of 0.10 m within the pond block from the property line. Heavy duty black vinyl fence is to be provided, as per City standards.	A 1.5 m high chain link fence is proposed along the pond block interface with private property. *Please refer to Drawings SWM-1 to SWM-6 for details*

6.6.2 HYDROLOGIC ANALYSIS

A Visual OTTHYMO (VO6) model was used to perform the hydrologic analysis of the subject lands using the approved model from the SCUBE SWS which was provided by the City. HCA staff confirmed on June 4th, 2025 that they are supportive of the use of the revised SCUBE modelling for the design and hydraulic impacts assessments for the Block 1 study. A copy of this letter has been provided in **Appendix A**.

The only updates made to the model were for the BSS1 lands, all hydrograph numbers (NHYD) for external lands were not revised. The hydrology model was run using the 6-hour SCS Type II rainfall distribution based on the Mount Hope IDF parameters. The proposed development was modelled with the following scenarios:

- Existing conditions, no changes from the SCUBE SWS model areas or imperviousness
- Existing conditions for all external areas, proposed condition for BSS1 with SWM controls
- Ultimate conditions for all areas, imperviousness per SCUBE SWS
- Ultimate conditions, proposed imperviousness for BSS1 lands and SWM controls

Output results from the VO6 hydrologic analysis for all the scenarios are provided in **Appendix G-1**. The scenario schematic for proposed Block 1 ultimate scenario with the proposed imperviousness and SWM ponds is shown on **Drawing SWM-7**.

6.6.3 QUALITY CONTROL

The minimum required water quality level for the SWM Ponds is Level 2. This level of control provides for the removal of 70% of total suspended soils. The surrounding blocks have incorporated Enhanced Level 1 water quality control at the request of the HCA. As such, an Enhanced Level of water quality has been provided through this functional design.

6.6.3.1 PERMANENT POOL

Proposed permanent pool volumes for the ponds have been established based on MECP criteria Table 3.2 from the 2003 Stormwater Management Planning and Design Manual. Calculations are provided in **Appendix H**.

The required volume for each pond is summarised below:

Table 6-5 Permanent Pool Calculations

Pond	Imperviousness (%)	Area (ha)	MOE Permanent Pool Requirements (m^3/ha)	Required Storage (m^3)	Provided Storage (m^3)
1	68	33.56	181.27	6,083	17,496
2	54	28.29	147.5	4,172	11,377
3	69	15.05	182.7	2,749	3,257

Although the minimum requirement for water quality treatment of the BSS1 lands is Normal Level 2 according to the MECP standards, the proposed permanent pool volume storage meets Enhanced Level 1 water quality treatment level.

6.6.3.2 EROSION ANALYSIS

Erosion impact mitigation will be provided through extended detention storage within the proposed SWM facilities. Under the original SCUBE SWS, the release rate of the extended detention storage volume had been based on 15% of the 2-year storm event. The extended detention storage target in the original SCUBE SWS was 101 m^3/ha for Pond 1, 107 m^3/ha for Pond 2 and 99 m^3/ha for Pond 3. As indicated in the TOR for the BSS1, and as requested by HCA, an erosion threshold analysis was undertaken by GEO Morphix for WC5.0. The Erosion Threshold Analysis report is included in **Appendix E**.

The erosion control target for WC5.0 has been based on the critical discharge determined by GEO Morphix to be 0.116 m^3/s (refer to **Appendix E** for details). This equates to a unit flow rate of 0.00069 m^3/s/ha for the contributing drainage area from the subject site. The extended detention control has been established by controlling the 25 mm 4-hour Chicago storm event to the specified erosion threshold rate. The target pond release rates, based on the erosion threshold exceedance, are 0.023 m^3/s and 0.02 m^3/s for Ponds 1 and 2, respectively.

As the BSS for Block 2 studied WC6.0 and utilized the SCUBE SWS Pond 3 erosion target for the design of Pond 6, the same approach was undertaken for the erosion detention storage for Pond 3. Since the area and imperviousness for Pond 3 varied from the SCUBE SWS design, the

unit flow rate was used, but the storage volume was determined using the hydrologic model. Based on the SCUBE SWS unit release rate of 1 L/s/ha this results in a target release rate of approximately 15 L/s for the 15.05 ha drainage area to Pond 3.

The implementation of these erosion control release rates to the pond target discharge flows results in a drawdown time of 65 hours for Pond 1, 24 hours for Pond 2 and 47 hours for Pond 3. These drawdown times are within the typical 24-72 hour acceptable range.

For areas with only onsite control, it is not feasible to control the flows down to either the 0.69 L/s/ha target for WC5.0 or 1 L/s/ha target for WC6.0 using the minimum 75 mm orifice. As such it is recommended that other measures be considered when designing those properties, such as rainwater reuse, LIDs, etc. which will contribute to erosion control on a best-efforts basis.

6.6.3.3 ONSITE CONTROL AND UNCONTROLLED LOTS

As mentioned in above several areas from Block 1 are draining uncontrolled to WC5.0/WC6.0 and seven areas require onsite control as they are not able to be conveyed to the proposed stormwater sites. For the areas proposed to be developed in the future and will incorporate more than one block (526, 574, 610, 612, 616, 620, 624) that will not receive quality control from the pond, and OGS or equivalent treatment device will be required on site to provide a minimum of 80% TSS removal.

6.6.4 QUANTITY CONTROL

The original SCUBE SWS provides an assessment of the potential impacts of stormwater runoff within Watercourses 5, 5.2 and 6 associated with the proposed land use changes. The SCUBE SWS determined unitary storage and release rates for each proposed pond in order to control post-development flows to pre-development levels. These original quantity control and erosion control criteria from the SCUBE SWS have been summarized below in **Table 6-6**, **Table 6-7** and **Table 6-8** which summarize the total volume and flow targets based on the proposed post-development conditions within the Block 1 lands:

Table 6-6 SCUBE SWS Original Unit Volumes and Release Rates – Pond 1

Storm Event	SCUBE SWS West Pond 1			
	Unit Volume	Volume	Unit Release Rates	Flow
	m^3/ha	m^3	L/s/ha	L/s
Drainage Area		***34.26 ha***		***34.26 ha***
Permanent Pool	65	2,227	-	-

Extended Detention / Erosion Control	101	3,460	0.6	21
2-Year	144	4,933	4.2	144
100-Year	423	14,491	28.7	983

Table 6-7 SCUBE SWS Original Unit Volumes and Release Rates – Pond 2

Storm Event	SCUBE SWS West Pond 2			
	Unit Volume	**Volume**	**Unit Release Rates**	**Flow**
	m^3/ha	**m^3**	**L/s/ha**	**L/s**
Drainage Area		***26.13 ha***		***26.13 ha***
Permanent Pool	65	1,698	-	-
Extended Detention / Erosion Control	107	2,796	1	26
2-Year	153	3,998	6.5	170
100-Year	456	11,915	40.7	1,063

Table 6-8 SCUBE SWS Original Unit Volumes and Release Rates – Pond 3

Storm Event	SCUBE SWS West Pond 3			
	Unit Volume	**Volume**	**Unit Release Rates**	**Flow**
	m^3/ha	**m^3**	**L/s/ha**	**L/s**
Drainage Area		***22.16 ha***		***22.16 ha***
Permanent Pool	65	1,440	-	-
Extended Detention / Erosion Control	99	2,194	1	22
2-Year	141	3,125	6.5	144
100-Year	436	9,662	40.6	900

HCA has indicated that the SCUBE SWS volume and release rate targets are meant to act as a guide only, as the proposed actual impervious values and drainage catchment areas vary from the values from the original SCUBE SWS. However, as noted in the SCUBE SWS, the overall goal with regards to quantity control is to match post-development flows to pre-development flow rates in the existing watercourses downstream of the subject site. As such, the proposed SWM facilities were designed to control site flows from the subject development such that the post-development flows downstream are controlled to pre-development flows.

There are capacity issues associated with WC5.2 due to the use of ditches on Sunnyhurst Avenue. Therefore, it is proposed to re-direct discharge from Pond 2 from WC5.2 to WC5.0 (at

Barton Street) under post-development conditions. As a result, the total flows in WC5.0 at Barton Street include contributions from both Ponds 1 and 2, where both proposed SWM ponds are designed to provide sufficient attenuation such that the peak flows at Barton Street under post-development conditions are less than or equal to pre-development flows in WC5.0.

The original pre-development drainage areas specified in SCUBE SWS for Block 1 were re-delineated based on current topography, field investigations and the areas from the HCA's ongoing flood study. The updated areas were then used to determine the pre-development flows using a VO6 model. The rating curves were developed based on the required storage needed to meet the pre-development targets under post development conditions. VO6 modelling schematic and output files have also been included in **Appendix G**. The results from the hydrologic analysis are summarized below in **Table 6-9** and the stage storage relationship for all three ponds can also be found in **Appendix H.**

Table 6-9 Flow and Required Storage Volume Results

Pond	Pond Level	Post-Development Flows m^3/s	VO6 Required Storage Volume (m^3)	Required Elevation (m)	Provided Volume (m^3)
Pond 1	ED	0.023	3,704	87.42	3,704
	2	0.073	6,937	87.65	6,937
	5	0.186	10,295	87.93	10,295
	10	0.257	12,644	88.10	12,644
	25	0.314	16,003	88.29	16,003
	50	0.354	18,591	88.48	18,591
	100	0.395	21,254	88.72	24,555*
Pond 2	ED	0.02	2,416	86.24	2,416
	2	0.057	4,739	86.44	4,739
	5	0.118	7,475	86.68	7,475
	10	0.192	9,251	86.83	9,251
	25	0.262	11,634	87.01	11,634
	50	0.294	13,646	87.16	13,646
	100	0.328	15,752	87.32	18,437*
Pond 3	ED	0.015	1,715	85.99	1,715
	2	0.083	2,775	86.26	2,775
	5	0.207	3,959	86.55	3,959
	10	0.31	4,792	86.75	4,792
	25	0.499	5,913	86.97	5,913
	50	0.551	6,752	87.13	6,752
	100	0.656	7,608	87.29	8,768*

*Provided 100-year volume based on available active storage in the ponds.

The extended detention flow rates summarized in **Table 6-9** above are based on the 25 mm runoff volume to each SWM pond being released to the unitary flow rates, as per the erosion threshold requirements previously discussed in **Section 6.6.3.2**. The 100-year water level in the proposed SWM pond facilities is based on the maximum 100-year volume required at the maximum allowable active storage depth of 2.5 m, as per City standards. As the Regulatory Storm Event for the subject Block Servicing Study area is the 100-year storm event, no consideration has been required for quantity control of the Regional storm event.

The adjusted pond targets are summarized below in **Table 6-10** which also provides a comparison of the proposed pond target unit release rates to the SCUBE SWS targets for both Ponds 1 and 3. This comparison was done in order to verify that the proposed release rates match pre-development flows downstream of the subject site and are consistent with targets established in the SCUBE SWS.

Table 6-10 Proposed SWM Pond Volume and Release Rates

Storm Event	Pond-1 Area = 33.56 ha		SCUBE SWS Target Area = 34.26 ha	
	Volume	Release Rates	Volume	Release Rates
	m^3/ha	L/s/ha	m^3/ha	L/s/ha
Erosion Control	110	0.7	101	0.6
2-Year	207	2.2	144	4.2
100-Year	633	11.8	423	28.7
Storm Event	**Pond-2 Area = 28.29 ha**		**SCUBE SWS Target Area = 26.13 ha**	
	Volume	**Release Rates**	**Volume**	**Release Rates**
	m^3/ha	**L/s/ha**	**m^3/ha**	**L/s/ha**
Erosion Control	85	0.7	107	1
2-Year	168	2.0	153	6.5
100-Year	557	11.6	456	40.7
Storm Event	**Pond-3 Area = 15.05 ha; IMP% =69%**		**SCUBE SWS Target Area = 22.16 ha**	
	Volume m^3/ha	**Release Rates L/s/ha**	**Volume m^3/ha**	**Release Rates L/s/ha**
Erosion Control	113	1	99	1
2-Year	184	5.5	141	6.5
100-Year	505	43.6	436	40.6

Table 6-11 Proposed SWM Pond Volume and Release Rates (cont'd)

Storm Event	Pond-1 Area = 33.56 ha		SCUBE SWS Target Area = 34.26 ha	
	Volume m^3	Release Rates L/s	Volume m^3	Release Rates L/s
Erosion Control	3,704	23	4,011	25
2-Year	6,937	73	5,730	166
100-Year	21,254	395	16,830	1143
Storm Event	**Pond-2 Area = 28.29 ha**		**SCUBE SWS Target Area = 26.13 ha**	
	Volume m^3	**Release Rates L/s**	**Volume m^3**	**Release Rates L/s**
Erosion Control	2,416	20	2,625	24
2-Year	4,739	57	3,750	159
100-Year	15,752	328	11,180	997
Storm Event	**Pond-3 Area = 15.05 ha**		**SCUBE SWS Target Area = 22.16 ha**	
	Volume m^3	**Release Rates L/s**	**Volume m^3**	**Release Rates L/s**
Erosion Control	1,715	15	2,611	26
2-Year	2,775	83	3,730	171
100-Year	7,608	656	11,500	1071

The proposed SWM facilities were designed to attenuate peak flows such that the post-development flows are controlled to pre-development flow rates downstream of the subject site in WC5.0 and WC6.0. Refer to **Appendix H** for pond sizing calculations. Pond sizes will be further refined and optimized as part of draft planning.

As noted in **Table 6-11** below, post-development flows at the downstream locations in WC5.0 are all equal to or less than pre-development target flow rates which would not result in any flood impacts to WC5.0 as shown in **Section 2.1.4** above. Similarly, as noted in **Table 6-12**, post-development flows for all storm events are controlled to less than pre-development target flow rates at all downstream locations in WC6.0. Refer to **Section 2.2.5** for the existing and proposed flood elevations for WC6.0.

Tables 6-11 and **6-12** outline the existing and proposed flows for WC5.0 and WC6.0, respectively.

Table 6-12 WC5.0 Existing and Proposed Flows

	Location	2-year	5-year	10-year	25-year	50-year	100-year
Existing	Barton	1.81	3.27	4.36	5.54	6.97	8.16
Proposed		1.81	3.23	4.23	5.42	6.51	7.66
% Difference		0%	-1%	-3%	-2%	-7%	-6%
Existing	CPR	2.91	4.98	6.67	8.85	10.67	12.42
Proposed		2.89	4.89	6.49	8.55	10.15	11.80
% Difference		-1%	-2%	-3%	-3%	-5%	-5%
Existing	SSR	3.47	5.96	7.89	10.59	12.70	14.83
Proposed		3.46	5.90	7.76	10.36	12.29	14.33
% Difference		0%	-1%	-2%	-2%	-3%	-3%
Existing	QEW	3.86	6.64	8.78	11.53	13.41	15.40
Proposed		3.86	6.60	8.64	11.31	13.09	14.84
% Difference		0%	-1%	-2%	-2%	-2%	-4%

Table 6-13 WC6.0 Existing and Proposed Flows

	Location	2-year	5-year	10-year	25-year	50-year	100-year
Existing	Barton	1.05	2.04	2.74	4.16	5.12	6.11
Proposed		0.86	1.77	2.50	3.51	4.33	5.22
% Difference		-18%	-13%	-9%	-16%	-15%	-15%
Existing	CPR	1.63	2.59	3.40	4.47	5.31	6.08
Proposed		1.62	2.56	3.36	4.38	5.18	5.99
% Difference		-1%	-1%	-1%	-2%	-2%	-1%
Existing	QEW	2.39	4.05	5.21	6.87	8.07	9.28
Proposed		2.37	4.03	5.19	6.81	7.99	9.20
% Difference		-1%	0%	-1%	-1%	-1%	-1%
Existing	Lake*	5.69	10.44	14.14	19.17	22.84	26.54
Proposed		5.65	10.28	13.93	18.89	22.42	26.07
% Difference		-1%	-2%	-1%	-1%	-2%	-2%

*Downstream of the confluence of WC5.0 and WC6.0

Flows for the ultimate SCUBE SWS scenario and the ultimate scenario with BSS1 imperviousness and storm ponds has also been compared below, which shows that there is no increase in flow.

Table 6-14 WC5.0 SCUBE SWS and BSS1 Proposed Flows

	Location	2-year	5-year	10-year	25-year	50-year	100-year
Ultimate SCUBE SWS	Barton	3.14	5.46	7.32	9.37	11.14	13.58
Ultimate BSS1		1.81	3.23	4.23	5.42	6.51	7.66
% Difference		-42%	-41%	-42%	-42%	-42%	-44%
Ultimate SCUBE SWS	CPR	5.29	8.75	11.75	15.24	18.10	21.77
Ultimate BSS1		4.12	6.65	8.56	10.93	12.90	15.28
% Difference		-22%	-24%	-27%	-28%	-29%	-30%
Ultimate SCUBE SWS	SSR	5.94	9.83	13.09	17.09	20.29	24.44
Ultimate BSS1		4.97	8.07	10.37	13.40	15.79	18.86
% Difference		-16%	-18%	-21%	-22%	-22%	-23%
Ultimate SCUBE SWS	QEW	6.88	11.06	14.07	17.32	20.34	23.86
Ultimate BSS1		6.06	9.73	12.33	15.30	17.37	20.10
% Difference		-12%	-12%	-12%	-12%	-15%	-16%

Table 6-15 WC6.0 SCUBE and BSS1 Proposed Flows

	Location	2-year	5-year	10-year	25-year	50-year	100-year
Ultimate SCUBE SWS	Barton	3.26	5.67	7.27	10.13	12.04	14.01
Ultimate BSS1		2.04	3.65	4.74	6.64	7.96	9.32
% Difference		-37%	-36%	-35%	-34%	-34%	-33%
Ultimate SCUBE SWS	CPR	2.31	3.75	4.89	6.25	7.30	8.46
Ultimate BSS1		2.19	3.49	4.55	5.84	6.81	7.83
% Difference		-5%	-7%	-7%	-7%	-7%	-7%
Ultimate SCUBE SWS	QEW	3.24	5.35	6.81	8.79	10.21	11.91
Ultimate BSS1		3.12	5.16	6.57	8.50	9.86	11.47
% Difference		-4%	-3%	-3%	-3%	-3%	-4%
Ultimate SCUBE SWS	Lake*	9.37	16.50	20.99	27.22	32.04	37.62
Ultimate BSS1		8.31	15.00	18.58	24.12	28.72	33.66
% Difference		-11%	-9%	-12%	-11%	-10%	-11%

*Downstream of the confluence of WC5.0 and WC6.0

In addition to the ponds, onsite controlled is also required for several areas going to each watercourse that are not able to be conveyed to a pond due to grading constraints in order to meet the target flows in each watercourse.

For WC5.0, drainage areas 574 and 526 require 1,280 m^3 of storage for the 100-year event based on the weighted area. For WC6.0 in the 10 area 620, which is being conveyed to Highway 8 will require approximately 829 m^3 of storage, area 612 which drains directly to the creek will require approximately 1433 m^3 of storage and areas 624, 610 and 616 which are draining to Barton Street will require 2,268 m^3 of storage.

6.6.5 SEDIMENT FOREBAY

Proposed forebays are designed to accommodate the 5-year flow. The major system will bypass the forebay and be conveyed directly to the wet cell. The criteria for forebays is a length to width ratio greater than 2:1 and sufficient length to meet MOE criteria. The length of the forebays is determined by the distance required to settle particles of a certain size, the MOE manual (2003) recommends settling particles greater than 0.15 mm. The dispersion lengths were checked to ensure sufficient length is provided to slow the incoming pipe flow. It has been determined that minimum forebay lengths of 26 m and 29 m for the two proposed forebay areas in Pond 2 (West) from Headwall 1 and 2 (HW-1 and HW-2), respectively, and a forebay length of 11 m is required by Pond 2 (East) to provide adequate settling.

Similarly, minimum forebay lengths of 102 and 38 m for Pond 1 (West) for HW-1 and HW-2, respectively, and a forebay length 40 m is required for Pond 2 (East) to provide adequate dispersion.

Therefore, all forebay lengths provided are sufficient for providing the minimum required dispersion and settling lengths.

6.6.6 POND OUTLET

Pond 1 and Pond 2 will discharge to WC5.0. Pond 3 will discharge to WC6.0 to the east of Jones Road. Proposed orifice plates will be bolted onto the outlet structures with the inverts set at the permanent pool levels of each pond. All the proposed ponds will have additional outlet openings to meet the release rates established in **Section 6.6.4**. The pond outlet structures and orifices will be designed at the detailed design stage, with a minimum orifice size of 75 mm being proposed.

Preliminary orifice dimensions and the corresponding target release rates and drawdown times for each pond have been calculated for the extended detention orifice and are indicated in **Table 6-15**.

Table 6-16 Orifice Sizing for Extended Detention Flow

Pond	Target Extended Detention Flow (m^3/s)	Preliminary Drawdown Time (hours)	Orifice Size (mm)
Pond 1	0.023	65	145
Pond 2	0.02	24	130
Pond 3	0.015	47	104

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6.6.7 ACCESS ROAD

A maintenance access road has been provided for each SWM pond in order to allow trucks and other equipment to access the facilities for inspection and maintenance. A 4.0 m wide maintenance road around the entire perimeter of each pond has been proposed within the pond block area. The entrance to the proposed maintenance access road to Pond 1 is from Street C, Pond 2 is from Gordon Dean Avenue, and Pond 3 is from Jones Road.

6.6.8 EMERGENCY OVERFLOWS

Pond 1 and Pond 2 have been designed to release emergency flows (WC5.0 and Barton Street) and Pond 3 has been designed to release emergency flows to WC6.0. The emergency spillway from the ponds has the following characteristics listed in **Table 6-16** below.

Table 6-17 Emergency Outlet Design

Post Development Scenario			
Pond	**Pond 1**	**Pond 2**	**Pond 3**
Spillway Invert (m)	88.7	88.2	87.6
HWL (100-Year) (m)	88.6	87.25	87.5
Top of Pond (m)	89.2	88.7	88.2
Weir Length; Side Slopes	63 m, 10:1	52 m, 10:1	16 m, 10:1
Storm Event for Spillway Design	100-year	100-year	100-year
Flow Required Capacity (m^3/s)	8.62	7.24	4.67
Receiving Channel/Road	WC5.0	Barton Street	WC6.0

6.7 SWM POND OPERATIONS AND MAINTENANCE

The recommended operation/maintenance and monitoring schedules for the proposed SWM ponds will be in accordance with the City of Hamilton Operation and Maintenance Report for Stormwater Management Facilities (2017). This will include general routine pond maintenance in addition to sediment cleanout of the subject SWM ponds. These details will be provided in a SWM pond operations and maintenance manual which will be developed for each SWM pond at detailed design.

6.8 WATER BALANCE

6.8.1 DESIGN CRITERIA

The Fruitland-Winona Secondary Plan states that LIDs shall be considered in the design of public and private developments in the Fruitland-Winona development area.

One of the objectives of the Secondary Plan was to incorporate a sustainable SWM strategy. Part of this strategy was to identify, at the early planning stages, opportunities to incorporate LID BMP approaches to managing stormwater while also accommodating conventional storm water management approaches, as necessary.

The SCUBE SWS recommends that LID BMP techniques be used to maintain the groundwater recharge rates within the study area. Per recommendations included on Figure 2.1 and Table 7.1 of the SCUBE SWS (provided in **Appendix A**), LID source controls for groundwater recharge will provide the following infiltration volumes based on each land use and underlying soil type within the Block 1 lands:

- Residential lands over silt/clay = 1 mm
- Commercial/Institutional lands silt/clay = 2.5 mm
- All land uses over sand/gravel = 2.5 mm

The infiltration criteria noted above were applied to the post-development drainage areas which were disaggregated based on land use and soil type. For drainage areas with parks and ponds located within proposed residential blocks and with an underlying soil type of silt/clay, an infiltration requirement of 1 mm was applied. The percentage of annual precipitation relating to 1 and 2.5 mm rainfall events was determined based on the City of Toronto Wet Weather Flow Management Guidelines Figure 1a. It is assumed that LIDs will only be able to be implemented in areas with 1.5 m of separation between the future grade and the groundwater table so that an LID and 1 m of clearance from the bottom of the LID can be accommodated. Based on this assumption, approximately 10.7 ha will not be able to implement infiltration, and 158,230 m^3 of rain is required to be infiltrated per year over the areas that have adequate separation. Water balance calculations are shown in **Appendix H**. Refer to **Drawing LID-1** for infiltration requirements.

In addition to meeting the SCUBE SWS recommendations for infiltration, WSP also conducted a water balance analysis to identify the deficit between pre and post-development (without mitigation). This identified an infiltration deficit of 160,986 m^3/year. As the infiltration deficit noted by WSP in the pre and post-development water balance analysis is more than the SCUBE SWS infiltration requirements, the water balance will govern as the required infiltration target.

The proposed LID BMPs that will achieve the infiltration targets will be implemented at the individual site or subdivision level and will be addressed at detailed design. The SCUBE SWS recommends that preliminary design of centralized/communal LIDs be conducted at the FSR

stage. As no centralized or communal LIDs are proposed for the Block 1 lands, LID analysis for specific features is not provided within this BSS1 report.

6.8.2 MITIGATION PLAN

In reviewing the feasibility of implementing LID Best Management Practices (BMP's), consideration will be given to the following factors:

- ability to meet all SWM goals, objectives and targets;
- suitability of substrates and groundwater conditions;
- site topography and size of contributing drainage areas;
- compatibility with urban form and natural features; and
- municipal servicing requirements.

In evaluating the practical feasibility of implementing LID BMPs, guidance was obtained from the *MOE Stormwater Management Planning and Design Manual, March 2003* (referred to herein as the *MOE SWMP Design Manual*). LID BMPs on the Block 1 lands will be designed to manage potential environmental impacts at or close to their source thereby minimizing downstream impacts such as providing erosion, water quality and quantity control. LID BMPs aim to manage stormwater runoff from urban development and replicate the natural or pre-development hydro-regime of a watershed. This is achieved through implementation of engineered, small-scale, source controls that include pre-treatment, filtration, infiltration, storage and re-use. It has been assumed that wherever practicable, the proposed rooftop and lawn areas would be directed to LID BMPs.

The following LID BMPs in **Table 6-17** are recommendations based on guidance from the CVC / TRCA Low Impact Development Stormwater Management Planning and Design Guide for incorporation of LID measures into the Block 1 Draft Plan. **Table 6-17** lists the recommended LID BMPs in order of feasibility (from most to least practical) for implementation in residential land use which makes up the majority of the Block 1 development lands.

Table 6-18 BSS1 – Proposed LID BMPs

	LID Measure	Notes	Application
1	Rainwater Harvesting	Source control for groundwater recharge if used for irrigation.	Private Lots (rain Barrels) or High-Density Built-up Areas with Flat Roofs to collect Water for irrigation

	LID Measure	Notes	Application
2	Downspout Disconnection	Enhanced groundwater recharge when used in conjunction with topsoil amendments.	Private Lots
3	Soak Away Pits/ Infiltration Chambers	Engineered underground rock filled galleries or chambers that store and infiltrate runoff.	Private parking lots. Public open spaces or Rights of Way.
4	Bioswales	Enhanced vegetative swale with filtration, attenuation and infiltration capabilities.	Public Rights of Way Landscape Strips, Parks and Open Spaces
5	Permeable Pavement	Promote infiltration/filtration through paved surfaces	Private employment land uses.
6	Grassed Swales	Conveyance LID to be located on continuous strips of green space. Promote infiltration and TSS removal.	Public and private lands where space permits.
7	Additional Topsoil	Minimum 200 mm of topsoil in landscape enhances groundwater recharge	Private or Public areas
8	Rear Yard Infiltration Trenches/Swales	Rear yard drainage swale with 300 mm topsoil granular storage media and perforated underdrain.	Single Family or Towns
9	Perforated Pipe Systems	Dual purpose (conveyance and infiltration) perforated storm sewer designed to exfiltrate into surrounding bedding.	Public Right of Way
10	Rain Gardens	Landscape elements designed to attenuate / infiltrate runoff, usually from nearby roofs	Private Property
11	Enhanced Tree Pits	Enlarged tree pits or topsoil filled chamber designed to receive direct runoff from streets for infiltration.	Public Right of Way

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6.8.3 LID BMP OWNERSHIP AND MAINTENANCE

Monitoring of LID performance is currently being undertaken by the Sustainable Technologies Evaluation Program (STEP) across the province led by the Conservation Authorities of Ontario. STEP provides a database of performance levels and maintenance requirements for a variety of LID technologies. STEP monitoring data indicates that properly maintained LID technologies, such as permeable pavement and infiltration galleries, exhibit very little loss in performance over time.

LID BMPs require routine but relatively low-cost maintenance. LID BMPs that utilize biofiltration such as bio-retention, bio-swales, and rain gardens, may require cleaning or replacement of the inlet media every five to ten years. Operation and Maintenance manuals for proposed LID BMPs will be provided at the detailed design stage by the civil engineer.

LID BMPs on the subject lands will be designed to simplify operations and maintenance in order to minimize the obligations of private landowners to maintain components of the system.

The extent to which LIDS are to be placed on single family lots is subject to change as a result:

1. City policy not allowing LIDs on single family due to maintenance responsibilities, and
2. The practicality of infiltration LIDS due to anticipated low hydraulic conductivity of native soils found in Block 1.

It is recommended that a best-efforts approach to water balance be considered at the draft plan approval stage within the future block development, parks and roads in consultation with the City.

6.8.4 INTEGRATING LID BMP DESIGN ELEMENTS

A suite of LID source and conveyance controls will be considered as part of a treatment train approach to provide quality control and infiltration mitigation, within the subject lands. The allocation of LID BMPs will be refined at the draft plan stage and will consider the feasibility of LID measures, considering underlying soil conditions, groundwater levels, proposed drainage patterns, land use of adjacent areas, local topography, maintenance responsibilities / costs, and additional factors identified by the City of Hamilton Secondary Plan and SCUBE SWS. Where LID controls are not feasible, consideration to other infrastructure design adjustments within the Block.

The SCUBE SWS, City of Hamilton Secondary Plan, and the City of Hamilton Innovative Stormwater Source Control Policy prioritize source control, or the treatment of runoff wherever it falls. Source control of stormwater runoff will be considered and prioritized for all areas within Block 1. LID BMP features can potentially reduce stormwater infrastructure costs while providing additional water quality improvements and infiltration opportunities.

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7 TRAFFIC/TRANSPORTATION

7.1 CONTEXT

The Fruitland-Winona Block 1 Owners Group retained Paradigm Transportation Solutions Limited (Paradigm) to conduct this Transportation Study for the Block 1 lands within the Fruitland-Winona Secondary Plan (FWSP) area (formerly Stoney Creek Urban Boundary Expansion) in the City of Hamilton.

Paradigm previously prepared a Transportation Study for the Block 1 lands dated March 2022. Following submission of the Transportation Study, comments were received from the City of Hamilton and an updated concept plan was developed. This submission addresses the review comments and reflects the proposed changes to the concept plan from a transportation perspective.

This study determines the impacts of the proposed development plan on the surrounding road network and identifies the recommended improvements to accommodate the site-generated traffic. The analysis horizon years include 2023 (base year), 2031 (anticipated full build-out year), and 2036 (five years beyond the anticipated full build-out).

7.2 DEVELOPMENT CONCEPT

It is understood that internal roadways would be constructed in accordance with the Detailed Staging and Phasing Plan for the development. The Secondary Plan proposes four new roads in Block 1:

- Gordon Dean Avenue: a north-south collector road that extends southerly from Sunnyhurst Avenue to Highway 8;
- Collector B: an east-west collector road that extends easterly from Sherwood Park Road into the adjacent Block 2 lands located east of the Block 1 lands;
- Street C: a local road that is proposed to generally bisect the lands west of Gordon Dean Avenue. Two scenarios for the Street C alignment are assessed. Scenario 1 – connection to Highway 8 and Scenario 2 – no connection to Highway 8; and
- Street D: a local road located in the southwest corner of Block 1. It contains two cul-de-sacs and intersects with Street C approximately mid-point between Highway 8 and Collector B.

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7.3 CONCLUSIONS

The main findings and conclusions of this study are as follows:

- **Base Year Traffic Conditions**: The study area intersections are currently operating at acceptable levels of service and well within capacity during the weekday AM and PM peak hours. The northbound and southbound left-turn movements at the unsignalized intersection of Highway 8 and Jones Road are reported to operate at LOS D during the AM and PM peak hours; however, both movements operate within capacity and no other critical movements are noted;
- **Site Trip Generation**: Full build-out of Block 1 is estimated to generate approximately 1,787 AM peak hour vehicle trips and 2,066 PM peak hour vehicle trips;
- **Site Trip Distribution and Assignments**: Trip distribution was estimated based on a review of existing traffic patterns as well as trip distribution data determined from 2016 TTS data. Site trips were assigned to the internal and external road networks in accordance with the trip distribution and logical routing choices;
- **Future Road Network**: Future road network improvements within the study area include two new collector roadways (Gordon Dean Avenue and Collector B), two local streets (Street C and Street D), the planned widening of both Barton Street and Highway 8 from two to four lanes. It is assumed that the planned improvements will be in place by 2031 to support the build-out of the Fruitland-Winona Secondary Plan area;
- **Horizon Years**: Year 2031 and 2036 were analyzed, representing the assumed full build-out/occupancy year and a period of five years beyond full build-out/occupancy year;
- **Background Traffic Forecasts**: A 2.0% per annum compounded growth rate was applied to the base year traffic volumes to derive the 2031 background traffic forecasts. A 4.5% per annum compounded growth rate was applied to the 2031 background traffic forecasts to derive the 2036 background traffic forecasts;
- **Background Traffic Conditions**: Under the 2031 and 2036 horizon years, critical movements are identified at the study area intersections during the AM and PM peak hours;
- **Total Traffic Conditions**: Total traffic analyses were conducted accounting for two scenarios related to Street C. Scenario 1 – Street C connects to Highway 8 and Scenario 2 – Street C does not connect to Highway 8.

  Under the 2031 and 2036 horizon years, capacity issues identified under background conditions are forecast to continue to occur under total traffic conditions. Several critical movements were identified in addition to those identified under background conditions at multiple study area intersections.

  The majority of study area intersections are forecast to operate similarly under both Scenario 1 and Scenario 2 conditions. One major difference is noted at the intersection of Fruitland Road and Sherwood Park Road/Collector B. Specifically, the westbound approach is forecast to operate over-capacity under Scenario 2 while it is reported to operate within capacity under Scenario 1. This is due to increased westbound left-turn

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movements at Fruitland Road and Sherwood Park Road/Collector B under Scenario 2 as Street C does not provide direct access to Highway 8;

- **Remedial Measures**: Geometric and traffic control improvements are required to accommodate the forecast traffic volumes resulting from the build-out of the Fruitland-Winona Secondary Plan area and the Block 1 lands. **Figure ES.1** (refer to **Appendix F** in Volume 2) illustrates the recommended future lane configurations and traffic control for the study area intersections;
- **Street C Connection Scenarios**: Preferred option is Street C, scenario 1 connection to highway 8;
- **Access Review**: The proposed road network (Scenario 2) and intersections meet and satisfy the TAC GDGCR requirements in terms of intersection spacing and sight distance requirements; and
- **Fruitland Road Width**: The Block plan proposes to reduce the ROW width to 26.0m. This reduction has been verified by the traffic engineer in the TIS as Gordon Dean is proposed to replace Fruitland Road as the designated truck route.

7.4 RECOMMENDATIONS

Based on the findings of this study, it is recommended that:

- The City of Hamilton recognize the conclusions drawn above;
- Traffic conditions to be monitored within the study area, to determine appropriate timing for implementation of road network improvements and remedial measures in response to actual growth realized and actual site traffic generated; and
- The preferred Street C connection is Scenario 2, where Street C does not connect to Highway 8.

In support of draft plan approval, this report can be amended to document any staging of interim or ultimate network improvements.

Refer to **Appendix F** for detailed Traffic Study by Paradigm.

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8 IMPLEMENTATION AND PERMITS

This section will highlight the required steps for development to occur within the BSS1 study area.

8.1 PHASING

Detailed phasing plans have not been developed at this time. Development will generally proceed from north to south following the logical extension of sanitary sewer and proposed storm ponds and outlets. The participation or non-participation of various landowners could affect the exact sequence of development and may require the construction of temporary measures.

Should any of the proposed draft plans require interim infrastructure measures, these will be designed in a manner to have regard for existing boundary conditions and not affect the ability of the ultimate infrastructure works to be constructed. Any interim measures required would be at the cost of the developer. All interim measures would be designed in accordance with City of Hamilton standards and any relevant approval agency requirements including the HCA.

Should the development of any of the lands require interim measures related to the WC5.0 design and construction, it will be demonstrated how the interim measures will be designed as required to accommodate existing conditions and ultimate development requirements to the satisfaction of City of Hamilton and the HCA. Should there be lands required for the ultimate channel design that cannot be acquired by the Landowner Group, interim design measures will be taken to implement the intent of the BSS1 and to accommodate existing and ultimate conditions.

As part of the ongoing planning applications City may impose holding provisions to manage yet to be determined technical and real estate constraints.

Following is the anticipated sequence of development:

Phase 1

This phase will include the construct of all “Core Infrastructure” indicated on Figure 1A. The intention is that all core infrastructure be constructed to allow any of the various land owners to proceed independently of each other.

1. Pond 1 and Channelization of WC5.0 from Barton Street to Street B (may require interim measures). Refer to plan in **Appendix M**.
2. Pond 2 and Gordon Dean from Barton Street to Highway 8.
3. Street B from Fruitland Road to Jones Road.
4. Street C from Gordean Dean to north limit of neighbourhood park.
5. Interim external requirements.
6. This phase could include new lotting that fronts onto Fruitland Road.
7. The remainder of WC5.0 south of Street B.

Upon completion of the core infrastructure and subsequent planning and construction activities associated with the individual blocs, building permits can be issued.

It is understood that there will be additional improvements in the community, refer to **Drawing 6**. These will include:

- Construction of a Community Park by the City
- Construction of a Neighbourhood Park
- ROW improvements to Barton Street, Highway 8, Fruitland Road and Jones Road

The timing of these improvements is subject to City EA projects and other associated approvals.

Development of Lands adjacent Jones Road and Barton at the North-East quadrant of Block 1 can proceed independently from the above Phases provided the needed infrastructure can be delivered. Due to the fragmented land ownership, implementation will be difficult.

HCA has identified concerns about the implementation and staging of WC5.0 and recommends that a comprehensive and coordinated approach is required. It is recommended that further work be pursued with the HCA in support of the draft plans to develop a coordinated approach acceptable to the HCA. All direction provided in the SCUBE SWS Phase 3 Implementation Report as it relates to post-construction wait times for WC5.0 will be followed.

In support of ongoing planning actions, the developer group will prepare a Detailed Staging and Phasing plan to the satisfaction of the City.

8.1.1 COORDINATION OF PHASING OF IMPLEMENTATION

To ensure the integrity of the Block's infrastructure design and the proposed WC5.0 realignment, coordinated detailed engineering design will be initiated and submitted for approval by the City of Hamilton, HCA, and other relevant agencies at the start of the Block's initial development submission. The Landowners Group will provide continuous oversight throughout the implementation strategy for Block 1SS.

8.2 CORE SERVICES

The development of lands within the majority of Block 1 relies on services that are mutually beneficial to many properties and are considered Spine services:

1. The channelization WC5.0 and its restoration
2. Culvert Crossing of WC5.0 at Street B
3. Sanitary sewer improvements on Barton Street external to the Block
4. Sanitary sewer improvements on Gordon Dean

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5. Construction of Street C
6. Pond 1 and its outfall to WC5.0
7. Pond 2 and its outfall on Barton Street
8. New collector Roads and associated intersection improvements at arterials
9. New trunk watermains and connections to existing water infrastructure within adjacent arterial Roads

The core services may be subject to community cost sharing or City DC credits. Refer to **Figure 7.**

It is understood that there will be additional improvements in the community (**Figure 6**). These will include:

- Construction of a Community Park by the City
- Construction of a Neighbourhood Park
- ROW improvements to Barton Street, Highway 8, Fruitland Road and Jones Road

The timing of these improvements is subject to City EA projects and other associated approvals.

The core services will be subject to community cost sharing or City DC credits. The following conditions will be applied to lands within Block 1 as it relates to cost sharing obligations:

- A Secondary Plan Area landowners' Cost Sharing Group shall be established to ensure orderly and timely development in the Secondary Plan Area, and that the costs associated with such development are fairly and equitably distributed among all landowners in the Secondary Plan Area.

- The costs associated with development include, but are not limited to, the cost of studies to inform and support the planning of the area, the costs and burdens related to community lands, services and infrastructure, as well as the cost to acquire land in order to implement this Plan in the Secondary Plan Area.

- The Secondary Plan Area landowners are required to enter into a cost sharing agreement or agreements among themselves.

- Prior to the draft approval, registration of any plan of subdivision or plan of condominium or final approval of any site plan application or the approval of any application under the Planning Act, the Secondary Plan Area landowners' Cost Sharing Group trustee shall provide the Town with confirmation, in writing, that the owner of such lands is in good standing with the Secondary Plan Area landowners' Cost Sharing Group."

8.3 PERMITS

The subdivision works will be subject to the permitting requirements of local and provincial agencies as outlined on **Table 8-1**.

Table 8-1 Summary of Permit/Approval Requirements for BSS1

COMPONENTS OF WORKS	City of Hamilton	HCA Ont Reg 1691/06 Permit	DFO	MECP-ECA
WC5.0 Channel Improvements including Road Crossings and Pond Outfalls	Yes	Yes	Unknown	No
Ponds 1/3 and Outfalls to WC5.0/WC6.0	Yes	Yes	No	Yes
Pond 2 and Outfall to Barton and WC5.0	Yes	Unknown	No	Yes
Municipal Infrastructure	Yes	No	No	Yes
Construction Dewatering	No	No	No	PTTW if Flows > 50,000 l/d

9 CONCLUSIONS AND RECOMMENDATIONS

This study provides the framework for orderly development within the Block 1 area of the Fruitland Winona Secondary Plan area. The following conclusions are made based on the investigations and analysis of the consultant team. Recommendations for subsequent stages of the development planning have been included:

- Based on the Urban Hamilton Official Plan Amendment No. 17 and further detailed investigations, no Natural Heritage System (NHS) is proposed within the subject lands.
- The EIS concluded that there were no significant environmental features warranting preservation. Recommendations include the provision of sediment controls during construction and ensuring that vegetation removal occurs outside of the migratory bird breeding window.
- The EIS concluded that the channelization of WC5.0 provides ecological benefits and a net improvement to the natural heritage of the community.
- The development concept plan has been prepared to support the BSS1 and is in keeping with the secondary plan and Gordon Dean EA.
- The Air Drainage Analysis does not indicate any concerns with the proposed concept plan.

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- Groundwater levels in the site are high limiting the installation of deep infiltration system and possible requiring pond liners. Ongoing GW monitoring is recommended to further improve the data.
- Soils throughout the site are anticipated to low infiltration rates limiting infiltration opportunities.
- Water balance for the site is recommended to be provided on based on the targets in SCUBE SWS and the pre-development infiltration deficit for areas where there would be minimum 1.5 m of separation between the proposed ground elevation and groundwater table.
- A fluvial geomorphological analysis has provided an erosion threshold for WC5.0 and Ponds 1 and 2 has been designed in consideration of the analysis. The erosion target for Pond 3 was taken from the Block 2 BSS by Aquafor Beech.
- A meander belt width for WC6.0 has been determined to be 30m.
- The block will require 3 stormwater management facilities (for the provision of stormwater quality, quantity and erosion control).
- Some development parcels require on-site SWM controls in the form of on-site storage for quantity control and OGS for quality control. It is recommended that extended detention be waived on site that develop with onsite controls.
- Development of Pond 3 will require land assembly, and the configuration is subject to change.
- New Storm sewers are required in the vicinity of Jones Road to facilitate development.
- Development of Block 1 is not anticipated to exceed City design criteria for offsite wastewater mains.
- Implications to wastewater mains have been documented for lands south of Highway 8 which may be developed in the future.
- The Water Hydraulic Analysis concluded that no external service improvements are required, and the development can be adequately serviced through the construction of new local watermains connected to existing infrastructure.
- The TIS recommends intersection improvements to improve left turn movements and signal timing adjustments at various intersections.

9.1 FURTHER STUDIES IN SUPPORT OF DRAFT PLAN APPROVAL

It has been determined in conjunction with the City of Hamilton that further studies be completed for the Block 1 lands in support of Draft Plan Approval. Future design works will be undertaken in accordance with City standards and other approval agency requirements.

The following reports are anticipated to be updated at the draft plan approval stage:

- Detailed Staging and Phasing Plan
- Functional Design of WC5.0
- Fluvial Geomorphological Report

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- Environmental Impact Statement
- Functional Servicing Report(s) - Including hydraulic grade line analysis
- Updated BSS1 Watershed models (hydrologic and hydraulic)
- Core Servicing Functional Design
- Traffic Impact Study

Refer to the **Table ES1** major requirements table at the beginning of this document for further details.

Should future planning applications contemplate Official Plan Amendments, then this BSS will be updated to reflect the new Planning Application(s). This BSS will be updated at the time of the first subdivision application to reflect the final planning application(s). It is understood that these future planning application will have to conform with the requirements of the Secondary Plan and updates to all components of the BSS may be required.

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